

Managers' Exploration and Exploitation Activities

The Influence of Organizational Factors and Knowledge Inflows



Managers' Exploration and Exploitation Activities: The Influence of Organizational Factors and Knowledge Inflows

Managers' Exploration and Exploitation Activities: The Influence of Organizational Factors and Knowledge Inflows

Exploratie en exploitatie activiteiten van managers: de invloed van organisatiefactoren en kennisinstromen

Proefschrift

ter verkrijging van de graad van doctor aan de Erasmus Universiteit Rotterdam op gezag van de Rector Magnificus Prof.dr. S.W.J. Lamberts en volgens besluit van het College voor Promoties.

De openbare verdediging zal plaatsvinden op donderdag 31 augustus 2006 om 16.00 uur

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Erasmus Research Institute of Management (ERIM) RSM Erasmus University / Erasmus School of Economics Erasmus University Rotterdam

Internet: http://www.erim.eur.nl

ERIM Electronic Series Portal: http://hdl.handle.net/1765/1

ERIM Ph.D. Series Research in Management 79

ISBN-10: 90-5892-116-6 ISBN-13: 978-90-5892-116-1

Design: B&T Ontwerp en advies www.b-en-t.nl / Print: Haveka www.haveka.nl

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PREFACE

The choice for this dissertation's subject, about how managers' exploration and exploitation activities can be influenced, not only ensues from my will to find answers to questions which are of relevance for both academia and management practice, but also from my interest to understand how a person can excel in seemingly contradictory behaviors.

I would like to thank both of my promoters, Professor Dr. Frans Van Den Bosch and Professor Dr. Henk Volberda, for their coaching during my PhD-student trajectory. Henk, I am grateful for the freedom and possibilities you created, which I needed to accomplish this dissertation and related research. Frans, thanks for the many interesting and inspiring conversations we had, which often went further than this dissertation; about things which seem to be even more important in life. I also would like to thank my colleagues of the department; I always enjoyed working with you. Special thanks to Justin Jansen; friend and colleague. During the journeys we made, abroad, or just to a good pub in Rotterdam, we had many good discussions and a lot of fun. Besides that, you always inspired me to do good research.

I also owe much gratitude to the managers of Rabobank, Philips, and Deloitte, who cooperated with this research. Special thanks to George Bernaert, Rien van Adrighem, Ad Boon, and Pascal Claeys; through your pioneering work and your enthusiasm, you created all freedom and possibilities I needed to conduct thorough and exiting research within the above mentioned companies. Special thanks also to Erik van den Bosch, Julien de Jong, and Eric van Lubeek; it was inspiring and fun doing research together with you.

Thanks also to my family and friends. Yes, I now finished 'studying'. Dearest Marleen, most of my gratitude goes to you, as we can share our lives together. You increase my desire to, and teach me how to, excel in seemingly contradictory behaviors, and make me realize that *amo et amor, ergo sum*.

Rotterdam, August 2006

Tom Mom

Table of Contents

PREFACE iii

CHAPTER 1 – INTRODUCTION	1
1.1 – Introduction	1
1.2 – Research Aim, Questions, and Conceptual Model	
1.3 – Contributions	
1.4 – Research Design	
1.5 – Outline of the Study	
CHAPTER 2 – THEORETICAL BACKGROUNDS AND CONCEPTUAL RESEARC	СН
FRAMEWORK	17
2.1 – Introduction	17
2.2 – Exploration and Exploitation: Insights from Related Management Fields and Positioning this Study	
Distinctions between Exploration and Exploitation	
Tensions and Relations between Exploration and Exploitation	22
Combing Exploration and Exploitation within Organizations	
Conclusion and the Positioning of this Study	
2.3 – Exploration and Exploitation at the Manager Level	31
Relevance of Manger Level Exploration and Exploitation Activities	
Conceptualizing Managers' Exploration and Exploitation Activities	
2.4 - Organizational Factors and Managers' Exploration and Exploitation Activities	
Relevance of Organizational Factors	
Specifying Organizational Factors	
2.5 - Knowledge Inflows and Managers' Exploration and Exploitation Activities	43
Relevance of Knowledge Inflows	43
Conceptualizing Managers' Knowledge inflows	47
The Mediating Role of Knowledge Inflows	
2.6 - Conclusion - Conceptual Research Framework	51
CHAPTER 3 – HYPOTHESES DEVELOPMENT	55
3.1 – Introduction	
3.2 – The Direct Impact of Organizational Factors on Managers' Exploration and	55
Exploitation Activities	
Organizational Factors as Common Features of Coordination Capabilities	
Organizational Factors as Common Features of Systems Capabilities	58
Organizational Factors as Common Features of Socialization Capabilities	
3.3 – The Impact of Organizational Factors on Managers' Knowledge Inflows	
Organizational Factors as Common Features of Coordination Capabilities	
Organizational Factors as Common Features of Systems Capabilities	64
Organizational Factors as Common Features of Socialization Capabilities	66
3.4 – The Impact of Knowledge Inflows on Manager's Exploration and Exploitation	
Activities	
Top-down Knowledge Inflows	
Bottom-up Knowledge Inflows	
Horizontal Knowledge Inflows	
3.5 - Conclusion	71

CHAPTER 4 – RESEARCH SETTING AND METHODS	75
4.1 – Introduction	75
4.2 – Methodological Consequences of Focusing at the Manager Level	
4.3 – Research Setting.	
4.3.1 - Rabobank	
Industry	
Rabobank Group: Short Historical Overview	79
Rabobank Group and its Local Banks: Figures, Structure, and Recent Developments	
Managers' Exploration and Exploitation Activities	
4.3.2 – Philips	82
Industry	82
Philips: Short Historical Overview	84
Philips Semiconductors: Figures, Structure, and Recent Developments	85
Managers' Exploration and Exploitation Activities	
4.3.3 – Deloitte	
Industry	87
Deloitte: Short Historical Overview	89
Deloitte Nederland: Figures, Structure, and Recent Developments	89
Managers' Exploration and Exploitation Activities	91
4.4 – Samples and Data Collection	92
4.5 - Measurement Development and Validation	95
4.5.1 – Exploration and Exploitation Activities	
4.5.2 – Organizational Factors	
4.5.3 - Knowledge Inflows	
4.5.4 – Control Variables	103
Hierarchical Levels	
Functional Areas	
Organizational Units	
Control Variables in the Integrated Dataset	106
4.6 - Conclusion	107
CHAPTER 5 – ANALYSES AND RESULTS	109
5.1 – Introduction	
5.2 – Rabobank Dataset Control Variables and Descriptives	
Organizational Factors and Managers' Exploration & Exploitation Activities	
Organizational Factors and Managers' Exploration & Exploitation Activities Organizational Factors and Managers' Knowledge Inflows	
Knowledge Inflows and Managers' Exploration and Exploitation Activities	
The Mediating Role of Knowledge Inflows	
5.3 – Philips Dataset	
Control Variables and Descriptives	
Organizational Factors and Managers' Exploration & Exploitation Activities	
Organizational Factors and Managers' Exploration & Exploitation Activities Organizational Factors and Managers' Knowledge Inflows	
Knowledge Inflows and Managers' Exploration and Exploitation Activities	
The Mediating Role of Knowledge Inflows	
5.4 – Deloitte Dataset	
Control Variables and Descriptives	
Organizational Factors and Managers' Exploration & Exploitation Activities	
Organizational Factors and Managers' Exploration & Exploitation Activities Organizational Factors and Managers' Knowledge Inflows	
Knowledge Inflows and Managers' Exploration and Exploitation Activities	
The Mediating Role of Knowledge Inflows	

5.5 – Comparing Results across Datasets	145
5.6 – Analysis of Integrated Dataset	147
Control Variables and Descriptives	
Organizational Factors and Managers' Exploration & Exploitation Activities	153
Organizational Factors and Managers' Knowledge Inflows	
Knowledge Inflows and Managers' Exploration and Exploitation Activities	158
The Mediating Role of Knowledge Inflows	
Structural Equation Modeling: Goodness of Fit Assessment and Comparison with	
Competing Models	163
5.7 – Conclusion	
CHAPTER 6 – DISCUSSION AND CONCLUSION	167
6.1 – Introduction	167
6.2 – Discussion of Findings	
The Role of Organizational Factors	
The Role of Managers' Knowledge Inflows	
Control Variables	
6.3 – Implications	
6.4 – Limitations and Future Research	
6.5 - Conclusion	
REFERENCES	189
NEDERLANDSE SAMENVATING (DUTCH SUMMARY)	
CURRICULUM VITAE	
APPENDIX A – Illustrative Studies: Distinctions and Relations between Exploration	
Exploitation	
APPENDIX B – Survey Items	231
APPENDIX C – Specification of Interviews	235

CHAPTER 1 – INTRODUCTION

1.1 – Introduction

A fundamental question in the field of strategic management, both from a researcher and a practitioner point of view, is how firms achieve and sustain competitive advantage. In order to be successful over time, firms in a dynamic environment are challenged to both explore new possibilities to achieve congruence with the changing business environment and to exploit old certainties to secure efficiency benefits (Levinthal & March, 1993; March, 1991). As Levinthal and March (1993: 105) put it: 'the basic problem confronting an organization is to engage in sufficient exploitation to ensure its current viability and, at the same time, to devote enough energy to exploration to ensure its future viability'. An exclusive focus on either exploration or exploitation may cause a threat to a firm's competitive advantage over time; Levinthal and March (1993: 105) for instance argue that 'an organization that engages exclusively in exploration will ordinarily suffer from the fact that it never gains the returns of its knowledge. An organization that engages exclusively in exploitation will ordinarily suffer from obsolescence'. Recent empirical studies (Gibson & Birkinshaw, 2004; He & Wong, 2004) seem to confirm that there is a relationship between exploration and exploitation and a firm's success. They show that firms or business units which have high levels of both exploration and exploitation outperform those firms or units which have not.

Firms however face difficulties to both explore and exploit; they often make 'explicit and implicit choices between the two' (March, 1991: 71). The explicit choices can be found in calculated decisions about alternative investments; both exploration and exploitation compete for scarce resources and the returns from the two differ with respect to certainty and proximity in time and space (Lewin et al., 1999; March, 1991). The implicit choices, March (1991: 71) argues, are revealed in 'many features of organizational forms and customs'. The implicit and explicit choices firms make between exploration and exploitation bring about a tendency for exploration and exploitation to be self-reinforcing, leading over time to excessive exploration or excessive exploitation within the firm (Levinthal & March, 1993).

Due to the importance for firms in dynamic environments to explore and exploit and difficulties they face doing so, notions on exploration and exploitation are a recurring underlying theme in various management literatures like organization design (e.g. Adler et al., 1999; Rivkin & Siggelkow, 2003; Sheremata, 2000; Volberda, 1996), organizational learning (e.g. Crossan & Berdrow, 2003; Holmqvist, 2004; Levinthal & March, 1993; March, 1991), strategy research (e.g. Burgelman, 1991; 2002; Floyd & Lane, 2000; McGrath, 2001; Volberda et al., 2001), technological innovation (e.g. Benner & Tushman, 2002: 2003: Duncan, 1976: Nerkar, 2003: Tushman & O'Reilly, 1996) and knowledge literature (e.g. Kogut & Zander, 1992; Grant & Baden-Fuller, 2004; Van den Bosch et al., 1999; Zack, 1999). To increase understanding about 'choices' (cf. March, 1991) firms make between exploration and exploitation, studies particularly investigate how organizational factors impact upon firm or unit level exploration and exploitation processes or outcomes (e.g. Benner & Tushman, 2002; 2003; Ghemawat & Ricart I Costa, 1993; Gibson & Birkinshaw, 2004; Jansen et al, 2005a; Levinthal & March, 1993; Sheremata, 2000). Notwithstanding these valuable contributions, both researchers and managers still struggle to understand how firms may manage and organize exploration and exploitation and how they may combine the two. The literature review in chapter two indicates not only that empirical research is lagging behind, but also that current literature seems to lack a theoretical rational on which and how organizational factors impact upon exploration and exploitation. Hence, current literature and management practice could benefit from increased understanding, conceptually and empirically validated, about what and how organizational factors affect exploration and exploitation and the relationship between these two (cf. Benner & Tushman, 2003; Gibson & Birkinshaw, 2004; Jansen et al., 2005a; Tushman & O'Reilly, 1996).

To increase this understanding, this study focuses at the individual level of analysis. Issues on exploration and exploitation are typically studied at the firm-level (e.g. Benner & Tushman, 2002; 2003; Ghemawat & Ricart I Costa, 1993) or at the business unit-level (e.g. Gibson & Birkinshaw, 2004; Jansen et al., 2005a). There is a lack, however, of understanding about exploration and exploitation at the individual level of analysis and about how organization members' exploration and exploitation activities may be influenced. This is quite surprising as several studies in management fields, such as organizational learning (Crossan et al., 1999; Vera & Crossan, 2004), strategy research (Burgelman, 1983b, 1991;

Rajagopalan & Spreitzer, 1996; Rosenbloom, 2000; Trispsas & Gavetti, 2000) and technological innovation (Duncan, 1976; Subramaniam & Youndt, 2005; Tushman & O'Reilly, 1996) indicate that firm or unit level exploration and exploitation to a large extent originate in the exploration and exploitation activities of their organization members; especially their managers (Duncan, 1976; Floyd & Lane, 2000; Tushman & O'Reilly, 1996). These studies indicate that understanding how to influence managers' exploration and exploitation activities benefits our understanding on how to build exploration and exploitation within a business-unit or firm.

1.2 - Research Aim, Questions, and Conceptual Model

This study departs from the need to increase insight into how firms may manage and organize exploration and exploitation and from the lack of understanding on the individual level of analysis; i.e. managers' exploration and exploitation activities. More specifically, the purpose of this study is to enhance conceptually and empirically validated understanding about how organizational factors and intra-organizational knowledge inflows. managers' influence managers' exploration and exploitation activities. To this end, this study first develops, based on the literature, a conceptual model and corresponding hypotheses indicating the causal relationships between the constructs. Subsequently we test the hypotheses with survey data for managers of large multi-unit knowledge intense firms operating in dynamic environments, controlling for hierarchical level, functional background, and organization unit. Qualitative data is used to support the development of the conceptual model, hypotheses, and survey, and to help interpret the quantitative results. Below, a short discussion follows on the study's central constructs, and on why we investigate the impact of organizational factors as common features of combinative capabilities and of managers' intraorganizational knowledge inflows on managers' exploration and exploitation activities.

We depart from March (1991) to conceptualize exploration and exploitation at the manager level. March considers the relation between exploration, which includes 'things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation', and exploitation, which includes 'such things as refinement, choice, production,

efficiency, selection, implementation, execution' in organizational learning (March, 1991: 71). Studies on organizational learning indicate that the essence of managers' exploration activities is creating variety in experience (Bontis et al., 2002; Holmqvist, 2004; Levinthal & March, 1993; McGrath, 2001) which is associated with broadening a manager's existing knowledge base (cf. Katila & Ahuja, 2002; Levinthal & March, 1993; Sidhu et al., 2004). Examples in the literature of such exploration activities of managers include searching for new organizational norms, routines, structures, and systems (Crossan et al., 1999; Nooteboom, 2000; Zollo & Winter, 2002), experimenting with new approaches towards technologies, business processes, or markets (McGrath, 2001), innovating and adopting a long-term orientation (Duncan, 1976; Tushman & O'Reilly, 1996), and reconsidering existing beliefs and decisions (Floyd & Lane, 2000; Ghemawat & Ricart I Costa, 1993; Rivkin & Siggelkow, 2003). Studies on organizational learning indicate that the essence of managers' exploitation activities is creating reliability in experience (Bontis et al., 2002; Holmqvist, 2004; Levinthal & March, 1993) which is associated with deepening a manager's existing knowledge base (cf. Katila & Ahuja, 2002; Levinthal & March, 1993). Examples in the literature of such exploitation activities of managers include using and refining their existing knowledge (Levinthal & March, 1993), activities related to applying, improving, and extending existing competences, technologies, processes and products (March, 1991), focusing on production and adopting a rather short-term orientation (Duncan, 1976; Tushman & O'Reilly, 1996), and elaborating upon existing beliefs and decisions (Floyd & Lane, 2000; Ghemawat & Ricart I Costa, 1993; Rivkin & Siggelkow, 2003). Section 2.3 further elaborates on managers' exploration and exploitation activities.

To further increase insight into managers' exploration and exploitation activities, and into how these activities can be influenced, this study joins with the greater part of current studies by examining how organizational factors impact upon managers' exploration and exploitation activities. Studies suggest a variety of organizational factors, such as, routinization and formalization of managers' tasks (Adler et al., 1999; Benner & Tushman, 2002; Duncan, 1976; Jansen et al., 2005a; Nonaka & Toyama, 2002), (de)-centralization or participation in decision making (Benner & Tushman, 2003; Duncan, 1976; Ghemawat & Ricart I Costa, 1993; Jansen et al., 2005a; Levinthal & March, 1993; McGrath, 2001; Rivkin & Siggelkow, 2003; Tushman & O'Reilly, 1996), socialization practices (Levinthal & March, 1993; March, 1993), connectedness to other organization members

(Jansen et al., 2005a; Sheremata, 2000), differential reward systems such as long-versus short-term rewards or individual versus group based rewards (Ghemawat & Ricart I Costa, 1993; Gibson & Birkinshaw, 2004; Nonaka & Toyama, 2002; Rivkin & Siggelkow, 2003), and aspects related to values and norms (Benner & Tushman, 2003; Gibson & Birkinshaw, 2004; Nonaka & Toyama, 2002; Tushman & O'Reilly, 1996), such as tolerance for ambiguity of a manager's peers and/ or superiors (Volberda, 1998).

To structure the investigation in this study, and to decide upon which organizational factors to consider, this study refers to the dynamic capabilities literature (e.g. Eisenhardt & Martin, 2000; Teece et al., 1997). The dynamic capabilities literature stresses the importance of capabilities by which firms explore and/or exploit, or as Elfring and Volberda (2001: 257) express it: 'The key issues in the dynamic capabilities approach are firms' (...) abilities to use current resources, to create new resources and to device new ways of using current or new resources'. These capabilities are referred to in the literature, covering a similar meaning (cf. De Boer et al., 1999; Eisenhardt & Martin, 2000; Van den Bosch et al., 1999), as 'dynamic capabilities' (Eisenhardt & Martin, 2000; Teece et al., 1997), 'combinative capabilities' (De Boer et al., 1999; Jansen et al., 2005b; Kogut & Zander, 1992; Van den Bosch et al., 1999), and 'architectural competence' (Henderson & Cockburn, 1994). Eisenhardt and Martin (2000: 1105) argue that 'although dynamic capabilities are idiosyncratic in their details and path dependent in their emergence, they have significant commonalities across firms'. The literature argues that these commonalities involve organizational factors (Henderson & Cockburn, 1994: 66; Jansen et al., 2005b: 1000; Verona, 1999: 137). We will further refer to the capabilities by which firms explore new possibilities and exploit old certainties in terms of combinative capabilities. The reason for this is that studies on combinative capabilities have explicitly addressed the impact of organizational factors on exploration and exploitation (Jansen, 2005; Van Den Bosch et al., 1999), and because they indicate the importance of the individual level (Grant, 1996; Kogut & Zander, 1992). Organizational factors as common features of combinative capabilities, conceptualized by Kogut & Zander (1992: 383) as the capability to 'synthesize and apply current and acquired knowledge', refer to a firm's ability to explore new possibilities and/ or exploit old certainties, while stressing the integration (Grant, 1996), exchange (Jansen et al., 2005b), or transfer (Kogut & Zander, 1992) of knowledge within the firm. In other words, this study discusses organizational factors as common features of combinative capabilities to structure the investigation about what organizational factors may affect managers' exploration and exploitation activities. Section 2.4 further elaborates on organizational factors.

Besides investigating the influence of "traditional" organizational factors as suggested by the "main stream" literature, this study will particularly focus on how a manager's acquisition of knowledge from other persons and/or units in the same organization, influence this manager's exploration and exploitation activities. On the basis of studies on intra-organizational knowledge flows (Gupta & Govindarajan, 2000; Schulz, 2001; 2003), we will conceptualize and operationalize knowledge acquisition by a manager in terms of a manager's knowledge inflows. On the basis of Schulz' (2003) and Gupta and Govindarajan's (2000) definitions of knowledge inflows, we define knowledge inflows of a manager as the 'aggregate volume' (Schulz, 2003: 444) of tacit and explicit knowledge, pertaining to several domains such as technology, products, processes, strategies, and markets, which a manager receives or gathers per unit of time, from other persons and/or units in the same organization. We do not intend to investigate inflows of operational or financial data or the taking of orders. This notion of knowledge inflows allows this study to examine a broad range of managers; i.e. managers pertaining to several hierarchical levels, functional areas, or organization units. Section 2.5 further elaborates on managers' knowledge inflows.

Previous research indicates that knowledge acquisition is an important explanatory factor for exploration as well as exploitation related activities within a firm. Studies in the field of organizational learning, for instance, indicate that the acquisition of knowledge is a primary mechanism by which firms, units, or organization members learn from each other (Huber, 1991; Levitt & March, 1988). Such learning through the acquisition of knowledge may be either exploratory (e.g. Inkpen, 1996; Nonaka, 1994; Tsai, 2001), reflected in an increase of the variety and broadness of the knowledge recipient's knowledge base, and/or exploitative (Adler et al., 1999; Levin, 2000), reflected in an increase of the reliability and deepness of the knowledge recipient's knowledge base. In the area of technological innovation, scholars (e.g. Katila & Ahuja, 2002; Nerkar, 2003; Rosenkopf & Nerkar, 2001) have examined the impact of knowledge acquisition by firms, as reflected in citation patterns within patent applications, in terms of the extent to which innovations tend to be incremental or radical. With respect to managers, several conceptual investigations and case studies in the field of

strategy process research indicate that exploration and exploitation related activities of managers are facilitated by vertical flows of knowledge within the firm, i.e. by managers' top-down and/ or bottom-up knowledge inflows (Burgelman, 1983b; 1991; Floyd & Lane, 2000; Rivkin & Siggelkow, 2003; Van Cauwenbergh & Cool, 1982). A manager's top-down knowledge inflows are associated with knowledge coming from persons or units at higher hierarchical levels than the knowledge recipient manager, whereas bottom-up knowledge inflows are associated with knowledge coming from persons or units at lower hierarchical levels. Whereas the focus of these studies is on vertical knowledge flows, studies belonging to the knowledge literature indicate the importance of examining horizontal knowledge inflows as well for understanding managers' exploration and exploitation activities (e.g. Grant, 1996; Gupta & Govindarajan, 1991; Hedlund, 1994; Kogut & Zander, 1996). We will therefore not only distinguish top-down and bottom-up knowledge inflows of managers, but horizontal knowledge inflows as well. Horizontal knowledge inflows do not follow the traditional lines of hierarchy; they are associated with knowledge coming from peers in the same organization unit, or coming from other departments or units at the same hierarchical level.

Based on the discussion above, the following main research question can be formulated:

How do organizational factors and knowledge inflows of managers influence managers' exploration activities and exploitation activities?

We formulate sub-research questions which guide the conceptual and empirical research of this study. Regarding the organizational factors, most studies in the literature (e.g. Gibson & Birkinshaw, 2004; Jansen et al., 2005a; Rivkin & Sigellkow, 2003; Sheremata, 2000) suggest that these factors *directly* impact upon managers' exploration and/ or exploitation activities. In line with these studies, we formulate as a first sub-research question:

1. How do organizational factors directly affect managers' exploration activities and exploitation activities?

As argued above, to structure the investigation in this study about what organizational factors affect managers' exploration and exploitation activities, this

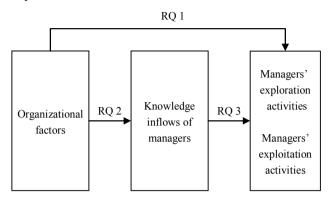
study discusses, on the basis of De Boer et al. (1999), Jansen et al. (2005b), and Van Den Bosch et al. (1999), organizational factors as common features of a firm's combinative capabilities. Studies on combinative capabilities not only stress the importance of the individual level, but argue, moreover, that the raison d'être of firms is 'the sharing and transfer of the knowledge of individuals and groups within organizations' (Kogut & Zander, 1992: 383), triggered by organizational factors, to enable the firm to explore and/ or exploit (De Boer et al., 1999). In other words: 'the central competitive dimension of what firms know how to do is to create and transfer knowledge efficiently within an organizational context' (Kogut & Zander, 1992: 384). Accordingly, studies pertaining to the knowledge literature indicate that the acquisition of knowledge (Lyles & Salk, 1996) and knowledge flows within an organization are not exogenous (e.g. Boone, 1997; Gupta & Govindarajan, 2000; Mom et al., 2002; Szulanski, 1996; Von Krogh & Köhne, 1998); rather they originate from, take place within, and are enabled or hindered by organizational factors, i.e. by the 'organizing principles by which people cooperate within organizations' (Kogut & Zander, 1992: 383).

Hence, based on studies on combinative capabilities and the knowledge literature, we will not only investigate the direct impact of organizational factors on managers' exploration and exploitation activities, but also their *indirect* impact. That is, we investigate how organizational factors influence managers' exploration and exploitation activities through their influence on managers' knowledge inflows. In other words, we will investigate how and to what extent *knowledge inflows mediate* the relationship between organizational factors and managers' exploration and exploitation activities. To examine these mediation effects, the following two sub-research questions will guide the research:

- 2. How do organizational factors affect knowledge inflows of managers?
- 3. How knowledge inflows of managers affect managers' exploration activities and exploitation activities?

The conceptual framework (figure 1.1) graphically represents the study's main constructs and the relationships which will be investigated, corresponding to the three sub-research questions; the direct impact of organizational factors and knowledge inflows on managers' exploration activities and exploitation activities, and the mediating role of knowledge inflows.

Figure 1.1 – Conceptual Framework



1.3 – Contributions

The literature indicates that firms face difficulties to manage concurrently exploration and exploitation (March, 1991; Levinthal & March, 1993). Previous research illustrates how various organizational factors impact upon firm or unit level exploration and exploitation processes or outcomes (e.g. Adler et al., 1999; Benner & Tushman, 2002; 2003; Ghemawat & Ricart I Costa, 1993; Gibson & Birkinshaw, 2004; Jansen et al, 2005a; Leana & Barry, 2000; Levinthal & March, 1993; Rivkin & Siggelkow, 2003; Sheremata, 2000). There is, however, a lack of conceptually and empirically validated understanding about exploration and exploitation at the manager level of analysis, about how organizational factors influence managers' exploration and exploitation activities, and about the role of intra-organizational knowledge flows. This study aims to deliver a contribution. Box 1.1 summarizes this study's major contributions.

This study delivers a contribution to the current literature on exploration and exploitation (e.g. Benner & Tushman, 2002; Gibson & Birkinshaw, 2004; March, 1991; Tushman & O'Reilly, 1996), which lacks conceptually and empirically validated understanding about exploration and exploitation at the level of the manager, by investigating managers' exploration and exploitation activities and by investigating how these activities may be influenced. Related to this, a contribution of this study to current literature is the development of scales which

assess a manager's level of exploration and exploitation as such scales were not available yet.

Box 1.1 – Summary of Major Contributions to Literature and Management Practice

- Investigating exploration and exploitation at the *manager level of analysis* contributes to current studies in the literature, which merely focus on firm and unit level exploration and exploitation (e.g. Benner & Tushman, 2002; Gibson & Birkinshaw, 2004; March, 1991; Tushman & O'Reilly, 1996). Also contribution in this respect by development of scales which measure managers' exploration and exploitation activities.
- Conceptual and empirical contribution to studies of related management fields which examine how various *organizational factors* impact upon exploration, exploitation, and the relation between these two (e.g. Adler et al., 1999; Benner & Tushman, 2003; Gibson & Birkinshaw, 2004; Jansen et al., 2005a; McGrath, 2001; Rivkin & Siggelkow, 2003; Sheremata, 2000).
- Contribution to studies on *combinative capabilities* and *intra-organizational knowledge flows* by inquiring into how managers' intra-organizational knowledge inflows mediate the relationship between organizational factors and their exploration and exploitation activities (e.g. Grant, 1996; Gupta & Govindarajan, 2000; Kogut & Zander, 1992; Schulz, 2003; Van Den Bosch et al., 1999).
- Contribution to *management practice* about how firms may manage and organize to combine exploration and exploitation by illustrating how configurations of organizational factors and knowledge inflows enable or inhibit managers to respond to particular ways by which firms may combine exploration and exploitation (Jansen, 2005; Volberda, 1998).

This study particularly contributes to studies which illustrate how organizational factors impact upon exploration and exploitation (e.g. Adler et al., 1999; Benner & Tushman, 2002; 2003; Ghemawat & Ricart I Costa, 1993; Gibson & Birkinshaw, 2004; Jansen et al., 2005a; Leana & Barry, 2000; McGrath, 2001; Rivkin & Siggelkow, 2003; Sheremata, 2000), by investigating how organizational factors influence managers' exploration and exploitation activities. Notwithstanding these existing studies, current literature and management practice could still benefit from understanding how organizational factors affect exploration and exploitation and the relationship between these two (cf. Benner &

Tushman, 2003; Gibson & Birkinshaw, 2004; Tushman & O'Reilly, 1996). Existing studies suggest a variety of organizational factors and quite differ among each other with respect to specific organizational factors they consider (see Appendix A). Hence, we not only deliver an empirical contribution, but also a conceptual one by proving a theoretical argument, based on studies on combinative capabilities, about what factors to include in an analysis about the impact of organizational factors on exploration and exploitation. Moreover, this study highlights the importance of knowledge flow configurations in the literature on the impact of organizational factors upon exploration and exploitation by developing and testing hypotheses which contribute to our understanding of how knowledge inflows of managers influence their exploration and exploitation activities.

The study also delivers a contribution to studies on combinative capabilities and intra-organizational knowledge flows (Grant, 1996; Gupta & Govindarajan, 2000; Kogut & Zander, 1992; Schulz, 2001; 2003; Szulanski, 1996; Van Den Bosch et al., 1999). Studies on combinative capabilities (Grant, 1996; Kogut & Zander, 1992; Van Den Bosch et al., 1999) suggest that the raison d'être of firms is 'the sharing and transfer of the knowledge of individuals and groups within organizations' (Kogut & Zander, 1992: 383), triggered by organizational factors, to enable exploration and exploitation. This study illustrates this line of reasoning by conceptually and empirically examining how and to what extent managers' intra-organizational knowledge inflows mediate the relationship between organizational factors as common features of combinative capabilities and managers' exploration and exploitation activities. In other words, this research contributes to studies pertaining to the knowledge literature by illustrating the importance of 'the sharing and transfer' (cf. Kogut & Zander, 1992) of knowledge within a firm -in terms of managers' knowledge inflows- for understanding managers' exploration and exploitation activities. Moreover, whereas studies tend to focus on illustrating how organizational factors impact upon intraorganizational knowledge flows (Gupta & Govindarajan, 2000; Szulanski, 1996), this study also illustrates the impact, or outcomes, of such knowledge flows in terms of managers' exploration and exploitation activities.

Finally, we may particularly contribute to the literature and to management practice regarding the issue of how firms may manage and organize to combine exploration and exploitation (e.g. Duncan, 1976; Gibson & Birkinshaw, 2004; Jansen et al., 2005; Levinthal & March, 1993; Tushman &

O'Reilly, 1996). That is; our findings illustrate how configurations of organizational factors and knowledge inflows enable or inhibit managers to respond to particular ways by which firms may combine exploration and exploitation (Jansen, 2005; Volberda, 1998). Section 6.3 further elaborates on this study's contributions and implications.

1.4 – Research Design

This section illustrates how the research of this study is designed and why. To do so, we clarify how the research approach, the research purpose and questions, the empirical setting, methods employed, and research activities conducted, make up the parts of an integrated whole (cf. Arbnor & Bjerke, 1997; Creswell, 2003). The reason to combine a quantitative and qualitative research approach in a study is that they should complement each other. This study's purpose to collect and analyze both quantitative and qualitative data corresponds to what Greene at al. (1989: 261) label a 'developmentally' purpose, and Morse (1991: 120) refers to as 'sequential triangulation', i.e. quantitative and qualitative methods are used sequentially to help inform each other. More specifically, in this study, first qualitative data has been used to create better understanding about the study's constructs (Miles & Huberman, 1994), to further enhance the rationale of their relationships (Eisenhardt, 1989), and to help build the managers' exploration and exploitation activities scales (Jick, 1979). Subsequently, quantitative data has been gathered and analyzed to test the hypothesized relationships between the constructs and to contribute to the generalizability of the results (Creswell, 1994). Finally, the study uses qualitative data to assist in explaining and interpreting the quantitative results (Miles & Huberman, 1994). Although we combined a quantitative and qualitative research approach in this study, the emphasis clearly is on the collection and analysis of quantitative data; the qualitative data serves to support the quantitative approach. Creswell (1994: 177) refers to this as a 'dominant-less dominant' research design. The reasons to focus in this study on the collection and analysis of quantitative data are related to the study's purpose statement and associated research questions. As we aim at assessing what and how factors influence an outcome and aim at generalizing to a population, i.e. managers within large multi-unit knowledge intense firms in dynamic environments, collecting quantitative data by means of a survey and statistically analyzing the

data seems to be the most suited approach (Creswell, 2003; Hussey & Hussey, 1997; Jankowicz, 1995).

To achieve this study's goal and address the research questions, we conducted empirical research within three large multi-unit firms operating in the financial services sector (Rabobank), electronics industry (Philips), and the accountancy and financial advisory sector (Deloitte). Regarding the selection logic, the goal of this study compels us to ensure that enough variation exists in our empirical data with respect to managers' exploration and exploitation activities. Therefore, we decided to examine managers whose firms are confronted with pressures to explore and with pressures to exploit. The literature indicates that several challenges within all three firms' industries make them an interesting context to investigate managers' abilities to conduct exploration and exploitation activities. Changes regarding technologies, competition, regulation, and customer demands, force managers of firms in the financial services, electronics, and the accountancy and financial advisory industries, to explore (Banker et al., 2005; Flier et al., 2001; Greenwood et al., 2005; Henisz & Macher, 2004; Sarvary, 1999). At the same time, an increased pressure to focus on efficiency and cutting costs, increasing importance of economies of scale, and short-term competitive pressures, force managers of firms in these industries to conduct exploitation activities (Banker et al., 2005; Flier et al., 2001; Greenwood et al., 2005; Henisz & Macher, 2004; Sarvary, 1999). Furthermore, regarding the selection logic, the knowledge literature indicates the value of examining firms whose members posses high levels of specialized knowledge (Grant, 1996) when investigating the role of knowledge flows within a firm with respect to organization members' exploration and exploitation activities. Technology firms like Philips are often used examples of such firms (cf. Smith et al., 2005). The greater part of empirical studies on exploration and exploitation also take technology firms as an empirical setting (see Appendix A). Therefore, to increase variety in our empirical dataset, we decided to do empirical research within knowledge intense service firms as well. The professional advisory sector in which Deloitte is active, and the financial services sector in which Rabobank is active, are cited examples of industries of which the firms' members posses high levels of specialized knowledge (Lievens & Moenaert, 2000; Van Den Bosch et al., 2005; Van Wijk, 2003).

In each company, data has been gathered by means of in-depth interviews, company documents, and a survey. In each company the same survey has been conducted. The literature suggests the importance of administering the survey to

managers pertaining to various hierarchical levels, functional backgrounds, and organization units, as levels of managers' exploration and exploitation activities may differ along these dimensions (e.g. De Leede et al., 2002; Floyd & Lane, 2000; Tushman & O'Reilly, 1996). We therefore decided to survey managers of all levels, functions, and units of the three firms. Due to the labor-intensiveness of this approach, we were forced to limit the number of firms within which we gathered data. This may not have posed too severe restrictions on the generalizability of these study's findings, as our goal is to generalize findings to the manager level of analysis. Moreover, we created separate datasets, one pertaining to each firm and separately analyzed the data as to be able to compare results between firms. We also conducted interviews after we analyzed the quantitative data, among others to establish the impact of firm or industry level influences on the results.

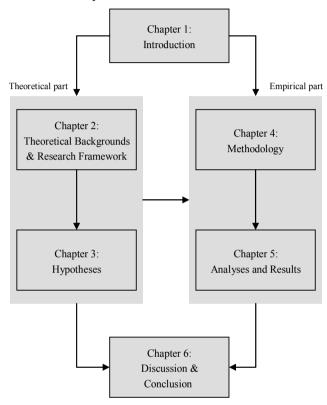
The following research activities have been conducted: *first*, we conducted desk research; we examined studies on organizational learning (e.g. Holmqvist, 2004; Levinthal & March, 1993; March, 1991), organization design (e.g. Adler et al., 1999; Jansen et al., 2005b; Rivkin & Siggelkow, 2003; Sheremata, 2000; Volberda, 1996), strategic management (e.g. Bartlett and Ghoshal, 1993; Burgelman, 1983; Floyd & Lane, 2000; McGrath, 2001; Van Cauwenberg & Cool, 1982), innovation (e.g. Benner & Tushman, 2002; 2003; Katila & Ahuja, 2002; Subramaniam & Youndt, 2005), and knowledge (e.g. Gupta & Govindarajan, 2000; Hedlund, 1994; Kogut & Zander, 1992; Nonaka, 1994; Schulz, 2001; Tsai, 2001; Van Den Bosch et al., 1999). Based on this literature review, we formulated the research problem, purpose and questions, constructed the conceptual framework which specifies the main constructs under study, and obtained insight into the main relationships between the constructs. Second, we examined company documents and conducted in-depth interviews with managers pertaining to several hierarchical levels, functional backgrounds, and organization units to assess practitioners' relevance with respect to the formulated research problem and questions, to more accurately describe the constructs under study, and to assess justification, from practitioners' point of view, to include or exclude constructs into or out off the conceptual framework. Third, we developed hypotheses based on the literature. The interviews also served to increase understanding about causal mechanisms between the constructs. Fourth, after having developed the hypotheses, we constructed the survey. To this end, we selected relevant existing measures from the literature. Regarding managers' exploration and exploitation activities, we developed the scales' items ourselves based on conceptualizations in the literature and in-depth interviews held to enhance the scales' reliability and validity. After having conducted a pilot survey, we further enhanced the phrasing of the items based on the pilot study, resulting into the final version of the survey. *Fifth*, we collected quantitative data by the survey, and subsequently analyzed the data for each firm using regression analyses. After having compared the results of the three datasets, we merged the data into one integrated dataset and subsequently analyzed this combined data. We used this integrated dataset to test the hypotheses. We furthermore used structural equation modeling to assess the goodness of fit of our research model and to compare the model with competing models. *Finally*, we evaluated the quantitative findings based on the literature and interviews. To increase understanding and interpret the quantitative results, several feedback sessions were held within each company. During these feedback sessions with managers, the empirical results of the study were discussed, as well as the interpretation of these results and managerial implications.

1.5 – Outline of the Study

This book contains six chapters. Chapters 2 and 3 constitute the theoretical part, chapters 4 and 5 constitute the empirical part (see also figure 1.2). After having introduced the study in chapter 1, chapter 2 delves into the literature to position this study by reviewing related existing studies on exploration and exploitation, to enhance understanding about the study's main constructs, and to indicate the relevance of these constructs' inclusion into the study. This literature review results in the introduction of a conceptual research framework which will serve for further hypotheses development in chapter 3 explicating how organizational factors and intra-organizational knowledge inflows of managers impact upon their exploration and exploitation activities. Chapter 4 further explains the study's methodology elaborating on the empirical setting, sampling and data collection procedures, and the development and validation of the survey's scales. Chapter 5 successively presents the analysis and results of the data collected at Rabobank, Philips, and Deloitte. After comparing the results of the three datasets, we merge the data into one integrated dataset and subsequently analyze this combined data (section 5.6). Chapter 6 concludes with a discussion of the findings of this study,

theoretical and managerial implications, limitations of the study and future research issues.

Figure 1.2 – Outline of the Study



CHAPTER 2 – THEORETICAL BACKGROUNDS AND CONCEPTUAL RESEARCH FRAMEWORK

2.1 – Introduction

The literature review as presented in this chapter aims at positioning this study, establishing the importance of the study, enhancing our understanding about its central constructs, and providing a rational for the construct's inclusion into this research. It also serves to provide a first rationale concerning the relationships between the constructs. This chapter results in a research framework which guides the hypotheses development in the next chapter.

Section 2.2 gives a brief overview of literatures, based on studies of several related management fields, in which issues on exploration and exploitation can be found. The section illustrates various related distinctions and associated tensions between exploration and exploitation. Furthermore, based on these same literatures, the section provides a short overview of main organizational responses for combining exploration and exploitation. The section concludes by positioning this study. The following section, section 2.3, will focus on exploration and exploitation at the manager level of analysis and will provide suitable conceptualizations based on the literature and qualitative data derived from indepth interviews. The section also illustrates which different demands the main organizational responses for combining exploration and exploitation, as identified in section 2.2, place on managers' exploration and exploitation activities. Section 2.4 gives a short overview of studies which illustrate which and how organizational factors impact upon exploration and exploitation within an organization. The section identifies organizational factors as common features of combinative capabilities to create further understanding in this study about which and how organizational factors impact upon managers' exploration and exploitation activities. Subsequently, section 2.5 conceptualizes and illustrates the role of managers' knowledge inflows as antecedents of managers' exploration and exploitation activities and briefly elaborates on the mediating role of managers' knowledge inflows between organizational factors and managers' exploration and exploitation activities. Finally, section 2.6 concludes with the conceptual research framework which serves for further hypotheses development in chapter 3.

2.2 – Exploration and Exploitation: Insights from Related Management Fields and Positioning this Study

Chapter one's first section illustrates that this study departs from the need to increase insight into how firms may manage and organize exploration and exploitation. To position this study and establish its importance, section 2.2 illustrates what existing studies have focused upon regarding managing and organizing exploration and exploitation. To this end, we delve into various related distinctions between exploration and exploitation as put forward in studies pertaining to different management fields, into tensions and relations between exploration and exploitation, and into current insights about how organizations may manage and organize to combine exploration and exploitation. Although this study's level of analysis is the individual level, section 2.2 will not focus on the individual level as most existing studies on exploration and exploitation focus on the firm or unit-level. Section 2.2 ends with illustrating gaps in the literature and with identifying valuable roads for future research which increase our insight regarding exploration and exploitation in organizational life.

Issues on exploration and exploitation can, explicitly or implicitly, be found in studies pertaining to several management fields. Overviews of studies dealing with exploration and exploitation, grouped by management field, can, for instance, be found in Adler et al. (1999: 44), Ghemawat and Ricart I Costa (1993: 59-61), Gibson and Birkinshaw (2004: 210-11), He and Wong (2004: 482); Jansen (2005: 19-24), March (1991: 72), and Volberda (1996: 359-60). Based on these overviews and the aim of this study, the focus in the remainder of this section will be on studies pertaining to organizational learning, organization design, strategic management, and innovation. Since March (1991) related exploration and exploitation to organizational learning, not only studies on organizational learning but also those pertaining to other fields tend to refer to issues on exploration and exploitation as brought forward in his work. Several studies on organizational design address the impact of organization design elements on exploration and exploitation related activities or processes within the firm, which is particularly valuable for this study as these studies generate insight into how and why organizational factors impact upon exploration and exploitation and into how management may organize to deal with exploration and exploitation and tensions

between the two. Exploration and exploitation is furthermore an issue of strategic management as they are directly related to a firm's competitive advantage (cf. Lewin et al., 1999) and a firm's (He & Wong, 2004) or unit's performance (Gibson & Birkinshaw, 2004; Jansen, 2005). Furthermore, studies on strategy research point to the importance of understanding managers' exploration and exploitation activities for understanding exploration and exploitation at the firm or unit level (Burgelman, 1983b, 1991; Rajagopalan & Spreitzer, 1996; Rosenbloom, 2000; Trispsas & Gavetti, 2000). Finally, this study reviews research on innovation, as this management field has witnessed a rich body of studies on exploration and exploitation related issues within organizations.

Distinctions between Exploration and Exploitation

March (1991) considers the relation between exploration and exploitation in organizational learning. He argues that exploration includes 'things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation', whereas exploitation includes 'such things as refinement, choice, production, efficiency, selection, implementation, execution' (March: 71). Studies on organizational learning indicate that the essence of exploration is creating variety in experience (Bontis et al., 2002; Holmqvist, 2004; Levinthal & March, 1993; McGrath, 2001) characterized by activities such as searching for new organizational norms, routines, structures, and systems (Crossan et al., 1999; Nooteboom, 2000; Zollo & Winter, 2002), experimenting with new approaches towards technologies, business processes, or markets (March 1991; McGrath, 2001), and developing new knowledge (Levinthal & March, 1993). The essence of exploitation in studies on organizational learning is creating reliability in experience (Bontis et al., 2002; Holmqvist, 2004; Levinthal & March, 1993) characterized by such activities as applying, improving, and extending existing competences, technologies, processes and products (March, 1991) and using and refining existing knowledge (Levinthal & March, 1993).

Studies on organization design illustrate distinctions between exploration and exploitation in organizational life by distinguishing between organizational design elements which are conducive to exploration related activities, processes and outcomes and organizational design elements which are conducive to exploitation related activities, processes and outcomes. Burns and Stalker (1961), for instance, distinguish between two forms of management systems; the mechanistic form and the organic form. The mechanistic form, characterized by

high levels of differentiation of functional tasks and a hierarchical structure of control, authority and communication, is appropriate to stable conditions. The organic form, characterized by high levels of integration of individuals' specialized knowledge and a network structure of control, authority and communication, is appropriate to changing conditions. Recently, studies on organizational design investigate how organizational design elements stimulate or hinder a firm to simultaneously pursue exploration and exploitation related tasks (Adler et al., 1999; Gibson & Birkinshaw, 2004; Rivkin & Siggelkow, 2003; Sheremata, 2000; Van Den Bosch et al., 1999; Volberda, 1996). Adler et al. (1999), for instance, investigate how organizational factors enable a manufacturing firm to simultaneously conduct routine-tasks, and non-routine-task. Gibson & Birkinshaw (2004) illustrate that an organization design, characterized by a combination of 'hard' (discipline and stretch) and 'soft (support and trust) design elements (Gibson & Birkinshaw, 2004: 213) fosters both high levels of exploitation oriented actions, i.e. geared toward alignment, and exploration oriented actions, i.e. geared toward adaptability. Rivkin and Siggelkow (2003) examine interdependencies among elements of organizational design and illustrate how organizational design elements may be combined to encourage both broad search and stability within the organization. Similarly, Sheremata (2000) identifies organizational structural elements which stimulate creative action by increasing the quantity and quality of ideas, knowledge, and information, an organization can access (Sheremata, 2000: 390), i.e. centrifugal forces. He furthermore identifies organizational structural elements which stimulate collective action by integrating dispersed ideas, knowledge, and information (Sheremata, 2000: 390), i.e. centripetal forces.

Studies on strategic management consider distinctions between exploration and exploitation as well. Burgelman (1983c), for instance, argues that 'firms need both diversity and order in their strategic activities to maintain their viability' (Burgelman, 1983c: 1349). This diversity results primarily from 'autonomous strategic activities', whereas order results from an 'induced concept of strategy' (Burgelman, 1983c). Autonomous strategic activities are related to the concept of exploration: 'autonomous strategy exploits initiatives that emerge through exploration outside of the scope of the current strategy and that provide the basis for entering into new product-market environments' (Burgelman, 2002: 327). Induced strategic activities are related to the concept of exploitation as they are 'within the scope of a company's current strategy and (...) extend it further in

its current product-market environment' (Burgelman, 2002: 327). Studies on competence based strategic management (Floyd & Lane, 2000; Prahalad & Hamel, 1990; Sanchez et al., 1996) consider a similar distinction between exploration, in terms of competence building (Sanchez et al., 1996) or competence definition (Floyd & lane, 200), and exploitation, in terms of competence leveraging (Sanchez et al., 1996) of competence deployment (Floyd & Lane, 2000). One of the keypremises of competence based strategic management is that building new competences and leveraging current competences both determine whether the firm will gain sustainable competitive advantage or not (Hamel & Heene, 1994: 4). Competence building is associated with achieving 'qualitative changes in (...) existing stocks of assets and capabilities, including new abilities to co-ordinate and deploy new or existing assets and capabilities in ways that help a firm achieve its goals' (Sanchez et al., 1996: 8). Competence building aims at changing the status quo to cope with forces demanding change by creating new strategic options for future action (Sanchez & Thomas, 1996). Competence leveraging is associated with applying existing assets and capabilities to current or new markets. It may require quantitative changes in stocks of like-kind assets similar to those the firm already uses (Sanchez et al., 1996: 8). Competence leveraging aims at preserving the status quo to deal with current competitive forces (Sanchez & Thomas, 1996). By considering the firm as an information processing entity, Ghemawat & Ricart I Costa (1993) consider the trade-off between two efficiency oriented search processes in strategic management; dynamic efficiency and static efficiency. Dynamic efficiency involves the continuous reconsideration of initial conditions geared to the development of new products, processes or capabilities, whereas static efficiency involves the continuous search for improvements within a fixed set of initial conditions aimed at refining existing products, processes or capabilities (Ghemawat & Ricart I Costa, 1993: 59).

Considerations about exploration and exploitation can also be found, explicitly or implicitly, in studies on technological or product innovation. Some authors classify innovations in terms of exploration and exploitation. Benner & Tushman (2002) and Jansen (2005), for instance, distinguish between 'exploitative innovations', i.e. innovations which involve 'improvements in existing components and architectures and build on the existing technological trajectory' (Benner & Tushman, 2002: 679) and 'exploratory innovations', i.e. innovations which involve 'a shift to a different technological trajectory' (Benner & Tushman, 2002: 679). Besides classifying innovations along a technology dimension, they

can also be classified along a customer/ market dimension (Abernathy & Clark. 1985; Danneels, 2002). Focusing on this dimension, He and Wong (2004) refer to an 'explorative innovation strategy' to denote 'technological innovation activities aimed at entering new product market domains' (He & Wong, 2004: 483-4), whereas they refer to an 'exploitative innovation strategy' to denote 'technological innovation activities aimed at improving existing product-market positions' (He & Wong, 2004: 484). Other studies on innovation indicate linkages between the concepts of exploration and exploitation, and the concepts of radical and incremental innovations. These studies illustrate that radical innovations draw upon exploration activities such as distant search for knowledge, developing new knowledge, and increasing variety of the firm's knowledge base (Katila & Ahuja, 2002; Rosenkopf & Nerkar, 2001; Subramaniam & Youndt, 2005), whereas incremental innovations draw upon exploitation activities such as local search for knowledge, refining and using existing knowledge, and deepening the firm's knowledge base (Katila & Ahuja, 2002; Rosenkopf & Nerkar, 2001; Subramaniam & Youndt, 2005). Finally, by distinguishing two successive stages in the innovation process, some authors (e.g. Cheng & Van De Ven, 1996; Duncan, 1976) illustrate that the first stage is characterized by exploration activities such as risk taking, searching for alternatives (Duncan, 1976), and discovery (Cheng & Van De Ven, 1996), whereas the second stage is characterized by exploitation activities such as testing (Cheng & Van De Ven, 1996), and refining and implementing (Duncan, 1976) the innovation.

Tensions and Relations between Exploration and Exploitation

The previous section shows that related distinctions between exploration and exploitation can be found in studies pertaining to various management fields. Most of these studies implicitly or explicitly make the argument that it is beneficial for firms to combine, somehow, exploration and exploitation. Studies indicate that forces in the business environment influencing firms' short-term profitability, compel managers to, for instance, use and refine their existing knowledge (Levinthal & March, 1993), leverage competences (Sanchez et al., 1996), and pursue incremental innovations (Tushman & O'Reilly, 1996) and efficiency (Volberda, 1996). Firms in turbulent environments face also growing prominence of powerful forces towards change, compelling managers to develop new knowledge (Levinthal & March, 1993), build competences (Sanchez et al.,

1996), and pursue radical innovations (Tushman & O'Reilly, 1996) and flexibility (Volberda, 1996).

There are however *tensions* between exploration and exploitation; it is difficult not to explore or exploit at the expense of the other (Levinthal & March, 1993). Studies indicate several related reasons for these tensions. One of the reasons that there are tensions between exploration and exploitation are complications in allocating resources between the two as both exploration and exploitation have to compete for scarce resources (Christensen & Bower, 1996; Garcia et al., 2003). Furthermore, the distribution of costs and benefits differ between exploration and exploitation across time and space (Lewin et al., 1999; March, 1991). March (1991: 73) puts it this way: 'compared to returns from exploitation, returns from exploration are systematically less certain, more remote in time and organizationally more distant from the locus of action and adaptation'. Because of managers' preference for more certain and more proximate returns over less certain and distant returns, organizations typically improve exploitation more rapidly than exploration (Lewin et al., 1999: 538; March, 1991: 73). Furthermore, in incumbent firms, the allocation of resources is usually shaped by the demands of existing customers providing impetus for innovations known to be demanded by current customers in existing markets (Christensen & Bower, 1996). These firms, however, risk starving efforts to commercialize new technologies for remote or emerging markets. Christensen and Bower (1996) argue that effectively developing technologies for new or emerging markets should take place outside of the mainstream organizational and strategic context to circumvent incentive and resources allocation processes designed to nourish sustaining innovations that address current customers' needs (Christensen & Bower, 1996: 215-6).

Another main reason for tensions between exploration and exploitation is that exploration and exploitation are associated with specific organizational structures, systems or processes, which either increasingly stimulate exploration or exploitation within the organization (Adler et al., 1999; Benner & Tushman, 2002; 2003; Duncan, 1976; Ghemawat & Ricart I Costa, 1993; Rivkin & Siggelkow, 2003; Sheremata, 2000; Van Den Bosch et al., 1999; Volberda, 1996). Levinthal and March (1993), for instance, conceptually examine how two organizational practices that facilitate learning –simplification and specialization- contribute to three learning imperfections; overlooking distant times, distant places, and failures. These learning imperfections lead either to dynamics of accelerating exploration; a 'failure trap' (Levinthal & March, 1993: 105), or to dynamics of

accelerating exploitation; a 'success trap' (Levinthal & March, 1993: 106). The computer simulation models in March's (1991) study show how several aspects of the social context of organizational learning impact upon the relation between exploration and exploitation; faster mutual learning between members of an organization and an organizational code, which is stimulated by high levels of socialization and low levels of turn-over, increase exploitation and decrease exploration. Studies, in other fields than organizational learning, also indicate tensions between exploration and exploitation because of incompatible structures, systems, or processes. Benner and Tushman (2003), for instance, argue that routinization triggered by process management techniques stimulates local search and inhibits distant search. The results of their empirical study (Benner & Tushman, 2002) show that the greater the extent of process management activities in a firm, the larger the number of exploitative innovations and the smaller the number of exploratory innovations. Hansen et al. (2001) investigate how the type of a team's tasks (i.e. explorative versus exploitative tasks) mediates the effect of a team's network position on its performance. The study shows that network structures which have a positive effect on teams engaging in exploration tasks, have a negative effect on teams engaging in exploitation tasks, and vice versa. More specifically, the empirical findings indicate that exploratory teams benefit from a network structure characterized by many strong and non-redundant ties, whereas exploitative teams benefit from a network structure characterized by weakly tied contacts that are moderately interconnected. Rosenkopf and Nerkar (2001) show that when organizational and technological boundary spanning search increases, the firm's ability to explore, i.e. the ability to create new knowledge through recombining knowledge, increases. Local search on the other hand, i.e. search for solutions in the neighborhood of the firm's current expertise, increases the level of exploitation within the firm, i.e. the creation of incremental innovations.

Tensions between exploration and exploitation, caused by several reasons as outline above, have triggered some authors to formulate the *relation* between exploration and exploitation as a *trade-off*, i.e. they argue that exploration and exploitation can not be combined at the same place and time. This view implies that an increase in exploration within, for instance, a business unit is associated with a decrease in exploitation within that same business unit, and vice versa (e.g. Benner & Tushman, 2003; Christensen & Bower, 1996; O'Reilly & Tushman, 2004). A second perspective on the relation between exploration and exploitation

which can be found in the literature stresses the time dimension, arguing that exploration and exploitation engender and/or follow each other over time (e.g. Cheng & Van de Ven, 1996; Garcia et al., 2003; Nooteboom, 2000; Winter & Szulanski, 2001). They see the relationship between exploration and exploitation as *oscillating*. Others adopt a more *combinatorial* view on the relation between exploration and exploitation, arguing that the two can be combined or synthesized within space and time. This view implies that an increase in exploration within, for instance, a business unit may go with an increase in exploitation within that same unit, or the other way around (e.g. Gibson & Birkinshaw, 2004; Nerkar, 2003; Nonaka & Toyama, 2002; Rivkin & Sigelkow, 2003; Sheremata, 2000).

Combing Exploration and Exploitation within Organizations

Distinguishing various tensions between exploration and exploitation, and various perspectives on the relation between exploration and exploitation, as outlined above, helps understanding various ways in which organizations may manage and organize to combine exploration and exploitation (Jansen, 2005; Volberda, 1998). Although various literatures indicate the importance for firms to combine exploration and exploitation and indicate difficulties firms face doing so, less research has been devoted to understanding how firms may manage tensions between exploration and exploitation. Duncan (1976) introduced the term 'ambidextrous organization' to denote organizations which deal with conflicting demands between the initiation and implementation stage of the innovation process by using different organization structures. More recently, authors use the term ambidexterity in a more general way to indicate high levels of both exploration and exploitation, i.e. an ambidextrous organization (He & Wong, 2004) or business unit (Gibson & Birkinshaw, 2004; Jansen et al, 2005a) is an organization or unit with high levels of both exploration and exploitation. In this section, three main organizational responses for combining exploration and exploitation will be identified: spatial separation, temporal separation, and synthesis. The classification of these organizational responses is based on the different perspectives on the relation between exploration and exploitation as outline above, namely the trade-off, oscillating, and combinatorial perspective. Poole and Van De Ven's (1989) suggestions about how a firm may deal with paradoxes, and Jansen's (2005) and Volberda's (1998) identification of corporate responses to achieve ambidexterity, respectively flexibility. Classifying organizational responses for managing tensions between exploration and exploitation makes sense in this study, as each of these responses places different demands on managers' exploration activities and exploitation activities, as will be outlined in this chapter's section 2.3.

The essence of spatial separation is simultaneously developing explorative and exploitative modes in different places in the organization. This organizational response for combining exploration and exploitation is based on the trade-off view on the relation between exploration and exploitation. In the case of spatial separation, 'one horn of the paradox is assumed to operate in one physical or social locus, while the other operates in a different locus' (Poole & Van De Ven. 1989: 566). Spatial separation can occur by level, function, and/ or location (Volberda, 1998). Separation by level is related to hierarchy (e.g. top-, versus middle-, versus front-line-managers). Separation by function is related to distinctive functions performed, processes applied, or knowledge used (e.g. marketing, production, and engineering). Separation by location is influenced by geography and distinct business units (cf. Volberda, 1998: 270). Examples of separation by level can be found in studies on strategic management (Burgelman, 1983a; 1983b; Floyd & lane, 2000; Prahalad & Hamel, 1990). Traditionally, the exploration of capabilities and the development of strategy are assumed to take place at the top or corporate level, whereas the exploitation of these capabilities and the execution of strategy take place at lower levels (Chandler, 1962; Prahalad & Hamel, 1990). Others suggest that the best place to explore new opportunities, build capabilities and develop strategy is at the lowest hierarchical levels (Burgelman, 1983b; Kimberly, 1979; Quinn, 1985), whereas the role of top management is to evaluate and ratify initiatives that emerge from across the organization (Floyd & Lane, 2000). Examples of separation by function can be found in nearly all large multi-unit firms. Typically, production-units are strongly geared towards exploitation by focusing on operational efficiency. R&D-units and marketing-units are more oriented towards exploration by engaging in unpredictable research projects, developing new products, and searching for and experimenting with new approaches to markets and customers (Volberda, 1998). Separation of exploration and exploitation by location can be found in studies on 'structural ambidexterity' (e.g. Benner & Tushman, 2003; O'Reilly & Tushman, 2004). According to proponents of structural ambidexterity (cf. Gibson & Birkinshaw, 2004), ambidextrous organizational forms are 'composed of highly differentiated but weakly integrated subunits' (Benner & Tushman, 2003: 247). While the exploration units are small and decentralized, with loose cultures and

processes, the exploitation units are larger and more centralized, with tight cultures and processes (Benner & Tushman, 2003: 247). Integration takes place at the senior team level. Another way of separating exploration and exploitation by location can be found in studies on inter-firm networks or alliances (Beckman et al., 2004; Mitchell & Lewin, 1998). In the case of alliances between firms, exploration and exploitation are not combined within one firm but the exploitation of existing capabilities or the exploration of new opportunities is rather outsourced to (a) network partner(s) (Baden-Fuller & Volberda, 1997; Mitchell & Lewin, 1998).

Studies on technological innovation and strategic renewal indicate that firms may deal with tensions between exploration and exploitation by temporally separating the two (Audia et al., 2000; Shepard, 1967; Tushman & Anderson, 1986; Volberda et al., 2001). This organizational response for combining exploration and exploitation is based on the oscillating view on the relation between exploration and exploitation. By taking the role of time into consideration in this approach, 'one horn of the paradox is assumed to hold during one time period, and the other during a different time period' (Poole & Van De Ven, 1989: 566). Based on computer simulations of innovation processes, Cheng and Van De Ven (1996), for instance, illustrate that in the innovation process exploration and exploitation follow each other sequentially. Whereas the actions and outcomes experienced by innovation teams exhibit a chaotic pattern, characterized by an expanding and diverging process of discovery, during the initial period of innovation development, the final period of the process exhibits more stable conditions, characterized by a narrowing and converging process of testing (cf. Cheng & Van De Ven, 1996: 593). Similarly, Duncan (1976) presents a model for designing organizations for initiating and implementing innovations. The initiation stage of the innovation process is facilitated by an organizational structure characterized by a high degree of complexity, low formalization, and low centralization. The implementation stage of the innovation process, however, is facilitated by an organizational structure characterized by a low degree of complexity, high formalization, and higher centralization. As initiation and implementation follow each other sequentially, Duncan (1976) suggests that organizations correspondingly should change their organization structure over time to match the changes in tasks. Winter & Szulanski (2001) apply the concepts of exploration and exploitation to replication strategies by conceptualizing replication strategy as a process that involves a regime of exploration in which the

business model is created and refined, followed by a phase of exploitation in which the business model is stabilized and leveraged through large-scale replication (Winter & Szulanski, 2001: 730). The sequential exploration and exploitation phases in replication strategy demand changes in the direction of knowledge transfer between the central organization and the outlets over time. Whereas initially in the exploration phase transfers of knowledge from the outlets to the central organization are needed, in the exploitation phase, knowledge transfers from the central organization to the outlets will prevail (Winter & Szulanski, 2001: 734). Some studies on technological innovations illustrate that technological change is characterized by periods of incremental change, punctuated by discontinuities (Tushman & Anderson, 1986). During periods of incremental change, competition and environmental uncertainty is lower than during periods of discontinuity, i.e. rates of competition and levels of uncertainty within the technological environment change cyclically (Tushman & Anderson, 1986). Consequently, these studies argue, firms should alternate between pursuing incremental innovations during times of incremental change and pursuing radical innovations during periods of discontinuities (Audia et al., 2000; Garcia et al., 2003). The hypotheses, supported by computer simulations, as developed by Garcia et al. (2003), for instance, illustrate that a focus on technology exploration over exploitation within a firm is favorable in times when competition is high, whereas a focus on technology exploitation over exploration is favorable in times when competition is low.

The third identified organizational response for pursuing both exploration and exploitation is by synthesizing them (Nonaka & Toyama, 2002; Poole & Van de Ven, 1989: 567); that is by 'balancing' them in both time and space (Levinthal & March, 1993). This organizational response for combining exploration and exploitation is based on the combinatorial view on the relation between exploration and exploitation. Proponents of this view typically argue that spatial or temporal separation of exploration and exploitation risk that the effects of an action at a certain place and at a certain time on other places in the organization and on the future are being ignored (cf. Levinthal & March, 1993: 97). In line with this view, Gibson and Birkinshaw (2004: 209) develop the concept of 'contextual ambidexterity' which they define as 'the behavioral capacity to simultaneously demonstrate alignment and adaptability across an entire business unit'. Proponents of a combinatorial view typically argue that an organizational unit may combine contradictory demands at the same place and time by combining seemingly

contradictory organizational design elements. Gibson and Birksinshaw (2004), for instance, argue that a context characterized by a combination of stretch, discipline, support, and trust facilitates contextual ambidexterity. Similarly, Adler et al. (1999) identify organizational mechanisms, i.e. meta-routines, job-enrichment, switching, and partitioning, which help an organization to combine routine and non-routine tasks. Rivkin and Siggelkow (2003) illustrate how an organization may balance search and stability by combining organization design elements which push the firm towards broad search with design elements that pulls it towards stability. Sheremata (2000) analyzes the difficulty for firms to be ambidextrous in terms of two opposing forces, centrifugal and centripetal forces. He defines centrifugal forces in this context as 'structural elements and processes that increase the quantity and quality of ideas, knowledge, and information an organization can access' (Sheremata, 2000: 390). Centripetal forces are 'structural elements and processes that integrate dispersed ideas, knowledge, and information into collective action' (Sheremata, 2000: 390). Sheremata (2000: 401-2) argues that centrifugal and centripetal forces must coexist to balance exploration and exploitation; there is a positive interaction effect between the two. Finally, McDonough and Leifer's (1983) findings illustrate that a unit that performs different kinds of tasks and deals with certain and uncertain environments uses different structural arrangements simultaneously.

Besides the already mentioned tensions between exploration and exploitation, another reason against synthesizing them can be found in the literature. That is; synthesizing exploration and exploitation may lead to ineffective compromise solutions. Related to this, Volberda (1998: 61) quotes Weick (1979: 220), who argues that 'The crucial point is that, in effecting the compromise solution, important adaptive responses have been selected against and nonadaptive, moderate responses have been preserved'.

Conclusion and the Positioning of this Study

Several conclusions can be drawn form this section's literature review and its derived table as shown in Appendix A. *First*, as also illustrated by column 3 of Appendix A, related distinctions between exploration and exploitation are implicitly or explicitly present in various management literatures such as organizational learning, organization design, strategic management, and innovation. These distinctions will help us conceptualizing managers' exploration and exploitation activities in the next section.

Second, as also illustrated by column 4 of Appendix A, different interpretations can be found in studies about the relation between exploration and exploitation, i.e. the relation is seen as a trade-off, oscillating, or combinatorial. Moreover, associated with these different perspectives on the relation between exploration and exploitation, different arguments are made for firms about how to combine exploration and exploitation, i.e. by spatial separation, temporal separation, or by synthesis. In the next section we illustrate how these three responses for combining exploration and exploitation place different demands on managers' exploration and exploitation activities.

Third, the literature review indicates that, as also illustrated by column 2 of Appendix A, current studies focus on exploration and exploitation at the firm or unit level. Studies addressing the individual level are nearly absent. Consequently, there is a lack of understanding about how exploration and exploitation can be conceptualized at the manager level, how they relate to each other at the manager level, how exploration and exploitation at the manager level can be measured, and about how organizational factors encourage or discourage managers to explore and/ or exploit. Hence, an un-walked road for research, the value of which will be elaborated upon in the next section, is one that conceptually and empirically investigates exploration and exploitation at the manager level.

Fourth, there seems not to be a tradition of systematic research and cumulative theory building on managing and organizing exploration and exploitation (also cf. Sidhu et al., 2004: 913). The literature review illustrates that current literature could still considerably benefit from increased understanding about how to manage and organize exploration, exploitation, and the relation between these two. Although column 5 of Appendix A illustrates that almost all studies indicate organizational factors which may impact upon exploration and exploitation, studies explicitly dealing with these issues are scarce (cf. Benner & Tushman, 2003; Gibson & Birkinshaw, 2004; Tushman & O'Reilly, 1996). Only a few studies explicitly address the question about how organizational factors affect exploration, exploitation, and the relation between these two (Adler et al., 1999; Ghemawat & Ricart I Costa, 1993; Gibson & Birkinshaw, 2004; Jansen et al., 2005a; Sheremata, 2000). Moreover, column 5 of Appendix A illustrates that studies quite differ among each other with respect to specific organizational factors they consider. This indicates that the literature could considerably benefit from a theoretical argument about what factors to include or exclude in an analysis about the impact of organizational factors on exploration and exploitation.

Fifth, column 2 of Appendix A illustrates that most studies are conceptual of which some are supported by case evidence or computer simulations; especially quantitative empirical research seems to be lagging behind. Most quantitative studies are found in research on innovation. More specifically, a valuable road for research is one which provides a general theoretical rational which increases our understanding about what and how organizational factors impact upon exploration and exploitation, and which consecutively provides empirical validation. Section 2.4 will illustrate how this study's contributes to this gap in the literature.

Finally, as also illustrated by column 2 of Appendix A, studies using empirical data tend to focus on technology intense and/ or production firms. Only Jansen et al. (2005a) focus explicitly on a service firm, whereas only Gibson and Birkinshaw (2004), McGrath (2001), and Subramaniam and Youndt (2005) include both production and service firms in their sample. Our empirical data is collected in a technology firm and two knowledge intense service firms.

2.3 – Exploration and Exploitation at the Manager Level

Relevance of Manger Level Exploration and Exploitation Activities

The section above illustrated, among others, that studies at the individual level, addressing exploration and exploitation, are nearly absent. To contribute at narrowing this gap in the literature, this study focuses at the individual level of analysis, that is, at managers' exploration activities and exploitation activities. The main reason for focusing at the individual level in this study, or more precisely at managers' exploration and exploitation activities, is the assumption that understanding about how to influence managers' exploration and exploitation activities benefits our understanding about how to build exploration and exploitation within a business-unit or firm. Although several levels of analysis are found to be relevant in management studies, e.g. the industry, firm, unit, group, and individual level (Klein et at., 1994), the most elementary unit of analysis in any social system is the individual behavioral act (Morgeson & Hofman, 1999). That is to say that the structure and actions of an organization or unit can be viewed as series of behavioral acts of organization members and the interactions between these individuals. Consequently several authors argue that, to understand how collective structure emerges, one must first understand the components of collective action (Brass et al., 2004; Morgeson & Hofmann, 1999). Some authors (Felin & Foss, 2004; Hofstede et al., 1993; Klein et al., 1999) even go so far as to argue that disappointing theoretical and empirical progress within studies on organizations and management are a result of the focus on collective level constructs at the expense of individual level considerations.

Although current studies on exploration and exploitation do not explicitly address individual level exploration and exploitation, references in these studies can be found suggesting that examining managers' exploration and exploitation activities is fundamental to understanding how to manage organizational level exploration, exploitation, and the relation between these two. Studies in the field of organizational learning illustrate that managers' activities impact upon firm- or unit-level learning processes and outcomes (e.g. Bontis et al. 2002; Crossan & Berdrow, 2003; Vera & Crossan, 2004). In the field of organization design, Adler et al. (1999) discuss an organization's inclination toward efficiency and/or flexibility in terms of the extent to which managers engage in routine or nonroutine activities. Sheremata (2000) discusses a firm's ability to build both exploration and exploitation within a firm in terms of managers' creative and collective actions. Rivkin and Siggelkow (2003) investigate a firm's ability to balance search and stability in terms of the impact of organization design elements on managers' decision making. Studies in the field of strategic management show that managers' activities are critical to strategic and organizational change (e.g. Adner & Helfat, 2003; Burgelman, 1983b, 1991; Rajagopalan & Spreitzer, 1996; Rosenbloom, 2000; Trispsas & Gavetti, 2000). The knowledge literature also indicates the fundamental role of managers of various levels, especially middle managers, regarding the creation of new knowledge (e.g. McFadyen & Cannella, 2004; Nonaka, 1994) but also regarding the transfer, acquisition, and utilization of existing knowledge (e.g. Zander & Kogut, 1995).

The relevance of understanding how to influence managers' exploration activities, their exploitation activities, or both at the same time, is also illustrated by the three main organizational responses for combining exploration and exploitation, as the literature indicates that each of these responses place different demands on manager's exploration activities and exploitation activities; see table 2.1. In section 2.2, three main organizational responses for combining exploration and exploitation, were identified: spatial separation, temporal separation, and

Table 2.1 - Relations between Exploration and Exploitation^a, Organizational Responses for Combining Exploration and Exploitation^a, and Demands on Managers' Exploration and Exploitation Activities

Relation exploration exploitation	Organizational response for combing exploration and exploitation	Illustrative studies	Demands on managers
Trade-off	Spatial separation: - Separation by level: differentiation of exploration and exploitation activities along hierarchical levels - Separation by function: focus of distinctive functional departments on either exploration or exploitation activities - Separation by unit: creating differentiated units suited for exploration and units suited for exploration and units suited for exploitation or exploitation and out-sourcing respectively exploitation or exploitation to alliance firm	- Burgelman, (1983a; 1983b); Floyd & Lane (2000); Prahalad & Hamel (1990) - De Leede et al. (2002) - Benner & Tushman (2003); Jansen (2005); O'Reilly & Tushman (2004) - Baden-Fuller & Volberda (1997); Mitchell & Lewin (1998)	Managers pertaining to a certain hierarchical level, function, unit, or firm should focus on either exploration activities or on exploitation activities, depending on the focus of their hierarchical level, function, unit, or firm which is either on exploration or on exploitation. Top- or corporate managers should engage in both exploration and exploitation activities
Oscillating	Temporal separation: - Changing organization design elements over time to deal with alternating demands for exploration and exploitation	- Cheng & Van de Ven (1996); Duncan (1976); Tushman & Anderson, 1986; Winter & Szulanski (2001)	Managers at all levels and units should shift their focus over time from pursuing exploration activities to exploitation activities or vice versa
Combinatorial	Synthesizing: - Reconciling conflicting demands for exploration and exploitation by combining contradictory organizational design elements within a unit	- Gibson & Birksinshaw (2004); McDonough & Leifer (1983); Rivkin & Siggelkow (2003); Sheremata (2000)	Managers at all levels and units should engage in both exploration and exploitation activities
^a Based on liters	^a Based on literature review. Annendix A. and esnecially on Jansen (2005) and Volherda (1998)	(2005) and Volherda (1998)	

based on literature review, Appendix A, and especially on Jansen (2005) and Volberda (1998)

synthesis. According to proponents of spatial separation, managers pertaining to a certain hierarchical level (e.g. Floyd & Lane, 2000; Prahald & Hamel, 1990), function (e.g. De Leede at al., 2002), unit (e.g. Benner & Tushman, 2003; Tushman & O'Reilly, 1996), or firm (e.g. Baden-Fuller & Volberda, 1997; Mitchel & Lewin, 1998) should focus either on exploration activities or on exploitation activities, depending on the focus of their hierarchical level, function, unit, or firm which is either on exploration or on exploitation. Generally, these studies would argue furthermore that top- or corporate managers should engage in both exploration and exploitation activities to ensure the firm's appropriate balancing of exploration and exploitation. O'Reilly and Tushman (2004: 74) put it this way: 'general managers and corporate executives (....) must constantly look backward, attending to the products and processes of the past, while also gazing forward, preparing for the innovations that will define the future.' Studies on technological innovation and change (e.g. Shepard, 1967; Tushman & Anderson, 1986) indicate that firms may deal with tensions between exploration and exploitation by temporally separating the two. This would imply for managers at all levels and units to shift their focus over time from pursuing exploration activities to pursuing exploitation activities or vice versa. The third identified organizational response for combining exploration and exploitation is by synthesizing them; that is by creating organizational units in which the tensions between exploration and exploitation are being reconciled (Gibson & Birkinshaw, 2004; Rivkin & Siggelkow, 2003; Sheremata, 2000). This implies that managers, at all levels and functions, of these units should be encouraged to conduct both exploration and exploitation related activities. Table 2.1 illustrates how managers' exploration and exploitation activities are associated with specific organizational responses for combing exploration and exploitation.

Conceptualizing Managers' Exploration and Exploitation Activities

Empirical studies assessing a firm's or unit's level of exploration and/or exploitation indicate that this can be done in roughly two ways. The first way is by looking at *activities* or *processes* within the firm or unit, like for instance learning activities (Holmvqist, 2004), management systems (Gibson & Birkinshaw, 2004), or the acquisition of information (Sidhu et al., 2004). The second way is by looking at *outcomes*, like for instance the number of exploratory and exploitative innovations within a firm (Benner & Tushman, 2002) or the extent of newness manifested in a project (McGrath, 2001). As illustrated above, studies on

exploration and exploitation which also make notions on managers, all refer to managers' activities, rather than the possible outcomes of such activities (e.g. Adler et al., 1999; Burgelman, 1983b; Floyd & Lane, 2000; Rivkin & Siggelkow, 2003; Sheremata, 2000). Therefore, in this study, we will look at managers' exploration and exploitation activities.

This study departs from March (1991) to conceptualize, and later on in the study to operationalize, exploration and exploitation at the manager level as most current studies refer to his work when conceptualizing exploration and exploitation. March characterizes exploration as 'things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation'. He characterizes exploitation as 'such things as refinement, choice, production, efficiency, selection, implementation, execution' in organizational learning (March, 1991: 71). He specifically considers the relation between exploration and exploitation in organizational learning. Studies on organizational learning indicate that the essence of exploration activities is creating variety in experience (Bontis et al., 2002; Holmqvist, 2004; Levinthal & March, 1993; McGrath, 2001) which is associated with broadening a manager's existing knowledge base (cf. Katila & Ahuja, 2002; Levinthal & March, 1993; Sidhu et al., 2004). Such exploration activities of managers include searching for new organizational norms, routines, structures, and systems (Crossan et al., 1999; Nooteboom, 2000; Zollo & Winter, 2002), experimenting with new approaches towards technologies, business processes, or markets (McGrath, 2001), innovating and adopting a long-term orientation (Duncan, 1976; Tushman & O'Reilly, 1996), and reconsidering existing beliefs and decisions (Floyd & Lane, 2000; Ghemawat & Ricart I Costa, 1993; Rivkin & Siggelkow, 2003). Studies on organizational learning indicate that the essence of exploitation activities is creating reliability in experience (Bontis et al., 2002; Holmqvist, 2004; Levinthal & March, 1993) which is associated with deepening a manager's existing knowledge base (cf. Katila & Ahuja, 2002; Levinthal & March, 1993). Such exploitation activities of managers include using and refining their existing knowledge (Levinthal & March, 1993), applying, improving, and extending existing competences, technologies, processes and products (March, 1991), focusing on production and adopting a rather shortterm orientation (Duncan, 1976; Tushman & O'Reilly, 1996), and elaborating on existing beliefs and decisions (Floyd & Lane, 2000; Ghemawat & Ricart I Costa, 1993; Rivkin & Siggelkow, 2003).

Interviews at Rabobank, Philips, and Deloitte, indicate that managers conduct exploration activities such as developing new technologies, products, or product combinations; renewing internal processes and systems; searching for, learning about, and experimenting with new technologies; experimenting with new distribution channels; searching for new opportunities in existing, new, or emerging markets; discovering changing customer preferences; discovering, and experimenting with new business models, products, and services in both existing and previously un-served markets. Examples of exploitation activities include specializing in and improving and refining in-depth knowledge pertaining to existing market segments, products, technologies, or processes; activities related to fine tuning and standardizing processes, procedures, and tasks; increasing efficiency and economies of scale; consolidating, extending, and/ or divesting activities; and activities related to improving internal operations.

2.4 – Organizational Factors and Managers' Exploration and Exploitation Activities

Relevance of Organizational Factors

The sections above illustrated the need and relevance of increasing both conceptually and empirically validated insight into managers' exploration and exploitation activities and into how these activities can be influenced. As a next step in this study's literature review, it needs to be decided upon which important antecedents of managers' exploration and exploitation activities are. To increase our understanding about how managers' exploration and exploitation activities can be influenced, this study joins with the greater part of current studies by examining how organizational factors influence managers' exploration and exploitation activities. Regarding this issue, studies on exploration and exploitation (i.e. those mentioned in section 2.2 and summarized in Appendix A) give a valuable first insight. Although these studies rarely explicitly address manager level exploration and/or exploitation, they more than once refer to it to create understanding about exploration and exploitation at the unit or firm level; for instance in terms of managers' learning activities (Bontis et al., 2002; McGrath, 2001), managers engaging in routine versus non-routine tasks (Adler et al., 1999; Benner & Tushman, 2002; 2003), managers reconsidering versus improving existing beliefs or decisions (Floyd & Lane, 2000; Ghemawat & Ricart I Costa; Rivkin &

Siggelkow, 2003), their creative versus collective actions (Sheremata, 2000), and managers' short-term versus long-term orientations (Duncan, 1976; Tushman & O'Reilly, 1996). These studies also give insight into organizational factors which relate to exploration and/or exploitation processes or outcomes of firms or units through their impact upon managers' behavior or activities (cf. Ghoshal & Bartlett, 1994; Gibson & Birkinshaw, 2004). Examples of such organizational factors include routinization of tasks (Adler et al., 1999; Benner & Tushman, 2002; Nonaka & Toyama, 2002), formalization of tasks (Duncan, 1976; Jansen et al., 2005a), (de)-centralization or participation in decision making (Benner & Tushman, 2003; Duncan, 1976; Ghemawat & Ricart I Costa, 1993; Jansen et al., 2005a; Levinthal & March, 1993; McGrath, 2001; Rivkin & Siggelkow, 2003; Tushman & O'Reilly, 1996), socialization practices (Levinthal & March, 1993; March, 1993), connectedness (Jansen et al., 2005a; Sheremata, 2000), differential reward systems such as long- versus short-term rewards, or individual versus group based rewards (Ghemawat & Ricart I Costa, 1993; Gibson & Birkinshaw, 2004; Nonaka & Toyama, 2002; Rivkin & Siggelkow, 2003), and aspects related to values and norms (Benner & Tushman, 2003; Gibson & Birkinshaw, 2004; Nonaka & Toyama, 2002; Tushman & O'Reilly, 1996), such as tolerance for ambiguity of a manager's peers and/ or superiors (Volberda, 1998).

Specifying Organizational Factors

The studies mentioned above suggest a variety of organizational factors which may impact upon managers' exploration activities and exploitation activities. The fact, however, that studies quite differ among each other with respect to specific organizational factors they consider, indicates that the literature could considerably benefit from a theoretical argument about what factors to include or exclude in an analysis about the impact of organizational factors on manager's exploration and exploitation activities. In other words, we need to decide upon which are important organizational factors influencing managers' exploration and exploitation activities.

This study refers to the dynamic capabilities literature to provide such a theoretical argument as studies adhering a dynamic capabilities approach (cf. Teece et al., 1997) stress the importance of organizational capabilities by which firms explore and/or exploit, or as Elfring and Volberda (2001: 257) express it: 'The key issues in the dynamic capabilities approach are firms' (...) abilities to use current resources, to create new resources and to device new ways of using current

or new resources'. These organizational capabilities are referred to in the literature, covering a similar meaning (cf. De Boer et al., 1999; Eisenhardt & Martin, 2000; Van den Bosch et al., 1999), as 'dynamic capabilities' (Eisenhardt & Martin, 2000; Teece et al., 1997), 'combinative capabilities' (De Boer et al., 1999; Jansen et al., 2005b; Kogut & Zander, 1992; Van den Bosch et al., 1999), and 'architectural competence' (Henderson & Cockburn, 1994).

Eisenhardt and Martin (2000: 1105) argue that 'although dynamic capabilities are idiosyncratic in their details and path dependent in their emergence, they have significant commonalities across firms'. The literature argues that these commonalities involve organizational factors; Jansen et al. (2005b: 1000), for instance, argue that 'these commonalities involve organizational mechanisms, such as cross-functional teams and participation in decision making. Henderson and Cockburn (1994: 66) include in their definition of architectural competence 'organizational characteristics (...): the control systems and the 'culture' or dominant values of the organization', whereas Verona (1999) argues that a firm's internal integrative capabilities 'are strictly linked to the dimensions of processes, systems, and structures', such as 'control processes', 'incentive and reward systems', and 'social values' (Verona, 1999: 137).

This study will further refer to capabilities by which firms 'use current resources, (...) create new resources and (...) device new ways of using current or new resources' (cf. Elfring & Volberda, 2001: 257) in terms of combinative capabilities. The reason for this is that studies on combinative capabilities have explicitly addressed the impact of organizational factors on exploration and exploitation (Jansen, 2005; Van Den Bosch et al., 1999), and because they indicate the importance of the individual level (Grant, 1996; Kogut & Zander, 1992). The essence of organizational factors of combinative capabilities, conceptualized by Kogut & Zander (1992: 383) as the capability to 'synthesize and apply current and acquired knowledge', is that they integrate (cf. Grant, 1996) or transfer (cf Kogut and Zander, 1992) knowledge of individuals within the firm, to trigger exploration and/ or exploitation. In other words, this study discusses organizational factors as common features of combinative capabilities to structure the investigation about what, and how, organizational factors affect managers' exploration and exploitation activities, and their knowledge acquisition activities. Section 2.5 will elaborate upon managers' knowledge acquisition activities.

Table 2.2 – Combinative Capabilities: Description of Three different Types (cf. De Boer et al., 1999; Jansen et al., 2005b; Van Den Bosch et al., 1999)

al., 1999, Jansen et al., 20050, Van Den Bosen et al., 1999)		
Type of combinative		
capabilities	Description	
Coordination Capabilities	'Refer to methods of coordination' (Van Den Bosch et al., 1999: 556). Associated organizational factors influence managers' activities by fostering 'interactions and relations across disciplinary and hierarchical boundaries' (Jansen et al., 2005b: 1000)	
Systems Capabilities	'Reflect the degree to which rules, procedures, instructions, and communications are laid down in written documents or formal systems' (Van Den Bosch et al., 1999: 556). Associated organizational factors influence managers' activities as they 'program behaviors in advance of their execution and provide memory for handling routine situations' (Jansen et al., 2005b: 1002)	
Socialization Capabilities	'Contribute to common codes of communication and dominant vales' (Jansen et al., 2005b: 1003). Associated organizational factors influence managers' activities by specifying broad, tacitly understood rules for appropriate action (Camerer & Vepsalainen, 1988; Jansen et al., 2005b; Van Den Bosch et al., 1999).	

Source: De Boer et al. (1999); Jansen et al. (2005b); Van Den Bosch et al. (1999)

This study follows De Boer et al. (1999: 386-7), Jansen et al. (2005b: 1000) and Van den Bosch et al. (1999: 556) by discussing three types of combinative capabilities; coordination capabilities, systems capabilities, and socialization capabilities (see also table 2.2). Based on the argument that combinative capabilities are idiosyncratic in their details and path dependent in their emergence, but however have significant commonalities across firms (Eisenhardt & Martin, 2000: 1105) Jansen et al. (2005b) and Van den Bosch et al. (1999) submit specific organizational factors as common features of combinative capabilities. These include classical organizational factors such as centralization and formalization (cf. Jansen et al., 200b), but also, for instance, aspects of performance management and the social context such as reward systems and values (Gibson & Birkinshaw, 2004; Verona, 1999).

Coordination capabilities refer to lateral and vertical ways of coordination. Associated organizational factors influence managers' activities by fostering relationships across disciplinary, unit, and/or hierarchical boundaries (Jansen et al., 2005b; Teece et al., 1997; Van Den Bosch et al., 1999). They bring together different sources of expertise and increase interactions between managers. They may be explicitly designed, or result more implicitly from processes of interaction (De Leeuw & Volberda, 1996). Based on Jansen et al. (2005b) and Van Den Bosch et al. (1999), we will examine in this study a manager's participation in decision making and participation in cross-functional interfaces as organizational factors as common features of coordination capabilities. Moreover, studies have suggested as directions for future research investigating aspects of reward systems as an organizational factor of coordination capabilities (e.g. Jansen et al., 2005b; McGrath, 2001). Several studies indicate that for understanding manager's exploration, exploitation and knowledge acquisition activities the distinction between reward systems which tie a manager's rewards to overall firm performance and systems which reward them based on individual performance, is of special relevance (Ghemawat & Ricart I Costa, 1993; Gupta & Govindarajan, 2000; Rivkin & Siggelkow, 2003). Accordingly, this study investigates the impact of the extent to which a manager's rewards are based on overall firm performance (versus individual performance).

Systems capabilities reflect the degree to which rules, procedures, instructions, and communications are laid down in written documents or formal systems (De Boer et al., 1999; Van Den Bosch et al., 1999). Associated organizational factors influence managers' activities by programming behaviors in advance of their execution, establishing patterns of action, and by providing memory for handling routine situations (Galbraith, 1973; Jansen et al., 2005b; Van Den Bosch et al., 1999). Systems capabilities exhibit common features, i.e. formalization and routinization (Jansen et al., 2005). Accordingly, we examine the impact of formalization of a manager's tasks on this manager's exploration and exploitation activities. Regarding routinization, today organizations increasingly use IT-systems to support or employ routine tasks (Garrity & Sanders, 1998; Pinsonneault & Rivard, 1998). Notwithstanding writings in the popular press, the literature indicates that IT-systems are less suited to facilitate non-routine tasks, but are well suited to facilitate routine task (e.g. Goodhue & Thompson, 1995; Lim & Benbasat, 2000). Therefore, in this study, we will examine a manager's use of IT-systems to conduct tasks, as a measure of the extent to which this manager

conducts routine tasks. We do not intent to capture electronic ways of communication such as through email or web-based discussion forums.

Socialization capabilities contribute to a shared ideology within the firm, codes of communication, and the creation of dominant values (Camerer & Vepsalainen, 1988: Jansen et al., 2005b: Volberda, 1998). Associated organizational factors influence managers' activities by specifying broad, tacitly understood rules for appropriate action (Camerer & Vepsalainen, 1988; Jansen et al., 2005b; Van Den Bosch et al., 1999). Jansen et al. (2005b) investigate two organizational factors as common features of socialization capabilities: connectedness and socialization tactics. Socialization tactics are concerned with newcomers, as firms use them to establish congruence among the firm's and newcomers' values, norms, and beliefs (Chao et al., 1994; Fisher, 1986). As this study's focus is not on newcomers, we will investigate the more generally applicable construct of tolerance for ambiguity of a manager's peers and/ or superiors, which refers to the extent to which peers and/ or superiors allow a manager to have and/ or express new ideas, different opinions, and deviant behavior, norms, or values (Volberda, 1998: 178). Besides tolerance for ambiguity of a manager's peers and/ or superiors, we will investigate connectedness (cf. Jansen et al., 2005b) as an organizational factor of socialization capabilities, which refers to the degree, or density, of direct contacts among organization members within and across organization units (Jaworski & Kohli, 1993).

Table 2.3 – Organizational Factors as Common Features of Combinative Capabilities

Organizational factors as common features of combinative	Types of combinative	
capabilities	capabilities	
 Participation in decision making Participation in cross-functional interfaces 	Coordination Capabilities	
 Rewards based on overall firm performance 		
Formalization of tasksUse of IT-systems to conduct tasks	Systems Capabilities	
 Connectedness to other organization members Tolerance for ambiguity of a manager's peers and/or superiors 	Socialization Capabilities	
C		

Source: based on Jansen et al. (2005b), Van den Bosch et al. (1999), and others (see this section)

Table 2.3 shows the organizational factors which will be investigated in this study, and their association with the three types of combinative capabilities. Summarizing, in this study, several organizational factors as common features of combinative capabilities will be considered which can be examined at the manager level of analysis; i.e. a manager's participation in decision making, a manager's participation in cross-functional interfaces, extent of a manager's rewards based on overall firm performance, formalization of a manager's tasks, a manager's use of IT-systems to conduct tasks, a manager's connectedness to other organization members, and tolerance for ambiguity of a manager's peers and/or superiors.

The quotes below, derived from interviews, may anecdotically illustrate some of the organizational factors that we investigate in this study, and their relation with managers' knowledge acquisition and/ or exploration and exploitation activities.

• Rewards based on company-wide performance

We understand that, if we do not act as an organization as a whole, we will get into trouble. Our pay system reflects this. People receive a bonus if we are doing well as an organization. Now there is a culture of sharing; I understand that being one company is important. So, if someone wants to learn from me, I say 'that is fine'. People are also more proud to tell what they learned from others; the not-invented-here syndrome seems to be less.

Interview, February 2004, Middle level manager front-office; Rabobank

IT-systems

With the increasing development of our IT-systems we aim at proving people a personalized offer of information. I would call them [the IT-systems] successful if people stop making calls to each other, if they don't visit each other any more, if the systems provide them, in a personalized and specialized way, with all knowledge they need. I really think that using the systems increases people's efficiency in doing their job; it improves their specialized knowledge.

Interview, December 2004, Central & Support unit manager; Deloitte

•(In)-tolerance for ambiguity of manager's peers and/ or superiors Since about a year, we have a new general director; [name]. (....) He clearly communicated his vision for the future to the managers and employees; behavior which deviates [from this vision] is actually not tolerated any more. For me, that is OK; I know exactly what I am expected to do. But it gets more difficult to get something new through; you know, something which does not neatly fits into the vision. Tricky problems keep untouched. I don't want to get my fingers burned by proposing things which deviate from his vision.

Interview, February 2004, Front level manager back office; Rabobank

2.5 – Knowledge Inflows and Managers' Exploration and Exploitation Activities

The previous section illustrated the relevance of examining organizational factors as common features of combinative capabilities as explanatory factors of managers' exploration and/or exploitation activities. To further increase our insight into managers' exploration and exploitation activities and into how these activities can be influenced, this section argues why we focus on how knowledge inflows of a manager influence this manager's exploration and/ or exploitation activities. Furthermore, this section indicates what we mean by managers' knowledge inflows, and it illustrates the mediating role of knowledge inflows, i.e. how organizational factors influence managers' exploration and exploitation activities through their influence on managers' knowledge inflows.

Relevance of Knowledge Inflows

The argument that the acquisition of knowledge by a firm, unit, or manager is a critical antecedent or requirement for exploration and exploitation activities, is present in several studies pertaining to various management fields (e.g. Benner & Tushman, 2002; Floyd & Lane, 2000; Garcia et al., 2003; Hansen et al., 2001; Jansen, 2005; Katlia & Ahuja, 2002; Rivkin & Siggelkow, 2003; Rosenkopf & Nerkar, 2003; Sheremata, 2000; Sidhu et al., 2004; Subramaniam & Youndt, 2005; Van Den Bosch et al., 1999). For instance, Adler (1990) shows that sharing knowledge across the development/ manufacturing interface and between manufacturing plants triggers productivity learning resulting in higher levels of manufacturing efficiency. Winter and Szulanski (2001) illustrate that the exploration phase of a replication strategy characterized by discovering and developing a business model, is facilitated by the acquisition of knowledge by the central organization from its outlets. The exploitation phase of a replication

strategy characterized by stabilizing and leveraging the business model, is facilitated by the acquisition of knowledge by the outlets from the central organization.

Scholars on the field of technological innovation (Benner & Tushman, 2002; Katila & Ahuja, 2002; Nerkar, 2003; Rosenkopf & Nerkar, 2001) have examined the impact of knowledge acquisition by a firm, as reflected in citation patterns within patent applications, in terms of the extent to which innovations tend to be exploratory or exploitative. These studies indicate that the acquisition of distant, new knowledge (Benner & Tushman, 2002; Katila & Ahuja, 2002), old knowledge (Nerkar, 2003), or knowledge acquired across technological or organizational boundaries (Rosenkopf & Nerkar, 2001) stimulates exploration, whereas the acquisition of local, related knowledge (Benner & Tushman, 2002; Katila & Ahuja, 2002), recent knowledge (Nerkar, 2003), or knowledge acquired within technological or organizational boundaries (Rosenkopf & Nerkar, 2001) stimulates exploitation.

In the field of organizational learning, studies indicate that the acquisition of knowledge is a primary mechanism by which firms, units, or organization members learn from each other (Fiol & Lyles, 1985; Huber, 1991; Levitt & March, 1988). Such learning through the acquisition of knowledge may be either exploratory reflected in an increase of the variety and broadness of the knowledge recipient's knowledge base (e.g. Inkpen, 1996; McGrath, 2001; Nonaka, 1994; Tsai, 2001), and/or exploitative reflected in an increase of the reliability and depth of the knowledge recipient's knowledge base (Adler et al., 1999; Levin, 2000). For instance, Tsai (2001) showed that a position of an organizational unit within the organization that increases the unit's ability to access information and knowledge from other units is positively related to the creation of new knowledge and to innovative activities of that unit.

Studies on absorptive capacity also illustrate the value of examining the acquisition of knowledge for understanding firm or unit level exploration and exploitation. Van Den Bosch et al. (1999) argue that a firm's scope and flexibility of knowledge absorption positively relate to a firm's exploration adaptations, whereas efficiency of knowledge absorption positively relates to exploitation adaptations. Jansen (2005) shows that a unit's realized absorptive capacity (i.e. transformation and exploitation of acquired knowledge) positively relates to its exploitative innovations, whereas potential absorptive capacity (acquisition of

knowledge and its assimilation) positively moderates the relationship between realized absorptive capacity and exploratory innovations.

With respect to managers, several conceptual investigations and case studies in the field of strategic management indicate that top-down and bottom-up knowledge inflows facilitate managers' exploration and exploitation activities (Burgelman, 1983b; 1991; Floyd & Lane, 2000; Rivkin & Siggelkow, 2003; Van Cauwenbergh & Cool, 1982). Floyd and Lane (2000), for instance, identify various roles, associated with exploration and/or exploitation activities, which managers at all hierarchical levels may fulfill. A central characteristic of these roles is that they are linked and triggered across levels through the exchange of knowledge (Floyd & Lane, 2000).

Studies belonging to the knowledge literature also indicate the importance of examining knowledge, which a manager acquires from other persons and/ or units in the same organization, for understanding managers' exploration and exploitation activities (e.g. Grant, 1996; Gupta & Govindarajan, 1991; Hedlund, 1994; Kogut & Zander, 1996). As Grant (1996: 385) argues: 'the fundamental role of the firm is the integration of individuals' specialized knowledge', not only to trigger the exploration of new knowledge but also to stimulate the exploitation of existing knowledge.

Studies on social capital indicate the role of intra-organizational knowledge acquisition and exchange between managers, in terms of pursuing exploration and exploitation tasks as well. Social capital can be described as the knowledge embedded within, available through, and utilized by interactions among individuals, and their network of interrelationships (Nahapiet & Ghoshal, 1998; Subramanian & Youndt, 2005). The study of Hansen et al. (2001) shows that teams pursuing exploration tasks benefit from members receiving knowledge through many strong, non-redundant ties, whereas teams pursuing exploitation tasks benefit from team members receiving knowledge by weakly tied and moderately interconnected contacts. The findings of Sumbramaniam and Youndt's (2005) study show that the exchange of knowledge between organization members positively influences both a firm's radical and incremental innovative capabilities.

Concluding with respect to managers' exploration and exploitation activities, the literature illustrates the relevance of examining the acquisition of knowledge, residing in various places in the organization, by managers as a critical requirement for triggering their exploration and/or exploitation activities. Regarding exploration, the acquisition of knowledge by a manager may broaden

the manager's knowledge base and increase variety in experience (Bontis et al., 2002; Levinthal & March, 1993; Holmqvist, 2004; McGrath, 2001), lead to a reconsideration of existing beliefs and former decisions (Floyd & Lane, 2000; Ghemawat & Ricart I Costa, 1993; Rivkin & Siggelkow, 2003), and/or transform this manager's prevailing knowledge (Subramaniam & Youndt, 2005). For instance, by acquiring knowledge pertaining to products, markets, and technologies which is new to a manager, the manager may discover and experiment with new approaches to technologies, businesses, processes, or products (cf. McGrath, 2001). By acquiring and recombining aspects of organization members' specialized knowledge, a manager may develop new skills (Grant, 1996; Van Den Bosch & Van Wijk, 2001), and create new ideas and opportunities for innovation (Leonard-Barton, 1995). Regarding exploitation, the acquisition of knowledge by a manager may increase reliability in experience (Bontis et al., 2002; Levinthal & March, 1993; Holmqvist, 2004), lead to decisions which elaborate on existing beliefs and decisions (Floyd & Lane, 2000; Ghemawat & Ricart I Costa, 1993; Rivkin & Siggelkow, 2003), and/or reinforce the manager's prevailing knowledge (Subramaniam & Youndt, 2005). The internal transfer of best practices, for instance, may result in a refinement or improvement of a manager's existing knowledge base and skills, increasing the manager's reliability and efficiency in conducting routine tasks (Benner & Tushman, 2003; Ghemawat & Ricart I Costa, 1993). The acquisition of knowledge pertaining to existing products, markets, technologies, and strategies may improve, refine, or reinforce a manager's existing knowledge base (Ghemawat & Ricart I Costa, 1993; Subramaniam & Youndt, 2005), typically leading to exploitative decisions and activities (Burgelman, 1991; Floyd & Lane, 2000) such as increasing or decreasing production (Sanchez et al., 1996), increasingly implementing and executing induced strategic decisions (Burgelman, 1983), or pursuing increased efficiency in existing tasks (Ghemawat & Ricart I Costa, 1993).

The examples mentioned below, derived from interviews, may anecdotically illustrate how knowledge inflows of managers impact upon their exploration and exploitation activities.

About every three months, we [senior account managers] get from our business unit manager a kind of market study giving insight into what the other large banks are doing in the Rotterdam harbor, but also about what Rabo Amsterdam is doing or our partner in Antwerp. The

study gives, let's say, an overview of developments, opportunities, and threats in our market. Because of this study, I can make better decisions. Subsequently, I make a selection [among the products]; about some products I know that they are OK; just sell the stuff. About other products I know that they first need to be improved. In that case I talk, for instance, with the controller here to see to what extent I can adapt the price, or I talk to insurance when the insurance package needs to be improved.

Interview, January 2003. Senior account manager; Rabobank

Discussions with product line managers [front-line] are indispensable in my job. We talk to each other about technological developments, about customers and about business. They come up with many new ideas, but I have to evaluate the long term implications. The whole process, from concept to production, before you see revenues typically is seven years. I work on the things that do not exist; my job is to make them exist.

Interview, April 2004. Business Development manager; Philips

Acquiring knowledge from different service lines [units specialized in certain products and/ or markets] is absolutely necessary if we have to build a new tailor made piece of software for a new client. Before we really start developing, I first have to find out which different possibilities various programming languages offer, regarding the client's demand. I also try to find out whether in this organization we did something similar for another client. Subsequently I put together a team composed of people from different service lines and evaluate with them different options I made.

Interview, December 2004. Project manager Consultancy; Deloitte

Conceptualizing Managers' Knowledge inflows

Knowledge acquisition by a manager will be conceptualized, and later on in this study operationalized, in terms of knowledge inflows of a manager. Concepts such as knowledge sharing, knowledge exchange, and knowledge flows are sometimes used interchangeably in studies (cf. Schulz, 2001). However, whereas knowledge sharing and knowledge exchange imply a reciprocal relationship in terms of transfers of knowledge between managers, the concept of knowledge flows allows more precision about the directionality of the knowledge being transferred. That is, knowledge outflows are associated with a donor

providing a recipient with knowledge, where the knowledge donor is the focal unit of analysis (Gupta & Govindarajan, 2000; Schulz, 2001). Knowledge inflows are associated with a recipient receiving or gathering knowledge from a donor, where the knowledge recipient is the focal unit of analysis (Gupta & Govindarajan, 2000; Schulz, 2003). As this study tries to understand how knowledge, which a manager acquires or gathers from other persons and/ or units in the organization, impacts upon his or her exploration and exploitation activities, the study's focus will be limited to a manager's knowledge inflows only. Both the knowledge donor and/ or recipient may be the initiator of such knowledge inflows.

Notions on knowledge flows vary somewhat in the literature (cf. Schulz, 2001: 662; Van Wijk, 2003). Whereas some authors focus on certain types of knowledge such as the transfer of skills and technology (Tsai, 2002), the transfer of business practices (Szulanski, 1996), or the transfer of tacit knowledge (Kogut & Zander, 1993; Subramaniam & Venkatraman, 2001), we follow Gupta and Govindarajan (2000) and Schulz (2001; 2003) by adopting a broader notion on knowledge flows in this study. That is, based on Schulz' (2003) and Gupta and Govindarajan's (2000) definitions of knowledge flows, we define the knowledge inflows of a manager as the 'aggregate volume' (Schulz, 2003: 4442) of tacit and explicit knowledge pertaining to several domains such as technologies, products, processes, strategies, and markets, which a manager receives or gathers per unit of time, from other persons and units within the organization. We do not intend to capture inflows of operational or financial data or the taking of orders. Considering several knowledge domains allows this study to examine a broad range of managers; i.e. managers pertaining to several hierarchical levels, functional backgrounds, or organization units. Furthermore, considering both tacit and explicit knowledge allows examining different channels by which managers receive or gather knowledge (cf. Schulz, 2001), for instance, by telephone, e-mail, regular mail, through formal meetings, informal face-to-face contacts, and by using shared technologies such as the company's intranet.

Whereas studies in the field of strategic management indicate that top-down and bottom-up knowledge inflows facilitate managers' exploration and exploitation related activities (Burgelman, 1983b; 1991; Floyd & Lane, 2000; Van Cauwenbergh & Cool, 1982), others point to the important role of horizontal knowledge flows within an organization with regard to understanding exploration and exploitation related activities (Gupta & Govindarajan, 1991; Hansen et al., 2001; Nonaka, 1994; Sumbramaniam & Youndt, 2005). Therefore, following

studies on intra-organizational knowledge flows (e.g. Gupta & Govindarajan, 2000; Schulz, 2001; 2003), this study distinguishes vertical and horizontal knowledge inflows to better understand how knowledge inflows of a manger impact upon the manager's exploration and exploitation activities. Vertical knowledge inflows proceed along the hierarchy. They may be either top-down or bottom-up. In this study, top-down knowledge inflows of a manager are associated with knowledge coming from persons and units at higher hierarchical levels than the manager. Bottom-up knowledge inflows of a manager are associated with knowledge coming from persons and units at lower hierarchical levels than the manager. Horizontal knowledge inflows do not follow the traditional lines of hierarchy. Horizontal knowledge inflows of a manager are associated with knowledge coming from peer managers in the same organizational unit, or coming from other units at the same hierarchical level.

The Mediating Role of Knowledge Inflows

The previous section, section 2.4, and this section indicate the relevance of studying how organizational factors as common features of combinative capabilities and how managers' knowledge inflows influence managers' exploration and exploitation activities. Studies on combinative capabilities argue that the raison d'être of firms is 'the sharing and transfer of the knowledge of individuals and groups within organizations' (Kogut & Zander, 1992: 383), triggered by organizational factors, to enable the firm to adapt in exploratory and/ or exploitative ways (De Boer et al., 1999). In other words: 'the central competitive dimension of what firms know how to do is to create and transfer knowledge efficiently within an organizational context' (Kogut & Zander, 1992: 384). Accordingly, studies pertaining to the knowledge literature indicate that the acquisition of knowledge (Lyles & Salk, 1996) and knowledge flows within an organization are not exogenous (e.g. Gupta & Govindarajan, 2000; Szulanski, 1996); rather they originate from, take place within, and are enabled or hindered by organizational factors, i.e. by the 'organizing principles by which people cooperate within organizations' (Kogut & Zander, 1992: 383). Similarly, Grant (1996) proposes that the 'fundamental role of the firm is the integration of individuals' specialized knowledge' (Grant, 1996: 385) which makes an 'analysis of the mechanisms through which knowledge is integrated within firms' central to the knowledge based literature (Grant, 1996: 375). To address this issue, about the "role of the firm" with regard to managing and organizing for the sharing and

transfer of knowledge throughout the organization (cf. Grant, 1996; Kogut & Zander, 1992), this study will also examine how organizational factors affect managers' exploration and exploitation activities through affecting their knowledge inflows.

Hence, we argue in this study that organizational factors not only directly impact on managers' exploration and exploitation activities, but also, in line with studies on combinative capabilities and knowledge, exert an indirect influence through their impact on managers' knowledge inflows. In other words, to more comprehensibly understand how a firm could manage and organize to deal with exploration and exploitation at the manager level, we should not only investigate how and why organizational factors and knowledge inflows impact directly upon managers' exploration and exploitation activities, but also on how the these organizational factors impact upon managers' knowledge inflows.

Some studies in other literatures also argue, but not empirically show, that the acquisition of knowledge by a firm, unit, or manager, as a critical antecedent or requirement for exploration and exploitation activities, is facilitated or inhibited by organizational factors (e.g. Benner & Tushman, 2002; Hansen et al., 2001; Sheremata, 2000; Sidhu et al., 2004; Subramaniam & Youndt, 2005). Benner and Tushman (2002), for instance, show that routinization, triggered by process management techniques, increases a firm's exploitative innovations at the extent of exploratory innovations, as, so they argue, routinization stimulates the search for and acquisition of local knowledge at the expense of distant knowledge (Benner & Tushmanm 2002: 681). Hansen et al. (2001), for instance, show that exploration and exploitation tasks require different structural characteristics of an organization member's intra-organizational social network. The reason for this, they argue (Hansen et al., 2001: 27-29), is that different structural characteristics allow for the acquisition of different kinds and quantities of knowledge. Sheremata (2000: 391) argues that centrifugal forces, such as decentralization and reach, stimulate organization members' gathering of knowledge and consequently 'creative action', i.e. exploration. Centripetal forces, such as connectedness and temporal pacing, he argues, stimulate the integration of knowledge, and consequently organization members' collective action, i.e. exploitation. Sidhu et al. (2004) conceptualize a firm's exploration orientation in terms of scope of knowledge acquisition. They subsequently show how organizational elements such as the organization mission, strategic orientation, technology and slack resources, impact upon a firm's knowledge acquisition scope.

2.6 - Conclusion - Conceptual Research Framework

Based on a review of studies on organizational learning, organization design, strategic management, and innovation, this chapter illustrated related distinctions between exploration and exploitation in the literature, different interpretations about tensions and relations between the two, and different arguments about how firms may manage and organize both exploration and exploitation and associated implications for managers.

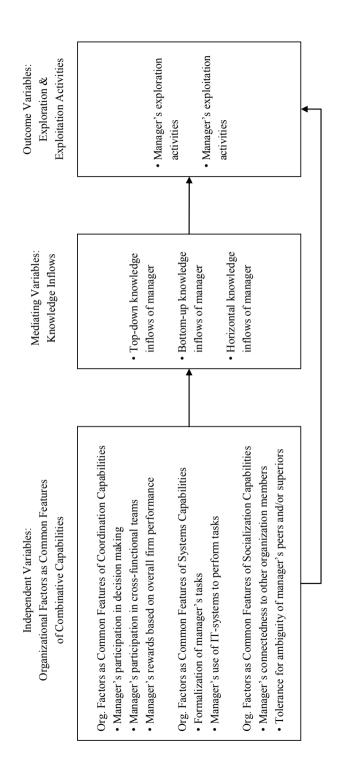
The literature review indicates however that there is a lack of systematic research, cumulative theory building, and a related set of empirical findings on these issues. Current literature and management practice could considerably benefit from increased conceptually and empirically validated understanding about what and how organizational factors impact upon exploration and exploitation, and the relation between these two, since studies explicitly dealing with these issues are scarce. Moreover, studies quite differ among each other with respect to specific organizational factors they consider, and empirical research seems to be lagging behind. The literature review indicates furthermore that current studies focus on exploration and exploitation at the firm or unit level. Studies addressing the manager level are nearly absent. Consequently, there is a lack of understanding about how exploration and exploitation can be conceptualized at the manager level, how they relate to each other at the manager level, how exploration and exploitation at the manager level can be measured, and about how organizational factors encourage or discourage managers to explore and/ or exploit.

This chapter illustrates that this study can deliver a contribution to the literature and management practice by investigating managers' exploration and exploitation activities. To further increase our understanding about how managers' exploration and exploitation activities can be influenced, section 2.4 argues to examine how organizational factors impact upon managers' exploration and exploitation activities. The literature suggests a variety of such factors. We indicated the relevance of referring to the concept of combinative capabilities for providing a theoretical argument about what factors to include or exclude in an analysis about the impact of factors on managers' exploration and exploitation activities. This leads to the identification of several organizational factors (see table 2.3) as common features of combinative capabilities as antecedents of managers' exploration and exploitation activities. Section 2.5 furthermore illustrates the relevance of investigating how knowledge inflows of a manager

influence this manager's exploration and/ or exploitation activities. The literature indicates that to more comprehensibly understand how a firm could manage and organize dealing with exploration and exploitation at the manager level, we should not only investigate how organizational factors and knowledge inflows impact directly upon managers' exploration and exploitation activities, but also on how the organizational factors impact upon managers' knowledge inflows, i.e. we will investigate how and to what extent knowledge inflows mediate the relationship between organizational factors and managers' exploration and exploitation activities.

Figure 2.1 illustrates the conceptual research framework which results from this chapter's discussion. As figure 2.1 shows, this study focuses on the impact of organizational factors as common features of combinative capabilities on managers' exploration and exploitation activities, and the mediating role of managers' knowledge inflows. Accordingly, in the next chapter, we develop hypotheses (1) on the direct impact of the organizational factors on managers' exploration and exploitation activities, (2) on the impact of the organizational factors on managers' knowledge inflows, and (3) on the impact of managers' knowledge inflows on their exploration and exploitation activities. These last two groups of hypotheses enable us to investigate the indirect impact of organizational factors as well, i.e. how they influence managers' exploration and exploitation activities through their influence on managers' knowledge inflows.

Figure 2.1 - Conceptual Research Framework



CHAPTER 3 – HYPOTHESES DEVELOPMENT

3.1 – Introduction

In this chapter, the hypotheses are developed. In line with the study's research framework (see figure 2.1, section 2.6) and research questions (see section 1.2), first, hypotheses are developed on the direct impact of the organizational factors on managers' exploration and exploitation activities. Section 2.4 provided a rational for the selection of the organizational factors. Second, hypotheses are developed on the impact of the organizational factors on managers' knowledge inflows. Third, hypotheses are developed on the impact of managers' knowledge inflows on their exploration and exploitation activities.

3.2 – The Direct Impact of Organizational Factors on Managers' Exploration and Exploitation Activities

Organizational Factors as Common Features of Coordination Capabilities

Participation in decision making, or decentralization (Aiken & Hage, 1966: 497), refers to the extent to which managers participate in decisions pertaining to the distribution of resources or policy formulation (Dewar et al., 1980; Hage & Aiken, 1967). The literature indicates that participation in decision making triggers managers to develop a variety of perspectives (Hage & Aiken, 1967; McGrath, 2001) and, consequently, enables them to better cope with uncertainty (Duncan, 1976). Moreover, it reduces the likelihood that change, or new and deviating perspectives will be vetoed by superiors (Thompson, 1967). Moreover, participation in decision making generates a greater involvement and commitment of managers in their job (Amabile, 1993; Damanpour, 1991) and consequently contributes to their ability and willingness to experiment, search for innovative solutions to problems, and take risk in order to increase performance on their job (McGrath, 2001; Pierce & Delbecg, 1977; Sheremata, 2000). Briefly, the literature argues that a manager's participation in decision making increases this manager's variety in experience (cf. Pierce & Delbecg, 1977: 30). However, as participation in decision making implies that more people with possibly different opinions are involved in the decision process, it reduces the speed and increases

the costs of problem solving (Sheremata, 2000), and it reduces possibilities of fast and efficient implementation (Duncan, 1976). Accordingly, centralization, i.e. low participation in decision making, is traditionally associated with stability, efficiency and reliability in actions and results (Rivkin & Siggelkow, 2003; Hage, 1965). Briefly, the literature indicates that decentralization, or participation in decision making, negatively relates to reliability in experience (cf. Pierce & Delbecq, 1977: 30). These arguments suggest the following hypotheses:

Hypothesis 1a: Participation in decision making by a manager is positively related to the extent to which this manager engages in exploration activities

Hypothesis 1b: Participation in decision making by a manager is negatively related to the extent to which this manager engages in exploitation activities

Cross functional interfaces encompass formal integration mechanism such as liaison personnel, task forces, and teams (Galbraith, 1973; Gupta & Govindarajan, 2000). They typically allow for immediate feedback, and dense, reciprocal, and personal interactions between managers of different functions, units, and hierarchical levels (Daft & Lengel, 1986; Egelhoff, 1991; Galbraith, 1973). These characteristics of cross-functional interfaces increase managers' variety in experience by enabling them to enter into debate with other people with different backgrounds, and to learn from each other's judgment and experience regarding new tasks. Moreover, by increasing managers' ability to deal with multiple or even conflicting interpretations about a situation, and to clarify and better define ambiguous problems, participation in cross-functional interfaces may reduce uncertainty and equivocality surrounding tasks, problems, and situations managers encounter (Daft & Lengel, 1986). As explorative tasks rather than exploitative tasks demand from a manager to deal with uncertainty and to interpret equivocal situations (Egelhoff, 1991; Holmqvist, 2003; Levinthal & March, 1993), the literature would argue that participation of a manager in cross-functional interfaces positively relates to the extent to which this manager engages in exploration activities. However, in the case of exploitative tasks, cross-functional interfaces easily lead to an "overload" of, for instance, different opinions, ideas, interpretations, and discussions, stifling the efficient and effective execution of

exploitative tasks (Daft & Lengel, 1986; Egelhoff, 1991). Consequently, we suggest the following two hypotheses:

Hypothesis 2a: Participation in cross-functional interfaces by a manager is positively related to the extent to which this manager engages in exploration activities

Hypothesis 2b: Participation in cross-functional interfaces by a manager is negatively related to the extent to which this manager engages in exploitation activities

Several studies indicate that for understanding manager's exploration, exploitation and knowledge acquisition activities, the distinction between reward systems which tie a manager's rewards to overall firm performance and systems which reward them based on individual performance is of special relevance (Ghemawat & Ricart I Costa, 1993; Gupta & Govindarajan, 2000; Rivkin & Siggelkow, 2003). Rewards based on overall firm performance and individual performance, are seen as the extremes of the same dimension (Lawler, 1986; Salter, 1973). The returns from exploration are typically distant from the locus of action (Lewin et al., 1999; March, 1991), consequently, one of the reasons that managers may be reluctant to conduct exploration activities when their rewards are based on individual performance, is that they do not reap the benefits of these exploration activities. On the other hand, rewards tied to overall firm performance trigger interdependent behavior, mutual adjustment and cooperation between managers of different functional areas, organizational units, and hierarchical levels, as it is generally to everyone's advantage that an individual work effectively, because all share in the financial fruits of higher performance (Collins & Clark, 2003; Ghemawat & Ricart I Costa, 1993; Gupta & Govindarajan, 1986; Lawler, 1986). Consequently, rewards tied to overall firm performance may reduce managers' reluctance towards conducting exploration activities as they will share in the fruits of these exploration activities, even if these fruits are reaped in other parts in the organization. Correspondingly authors argue that rewards based on firm performance positively influence exploration related activities such as innovating (Thompson, 1967), differentiating (Lawrence & Lorsch, 1967), and the development of new products and processes (Ghemawat & Ricart I Costa, 1993). However, incentive systems tied to individual performance inhibit risk taking and

foster a short-term egocentric focus (Kerr & Slocum, 1987), triggering a manager to conduct exploitation activities as the returns from exploitation are more certain, close in time, and privilege the near neighborhood of action (Lewin et al., 1999; March, 1991).

Hypothesis 3a: A manager's rewards based on overall firm performance is positively related to the extent to which this manager engages in exploration activities

Hypothesis 3b: A manager's rewards based on overall firm performance is negatively related to the extent to which this manager engages in exploitation activities

Organizational Factors as Common Features of Systems Capabilities

Formalization is the degree to which rules and codes describe a particular task, provide guides for decision making, provide guides for conveying decisions, instructions, and information, and the degree to which managers have to conform to the task description (Hage, 1965; Pugh et al., 1963). High formalization of tasks results in the development of expertise in a limited area (Hage, 1965) and therefore, within this area, it results in greater efficiency, higher production, less failures being made, and uniformity of behavior over time (Hall et al., 1967). Consequently, formalization of tasks increases the depth of managers' existing knowledge and their reliability in experience with respect to conducting the formalized tasks. However, by ex-ante describing and prescribing tasks and decision making, formalization reduces not only the ability to address unexpected situations or to conduct new tasks, but it also restricts the amount of deviation allowed from established standards (Aiken & Hage, 1966); i.e. formalization decreases a manager's ability to create variety in experience. These arguments lead to the following hypotheses:

Hypothesis 4a: Formalization of a manager's tasks is negatively related to the extent to which this manager engages in exploration activities

Hypothesis 4b: Formalization of a manager's tasks is positively related to the extent to which this manager engages in exploitation activities

Routinization reflects both the degree of variety in a task, i.e. the number of exceptions or the frequency of unexpected and novel events that occur, and the analyzability of a task, i.e. the extent to which a manager can follow an objective, well known procedure to solve problems (Perrow, 1967; Withey et al., 1983). Today, organizations increasingly use IT-systems to support or employ routine tasks (Pinsonneault & Rivard, 1998). Notwithstanding writings in the popular press, the literature indicates that IT-systems are less suited to facilitate nonroutine tasks, but are well suited to facilitate routine task (e.g. Goodhue & Thompson, 1995; Lim & Benbasat, 2000). Therefore, in this study, the use of ITsystems by a manager to conduct work related tasks will be used as a measure of the extent to which this manager conducts routine tasks, i.e. tasks with low variability and complexity, high predictability and uniformity, and well known cause-effect relationships. These characteristics of routine tasks and the main reasons to employ IT-systems to conduct routine tasks, i.e. increased speed, reliability, and uniformity, and lower costs (Devaraj & Kohli, 2002; Garrity & Sanders, 1998), indicates that the use of IT-systems to conduct tasks negatively relates to the extent to which a manager conducts new tasks and the manager's ability to deal with unexpected or difficult to analyze problems, but positively relates to the extent to which a manager conducts familiar tasks and encounters well-known, easy to analyze problems, suggesting the following hypotheses:

Hypothesis 5a: Use of IT-systems by a manager to conduct tasks is negatively related to the extent to which this manager engages in exploration activities

Hypothesis 5b: Use of IT-systems by a manager to conduct tasks is positively related to the extent to which this manager engages in exploitation activities

Organizational Factors as Common Features of Socialization Capabilities

Connectedness refers to the frequency of contacts a manager has with other organization members within and across organization units, and the density of this network of contacts (Jaworski & Kohli, 1993). Connectedness is associated with trust, shared norms, cooperation and knowledge exchange among organization members (Coleman, 1988; Rowley et al., 2000). Frequent contacts and a dense network; i.e. a high level of connectedness, promotes trust among

network members and facilitates the rapid diffusion of norms (Coleman, 1998; Rowley, 1997). As a result, managers embedded in highly interconnected networks develop shared behavioral expectations based on established norms. Moreover, deviant behavior becomes less accepted and will be sanctioned (Coleman, 1998). Consequently, the more managers are connected to other organization members, the more they are likely to respond to the network's expectations and norms in a concerted and similar fashion (Jaworski & Kohli, 1993), decreasing variation, experimentation, and the creation and diffusion of new ideas and insights (Hansen et al., 2001; Nahapiet & Ghoshal, 1998; Subramaniam & Youndt, 2005). Accordingly, connectedness will be negatively related to a manager's variety in experience and the broadness of the manager's knowledge base. On the other hand, because a high level of connectedness among organization members stimulates the development and circulation of similar norms, perspectives, and interpretations (Coleman, 1998; Hansen et al., 2001; Uzzi, 1997), dense networks provide a means for improving, refining, and increasing reliability in experience and the depth of knowledge acquired from other network members (Hansen et al., 2001; Rowley et al., 2000). Accordingly, we expect connectedness to be negatively related to managers' exploration activities, and to be positively related to managers' exploitation activities.

Hypothesis 6a: A manager's connectedness to other organization members is negatively related to the extent to which this manager engages in exploration activities

Hypothesis 6b: A manager's connectedness to other organization members is positively related to the extent to which this manager engages in exploitation activities

Tolerance for ambiguity is in this study not seen as a personal characteristic of managers, but rather reflects the extent that peer or superior managers allow a manager to have and/or express new ideas, different opinions, and deviant behavior, norms or values (Volberda, 1998: 178). It increases managers' openness to new opinions and diversity (Camerer & Vepsalainen, 1988). Accordingly, tolerance for ambiguity of managers' peers and/ or superiors increases managers' ability and/ or willigness to increase variety in experience. Moreover, effective decision making in situations involving risk or uncertainty,

both characteristics of exploration (cf. March, 1991; Levinthal & March, 1993), requires tolerance for ambiguity of a manager's contacts as the outcomes of these decision making situations have higher probability of deviating from established norms and practices than situations involving low risk or certainty (Gimpl & Dakin, 1984; Gupta & Govindarajan, 1984). For these reasons, we expect tolerance for ambiguity of a manager's peers and/ or superiors to positively affect managers' exploration activities. Instead, *in*tolerance for ambiguity of peers and/ or superiors causes managers to focus on only the least ambiguous problems and the most reliable answers (Dollinger, 1984) and to prefer well defined, stable, unchanging rules and behavior (Volberda, 1998). Therefore, we expect tolerance for ambiguity of peers and/ or superiors to be negatively related to managers' exploitation activities.

Hypothesis 7a: Tolerance for ambiguity of a manager's peers and/or superiors is positively related to the extent to which this manager engages in exploration activities

Hypothesis 7b: Tolerance for ambiguity of a manager's peers and/or superiors is negatively related to the extent to which this manager engages in exploitation activities

3.3 – The Impact of Organizational Factors on Managers' Knowledge Inflows

Organizational Factors as Common Features of Coordination Capabilities

Participation in decision making impels managers to acquire knowledge to determine what decisions to make, what important factors are in decision making, and how and when decisions should be made (Athuahene-Gima, 2003; Sheremata, 2000). Participation in decision making not only increases the quantity of knowledge needed by a manager to reduce uncertainty and to develop a variety of perspectives (Hage & Aiken, 1967; McGrath, 2001), but also makes demands on the quality of knowledge to be acquired. That is, accurate and timely knowledge is required to increase understanding and interpret situations correctly (Sheremata, 2000). Studies on organizational design indicate that accurate and timely knowledge can often be retrieved and interpreted best only by those located at its source (Quinn, 1980; Sheremata, 2000; Van De Ven 1980;), i.e. by those at lower

or front-line levels in the organization (Burns & Stalker, 1961). Consequently, managers participating in decision making typically need bottom-up knowledge inflows; they need to acquire their subordinates' ideas, expertise, insights, and opinions for more accurate and faster decision making (Ghemewat & Ricart I Costa, 1993). Furthermore, as participation in decision making compels managers to develop a variety of perspectives (Hage & Aiken, 1967; McGrath, 2001), it is likely to increase a broad search for and acquisition of knowledge (Duncan, 1967; Janssen et al., 2005b). Consequently, as the scope of horizontal knowledge inflows is likely to be broad (Winter & Szulanski, 2001), i.e. distant or unrelated to the recipient manager's existing knowledge base, participation in decision making is likely to increase a manager's horizontal knowledge inflows. Finally, as a main reason to decentralize decision making within large complex organizations is that it creates a demand for knowledge processing that exceeds top-management's capacity (Simon, 1957), it seems unlikely that managers who participate in decision making benefit from their superiors' knowledge (Ghemawat & Ricart I Costa, 1993). Consequently, we expect participation in decision making to be negatively related to a manager's top-down knowledge inflows not only because top-level managers are more distant from the source of knowledge, but also because top-down knowledge inflows are of narrow scope (Winter & Szulanski, 2001). These arguments suggest the following hypotheses:

Hypothesis 8a: Participation in decision making by a manager is negatively related to this manager's top-down knowledge inflows

Hypothesis 8b: Participation in decision making by a manager is positively related to this manager's bottom-up knowledge inflows

Hypothesis 8c: Participation in decision making by a manager is positively related to this manager's horizontal knowledge inflows

Cross functional interfaces encompass formal integration mechanism such as liaison personnel, task forces, and teams (Galbraith, 1973; Gupta & Govindarajan, 2000). They typically allow for frequent communication, immediate feedback, and dense, reciprocal, and personal interactions between managers of different functions, units, and hierarchical levels; i.e. cross functional interfaces increase the communication interface between functional and unit boundaries and

across hierarchical levels and hence serve as channels through which knowledge is being transferred (Daft & Lengel, 1986; Egelhoff, 1991; Galbraith, 1973; Gupta & Govindarajan, 2000). Consequently, as Galbraith (1973) argues and as Ghoshal and Bartlett (1988) and Gupta and Govindarajan (2000) empirically demonstrate, cross functional interfaces increase the extent of horizontal knowledge flows within an organization. Moreover, as Gupta and Govindarajan (2000) hypothesize and empirically demonstrate, cross functional interfaces increase vertical flows of knowledge as well as task forces, committees, and teams typically are composed of managers belonging to various hierarchical levels. Consequently, based on the literature, we would argue that the more a manager participates in cross-functional interfaces, the more such a manager is able to acquire top-down, bottom-up, and horizontal knowledge flows.

Hypothesis 9a: Participation in cross-functional interfaces by a manager is positively related to this manager's top-down knowledge inflows

Hypothesis 9b: Participation in cross-functional interfaces by a manager is positively related to this manager's bottom-up knowledge inflows

Hypothesis 9c: Participation in cross-functional interfaces by a manager is positively related to this manager's horizontal knowledge inflows

Rewards tied to total organizational performance rather than to individual performance increase a manager's willingness to understand the impact of his or her activities on other parts in the organization, and vice versa, the impact of what happens in other parts of the organization on his or her unit. In other words, different alternatives are not only evaluated from a manager's own perspective, but also from the perspective of the unit as a whole and of other units within the firm. As a result of this, rewards tied to overall firm performance trigger interdependent behavior, mutual adjustment and cooperation between managers of different functional areas, organizational units, and hierarchical levels, as it is generally to everyone's advantage that an individual work effectively, because all share in the financial fruits of higher performance (Collins & Clark, 2003; Ghemawat & Ricart I Costa, 1993; Gupta & Govindarajan, 1986; Lawler, 1986). Consequently, the literature indicates that through this interdependent behavior, mutual adjustment, and cooperation between managers, rewards based on

company-wide performance positively affect a manager's awareness about knowledge acquisition opportunities (Subramaniam & Youndt, 1998; Tsai & Ghoshal, 1998) and increase understanding of cause-effect relationships pertaining to the knowledge which resides in different places in the firm (Coleman, 1988; Rowley et al., 2000). Hence, we assume that a manager's rewards based on overall firm performance increase the acquisition of knowledge from all directions.

Hypothesis 10a:A manager's rewards based on overall firm performance is positively related to this manager's top-down knowledge inflows

Hypothesis 10b:A manager's rewards based on overall firm performance is positively related to this manager's bottom-up knowledge inflows

Hypothesis 10c: A manager's rewards based on overall firm performance is positively related to this manager's horizontal knowledge inflows

Organizational Factors as Common Features of Systems Capabilities

Formalization is the degree to which rules and codes describe a particular task, provide guides for decision making, provide guides for conveying decisions, instructions, and information, and the degree to which managers have to conform to the task description (Hage, 1965; Pugh et al., 1963). Typically, formalization aims at integrating and using knowledge of the firm while reducing the need for organization members to acquire knowledge other than that provided by the system; they limit both the intensity and scope of knowledge acquisition by managers' own initiative or authority (Weick, 1979). Furthermore, formalization of tasks limits reciprocal knowledge interactions between managers and hinders managers to acquire knowledge which is unrelated to the tasks to be conducted (Jansen et al., 2005; Lim & Benbasat, 2000). Consequently, as both bottom-up and horizontal knowledge inflows are often initiated by the knowledge recipient (Aoki, 1986; Van Den Bosch & Van Wijk, 1999), typically come about through dense personal reciprocal interactions, (Burgelman, 1983b; Subramanian & Youndt, 2005), and are distant, unrelated, or new to the recipient's existing knowledge base (Brady & Davies, 2004; Winter & Szulanski, 2001), we argue that formalization of tasks inhibits a manager to acquire bottom-up and horizontal knowledge inflows. Instead, formalization of tasks supports the acquisition of related, unambiguous knowledge for which the cause and effect relationships are known to allow

managers to respond to problems in known ways (Daft & Lengel, 1986; Galunic & Rodan, 1998). As top-down inflows of knowledge are typically of narrow scope and related to the recipient's field of expertise (Winter & Szulanski, 2001), as their relevance, i.e. the cause-effect relationships, is normally known (Schulz, 2003), and as they usually are uni-directional, and often initiated by the knowledge donor (Aoki, 1986; Van Den Bosch & Van Wijk, 1999), we argue that formalization of tasks positively relate to a manager's top-down knowledge inflows.

Hypothesis 11a:Formalization of a manager's tasks is positively related to this manager's top-down knowledge inflows

Hypothesis 11b:Formalization of a manager's tasks is negatively related to this manager's bottom-up knowledge inflows

Hypothesis 11c: Formalization of a manager's tasks is negatively related to this manager's horizontal knowledge inflows

The second organizational factor as a common feature of systems capabilities as investigated in this study is the use of IT-systems by a manager to conduct tasks. In this case, we do not mean to investigate the use of IT by a manager as a communication device, as, for instance, is the case when using email or discussion boards on the company's intranet. We rather investigate the use of IT-systems by a manager to conduct routine tasks, i.e. tasks with low variability and complexity, high predictability and uniformity, and well known cause-effect relationships. Examples of these tasks include making internal reports, making presentations or offers for customers or internal use, or tasks related to HRM. The use of IT-systems to conduct such routine tasks aims at increasing speed, reliability, and uniformity, and at lowering costs associated with these tasks (Devaraj & Kohli, 2002; Garrity & Sanders, 1998). Moreover, as indicated by managers from the companies' IT-departments during interviews, a main reason to implement IT-systems for conducting tasks is to reduce the need for managers to search for knowledge, as the IT-system should provide the manager with all knowledge needed. As a manager of the Central & Support unit at Deloitte expressed 'I would call them [the IT-systems] successful if people stop making calls to each other, if they don't visit each other any more, if the systems provide them, in a personalized and specialized way, with all knowledge they need.'

Accordingly, we expect the use of IT-systems by a manager to conduct tasks to be negatively related to a manager's knowledge inflows, except for top-down knowledge inflows as the knowledge provided by these systems, or changes regarding the content of the systems, typically comes from departments at higher hierarchical levels.

Hypothesis 12a:Use of IT-systems by a manager to conduct tasks is positively related to this manager's top-down knowledge inflows

Hypothesis 12b:Use of IT-systems by a manager to conduct tasks is negatively related to this manager's bottom-up knowledge inflows

Hypothesis 12c: Use of IT-systems by a manager to conduct tasks is negatively related to this manager's horizontal knowledge inflows

Organizational Factors as Common Features of Socialization Capabilities

Connectedness refers to the frequency of contacts a manager has with other organization members within and across organization units, and the density of this network of contacts (Jaworski & Kohli, 1993). Connectedness positively affects the exchange of knowledge among network members, regardless of position (Jansen et al., 2005b; Jaworski & Kohli, 1993) as an increase in connectedness is associated with an increase in knowledge acquisition opportunities (Subramaniam & Youndt, 1998; Tsai & Ghoshal, 1998) and an increase in the understanding of cause-effect relationships pertaining to the knowledge embedded in the network (Coleman, 1988; Rowley et al., 2000). It is recognized that a dense network, as it is likely to be closed off from the outside, makes it hard for new knowledge to penetrate the network (Uzzi, 1997). However, it facilitates the circulation of knowledge which resides in the network, as a reason for managers for being connected is to gain access to the others' knowledge (Hansen et al., 2001). As a manager's network of contacts may contain organization members from various positions and places in the organization (Sumbramaniam & Youndt, 2005; Van Wijk, 2003), i.e. peer members, subordinates, and/ or superiors, we expect connectedness to positively affect a manager's top-down, bottom-up and horizontal knowledge inflows.

Hypothesis 13a:A manager's connectedness to other organization members is positively related to this manager's top-down knowledge inflows

Hypothesis 13b:A manager's connectedness to other organization members is positively related to this manager's bottom-up knowledge inflows

Hypothesis 13c:A manager's connectedness to other organization members is positively related to this manager's horizontal knowledge inflows

Tolerance for ambiguity of a manager's peers and/ or superiors reflects the extent to which a manager's contacts allow a manager to have and/or express new ideas, different opinions, and deviant behavior, norms or values (Camerer & Vepsalainen, 1988; Volberda, 1998). It increases openness to new opinions and diversity (Camerer & Vepsalainen, 1988) and it increases managers' capacity for boundary spanning knowledge acquisition (Dollinger, 1984). Consequently, we expect tolerance for ambiguity of a manager's peers and/ or superiors to be positively related to a manager's bottom-up and horizontal knowledge inflows, as these knowledge inflows typically deviate from, are less related or more distant to the recipient's knowledge base, and posses more ambiguity because of more uncertainty regarding the cause-effect relations. On the contrary, intolerance for ambiguity of a manager's peers and/ or superiors causes managers to focus on the acquisition of unambiguous knowledge which is already related to their existing knowledge base (Dollinger, 1984). Consequently, we expect tolerance for ambiguity of a manager's contacts to be negatively related to a manager's topdown knowledge inflows as these knowledge inflows are typically closely related to the recipient's areas of expertise (Gupta & Govindarajan, 1991; Winter & Szulanski, 2001) and tend to be rather unambiguous; i.e. they possess a clear and proven understanding of cause-effect relationships (Egelhoff, 1991).

Hypothesis 14a:Tolerance for ambiguity of a manager's peers and/or superiors is negatively related to this manager's top-down knowledge inflows

Hypothesis 14b:Tolerance for ambiguity of a manager's peers and/or superiors is positively related to this manager's bottom-up knowledge inflows

3.4 – The Impact of Knowledge Inflows on Manager's Exploration and Exploitation Activities

Top-down Knowledge Inflows

Top-down knowledge inflows of a manager proceed along the hierarchy and are associated with knowledge coming from persons and units at higher hierarchical levels than the manager. Within large multi-unit firms, top-down flows of knowledge are typically confined to the vertical chains of organizational units specialized in functional, technological, geographic, or product-market related areas of expertise (Gupta & Govindarajan, 1991; Hedlund, 1994). This implies that the scope of top-down inflows of knowledge is likely to be narrow (Winter & Szulanski, 2001), i.e. closely related and even restricted to the recipient's specialized areas of expertise. Consequently, top-down inflows of knowledge increase the depth of the recipient manager's existing knowledge base rather than the broadness; they enable the recipient to increase, refine, or improve his or her expertise in a limited or specialized area (Cf. Katila & Ahuja, 2002).

Moreover, top-down inflows of knowledge tend to be rather unambiguous; i.e. they possess a clear and proven understanding of cause-effect relationships (Egelhoff, 1991), and their relevance with respect to improving the recipient's current activities is normally well-known (Schulz, 2003). Consequently, top-down knowledge inflows allow the recipient manager to respond to problems in familiar ways, and to increase the manager's ability to effectively and efficiently perform existing activities (Daft & Lengel, 1986; Galunic & Rodan, 1998); i.e. they allow the recipient manager to increase reliability, rather than variety, in experience.

The arguments above indicate that top-down knowledge inflows of a manager, being rather narrow and unambiguous (Egelhoff, 1991; Schulz, 2003; Winter & Szulanski, 2001), positively relate to the manager's exploitation activities, but are unlikely to relate to the manager's exploration activities. However, senior management can influence middle and front-line managers' exploration activities by other means then by top-down knowledge inflows. Senior management, for example, may trigger exploration within a firm by changing the characteristics of the organizational structure such as increasing other managers'

participation in decision making or decreasing managers' formalization of tasks (e.g. Duncan, 1976; McGrath, 2001; Tushman & O'Reilly, 1996), or by implementing cross-functional interfaces (Egelhoff, 1991; Galbraith, 1973). Other studies argue that the CEO can trigger managers' exploration activities, for instance, by fostering a culture which allows for deviant behavior and differing opinions and ideas (Volberda, 1998), or by challenging the strategic status quo of the firm (Bartlett & Ghoshal, 1993; O'Reilly & Tushman 2004).

Although the literature indicates that higher level managers may exert an influence on other managers' exploration activities by other means than top-down knowledge inflows, we argue that knowledge which comes from higher hierarchical levels does not relate to the recipient manager's exploration activities, but rather will be positively related to this manager's exploitation activities, suggesting the following hypothesis:

Hypothesis 15: Top-down knowledge inflows of a manager will be positively related to the extent to which this manager engages in exploitation activities.

Bottom-up Knowledge Inflows

Bottom-up knowledge inflows of a manager are associated with knowledge coming from persons and units at lower hierarchical levels than the manager. Contrary to bottom-up knowledge inflows of a manager, bottom-up inflows of data are rather unambiguous and provide the recipient manager in standardized and formalized ways with data about, for instance, the current performance of the organization; motivating the recipient manager to engage in exploitation activities (Brady & Davies, 2004; Sanchez & Heene, 1996). Bottomup inflows of knowledge, however, do not follow these standardized and formalized paths in an organization, rather they come about in ad hoc, random, unpredictable, and reciprocal interactions between the knowledge donor and knowledge recipient (Burgelman, 1983b) and typically demand qualitative rather than quantitative changes of existing activities (Sanchez & Heene, 1996). Consequently, bottom-up knowledge inflows of a manager do not relate to this manager's reliability in experience or to the depth of this manager's existing knowledge base; they are unlikely to impact upon the extent to which this manager engages in exploitation activities.

Regarding exploration, bottom-up knowledge inflows of a manager are likely to increase variety in experience; previous conceptual and case studies in the field of strategy research illustrate that front-line managers are directly confronted with new technological developments, unexpected problems, and changing market conditions and customer demands (Branzei et al., 2004; Burgelman, 1983b; Sheremata, 2000; Van de Ven 1980) and that bottom-up inflows of knowledge provide higher level managers with an increased understanding of changes regarding existing technologies, products, processes, and markets and with increased understanding of new or emerging technologies, markets, customer needs, or internal initiatives (Brady & Davies, 2004; Branzei et al., 2004; Burgelman, 1983b; Floyd & Lane, 2000). Consequently, a manager's bottom-up knowledge inflows may be a major source of exploratory learning by adding new knowledge to the recipient's existing knowledge base (Brady & Davies, 2004); bottom-up knowledge inflows may trigger knowledge recipient managers to revise current beliefs, to search for, develop, and experiment with various novel solutions to emerging problems, and to redefine strategic decisions (Bartlett & Ghoshal, 1993; Burgelman, 1983b; Floyd & Lane, 2000; Kimberly, 1979; Quinn, 1985).

The arguments above suggest that bottom-up knowledge inflows of a manager do not relate to this manager's exploitation activities, but rather positively influence this manager's exploration activities, suggesting the following hypothesis:

Hypothesis 16: Bottom-up knowledge inflows of a manager will be positively related to the extent to which this manager engages in exploration activities.

Horizontal Knowledge Inflows

Horizontal knowledge inflows of a manager are associated with knowledge coming from peer managers in the same organizational unit, or coming from other units at the same hierarchical level. Acquiring horizontal knowledge is enabled by rich and dense personal reciprocal interactions (Galbraith, 1973; Subramaniam & Youndt, 2005; Tsai, 2001). Through such reciprocal personal interactions, managers typically acquire knowledge from other parts of the organization which is rather ambiguous, complex and tacit (Egelhoff, 1991; Daft & Lengel, 1986). Acquiring this knowledge is less effective for dealing with or improving analyzable and rather unequivocal tasks and associated problems

(Egelhoff, 1991; Daft & Lengel, 1986). Hence, horizontal knowledge inflows are unlikely to influence reliability in managers' experience; they do not relate to a manager's exploitation activities.

However, the personal and reciprocal interactions by which a manager acquires horizontal knowledge, contribute to this manager's ability to interpret ambiguous and complex issues and to build understanding about new acquired knowledge (Daft & Lengel, 1986; Jansen et al., 2005), enabling the manager to increase variety in experience (Katila & Ahuja, 2002; Van Den Bosch & Van Wijk, 1999). Consequently, by stimulating cross-fertilization or (re-)combinations of different kinds of knowledge, horizontal inflows of knowledge have been found to enhance innovation and the creation of new knowledge at the recipient level (e.g. Grant, 1996; Kogut & Zander, 1992; Lawrence & Lorsch, 1967). Moreover, horizontal knowledge inflows cross functional, disciplinary, and technological areas (Grant, 1996; Hedlund, 1994; Leonard-Barton, 1995; Thompson, 1967). Consequently, their scope is likely to be broad (Winter & Szulanski, 2001); they are distant or unrelated to the recipient's existing knowledge base, increasing the broadness, rather than the depth, of the manager's existing knowledge base.

As the arguments above indicate that horizontal knowledge inflows of a manager are unlikely to relate to this manager's reliability in experience or to the depth of this manager's knowledge base, we argue that horizontal knowledge inflows are not related to a manager's exploitation activities. However, as horizontal knowledge inflows increase the broadness of the manager's knowledge base and variety in experience, we argue that these knowledge inflows positively relate to the manager's exploration activities.

Hypothesis 17: Horizontal knowledge inflows of a manager will be positively related to the extent to which this manager engages in exploration activities.

3.5 – Conclusion

Drawing on preceding literatures, this chapter developed hypotheses on the direct impact of organizational factors on managers' exploration and exploitation activities (see table 3.1 for an overview). To investigate the mediating role of knowledge inflows, hypotheses were developed on the impact of the

organizational factors on managers' knowledge inflows (see table 3.2 for an overview), and on the impact of managers' knowledge inflows on their exploration and exploitation activities (see table 3.3 for an overview).

Table 3.1 – Overview of Hypothesized Direct Impact[†] of Organizational Factors on Managers' Exploration & Exploitation Activities

	Dependent variables: Managers	'
Independent variables	exploration exploitatio activities activities	
Org. factors as common features of coordination caps.		
 Manager's participation in decision making 	H1a: + H1b: -	
• Manager's participation in cross-functional interfaces	H2a: + H2b: -	
Manager's rewards based on overall firm performance	H3a: + H3b: -	
Org. factors as common features of systems caps.		
 Formalization of manager's tasks 	H4a: - H4b: +	
• Manager's use of IT-systems to conduct tasks	H5a: - H5b: +	
Org. factors as common features of socialization caps.		
• Manager's connectedness to other org. members	H6a: - H6b: +	
Tolerance for ambiguity of mgr.'s peers and/or superiors	H7a: + H7b: -	

 $^{^{\}dagger}$ + = positive impact; - = negative impact

Table 3.2 – Overview of Hypothesized Impact † of Organizational Factors on Managers' Knowledge Inflows

Dependent variable	s: manager	's knowled	ge inflows
Indonondant variables	Top-	Bottom-	Horizon
Independent variables	down	up	tal
Org. factors as common features of coordination caps.			
 Manager's participation in decision making 	H8a –	H8b +	H8c +
• Manager's participation in cross-functional interfaces	H9a +	H9b +	H9c +
Manager's rewards based on overall firm performance	H10a +	H10b +	H10c +
Org. factors as common features of systems caps.			
 Formalization of manager's tasks 	H11a +	H11b –	H11c -
Manager's use of IT-systems to conduct tasks	H12a +	H12b –	H12c –
Org. factors as common features of socialization caps.			
 Manager's connectedness to other org. members 	H13a +	H13b +	H13c +
Tolerance for ambiguity of mgr.'s peers and/or superiors	H14a –	H14b +	H14c +

 $^{^{\}dagger}$ + = positive impact; -= negative impact

Table 3.3 – Overview of Hypothesized Impact[†] of Managers' Knowledge Inflows on Managers' Exploration and Exploitation activities

	Dependent variable	les: Managers'	
Predictor variables	exploration	exploitation activities	
Predictor variables	activities		
Manager's top-down knowledge inflows		H15: +	
Manager's bottom-up knowledge inflows	H16: +		
Manager's horizontal knowledge inflows	H17: +		

^{†+ =} positive impact

CHAPTER 4 – RESEARCH SETTING AND METHODS

4.1 – Introduction

This chapter describes important aspects of the study's research methodology. Section four of chapter one, 'Research Design', already illustrated how this research is designed and why; clarifying how the research approach, the research purpose and questions, the empirical setting, methods employed, and research activities conducted, make up the parts of an integrated whole (cf. Arbnor & Bjerke, 1997; Creswell, 2003). Section 4.2 of this chapter clarifies the congruence between the level of theory, level of measurement, and level of analysis in this study. The next section gives a description of and justification for the research setting, describing the companies at which the empirical research took place, their industries, and managers' exploration and exploitation activities. The next section describes the samples and elaborates on the sampling and data collection procedures. Finally, section 4.5 provides an overview of the sources and development of the survey's multiple-item scales which are used to measure the study's constructs, as well as an assessment of their reliability and validity. Section 4.6 concludes the chapter.

4.2 – Methodological Consequences of Focusing at the Manager Level

To gain valid and reliable answers to the study's research question, it matters to make sure that the level of theory, the level of measurement, and the level of analysis are congruent. The level of theory describes the target that a researcher aims to depict and explain (Klein et al., 1994: 199); in this study exploration and exploitation activities of managers of large knowledge-intense multi-unit firms in dynamic environments. It is the level to which generalizations are made. Focusing at the manager level would have the following consequences for the research approach; *first* that the level of measurement, i.e. the actual source of the data; the unit to which data are directly attached (Klein et al., 1994: 209), and the level of analysis, i.e. the treatment of the data during statistical analyses (Klein et al., 1994: 212), be also geared to the manager level of analysis. Accordingly, the survey's

measures, data collection and analysis, and theoretical and practitioners' implications of this study will all pertain to the manager level. Second, variation should exist in the dependent constructs at the manager level (Klein et al., 1994: 200). In other words, in order to justify examining exploration and exploitation at the manager level within a small number of firms, as this study does, managers within the same firm should sufficiently differ in the extent to which they engage in exploration and/or exploitation activities. Several studies examined in chapter two argue that managers, within the same firm, may differ in the extent to which they engage in exploration and/or exploitation activities: not only across hierarchical levels, functions, and units (Benner & Tushman, 2003; Duncan, 1976; Prahalad & Hamel, 1990; Tushman & O'Reilly, 1996), but also within a hierarchical level, function, or unit (Burgelman, 1983a; b; De Leede et al., 2002; Floyd & Lane, 2000; Gibson & Birkinshaw; 2004; Leana & Barry, 2000). Accordingly, we surveyed managers of all levels, functions, and units of the three firms. Third, examining the dependent variables at the manager level argues for examining the predictor variables at the manager level as well (Klein et al., 1994: 201). Moreover, variation should exist in the predictor variables at the manager level. Studies on social capital and strategic management, for instance, indicate that managers of the same firm may differ with respect to the extent to which they receive or gather knowledge and with respect to the directionality of knowledge inflows (i.e. top-down, bottom-up and/or horizontal) (e.g. Burgelman, 1983a; b; Floyd & Lane, 2000; Hansen et al., 2001; Nahapiet & Ghoshal, 1998; Subramanian & Youndt, 2005). Studies on organization design indicate that with one and the same firm, different levels of managers' participation in decision making, participation in cross functional teams, different reward systems, different levels of formalization, use of IT-systems, connectedness, and tolerance for ambiguity may exist (e.g. Adler et al., 1999; McDonough & Leifer, 1983; Volberda, 1998).

4.3 – Research Setting

The empirical research of this study has been conducted within three large multiunit companies operating in the financial services sector (Rabobank), electronics industry (Philips), and the accountancy and financial advisory sector (Deloitte). In each company, data has been gathered by means of in-depth interviews, company documents, and a survey. The same survey has been conducted in each company. Regarding the selection logic; the goal of this study compels us to ensure that enough variation exists in our empirical data with respect to managers' exploration and exploitation activities. Therefore, we decided to examine managers whose firms are confronted with pressures to explore and with pressures to exploit. The literature indicates that several challenges within all three firms' industries make them an interesting context to investigate managers' abilities to conduct exploration and exploitation activities. Changes regarding technologies, competition, regulation, and customer demands, force managers of firms in these industries to conduct exploration activities (Banker et al., 2005; Flier et al., 2001; Greenwood et al., 2005; Henisz & Macher, 2004; Sarvary, 1999). At the same time, an increased pressure to focus on efficiency and cutting costs, increasing importance of economies of scale, and short-term competitive pressures, force managers of firms in these industries to conduct exploitation activities (Banker et al., 2005; Flier et al., 2001; Greenwood et al., 2005; Henisz & Macher, 2004; Sarvary, 1999). Furthermore, regarding the selection logic, the knowledge literature indicates the value of examining firms whose members posses high levels of specialized knowledge (Grant, 1996) when investigating the role of knowledge flows within a firm with respect to managers' exploration and exploitation activities. Technology firms like Philips are often used examples of such firms (cf. Smith et al., 2005). Furthermore, the greater part of empirical studies on exploration and exploitation, take technology firms as an empirical setting (see Appendix A). Therefore, to increase variety in our empirical dataset, we decided to do empirical research within service firms as well. The professional advisory sector in which Deloitte is active, and the financial services sector in which Rabobank is active, are cited examples of industries of which the firms' members posses high levels of specialized knowledge (Lievens & Moenaert, 2000; Van Den Bosch et al., 2005).

The three sections below each give more insight into the research setting at, successively, Rabobank, Philips, and Deloitte. Each section describes developments in the industry which challenge managers of firms in these industries to increasingly conduct exploration and exploitation activities. Insight is also given into the companies' history, important current developments, figures, and the companies' structure. Finally, we briefly delve into these firms' managers' exploration and exploitation activities. A more elaborate description of the

managers of these companies is given at the 'sample and data collection' section; section 4.4 of this chapter.

4.3.1 – Rabobank

Industry

The first company at which the empirical research of this study has been conducted is a European financial services company; the Rabobank Group. The research took place at five local banks of the Group. Several developments within the European financial services industry, most notably those pertaining to regulations, technologies, globalization, and customer demands (Flier et al., 2001; 2003; Taylor, 1999), confront managers of firms in this industry with the challenge to increasingly focus upon exploration and exploitation activities. Since the mid-1980s the European financial services industry has witnessed a gradual process of deregulation, privatization, and harmonization (Flier et al., 2001; Taylor, 1999). By the elimination of restrictions on the entry of new domestic firms and restrictions on mergers and acquisitions, domestic and cross-border competition increases. A process of increasing scale and scope of financial services provided by firms has been started after relaxation of limits on combining banking, insurance and security activities within a single firm. These consequences of regulatory changes increase pressures for financial firms to consolidate, increase economies of scale, control costs, explore new markets, develop new hybrid products, and strategically renew themselves (Flier et al., 2001; Taylor, 1999).

Technological developments force financial firms to embrace new information and communication technologies and electronic commerce (Hensmans et al., 2001). These technological developments, enabling remote banking, i.e. managing one's account without physically going to a bank office (Flier et al., 2001: 188), change the interface between clients and financial services providers. They also enable non-financial players, such as telecommunication and retail companies, to enter the market (Hensmans, et al., 2001), forcing managers to develop new business models for both competing and cooperating with new players. Financial services firms invest heavily in information and communication technologies, not only to change the interface with customers, but also to renew or refine internal information and communication systems and processes. IT has for instance increased the transactions per employees (Vermeulen, 2001).

Changing customer preferences, such as the increasing appreciation of remote banking and a movement towards electronic payment devices undermine the importance of conventional brick-and-mortal outlets, stimulating financial firms to reduce costs and apply new technological developments, (Hensmans, 2001; Smits & Groeneveld, 2001; LRP). Growing popularity of new financial products such as hybrid products, increase the importance of combining banking and insurance activities.

Finally, there is an ongoing trend of globalization in the financial services industry. Growing global interdependence of regional financial services, and cross-border trade (Flier et al., 2001; Taylor, 1999), trigger major global financial players to geographically extent their activities within and across continents. Moreover, increased competition, the need to achieve economies of scale and scope, and pressure to focus on performance and cut costs, drive mergers and acquisitions within and across borders (Taylor, 1999).

Rabobank Group: Short Historical Overview¹

The foundation for the current Rabobank Group has been laid in 1898 in the Netherlands with the establishment of two cooperatives; southern agricultural credit cooperatives merged into the Boerenleenbank and northern agricultural credit cooperatives into the Raiffeisenbank. The two cooperatives founded a common central organization which served to support the local banks and fostered the foundation of new local bank members. In 1970, the two cooperatives had about 1,200 members. The local banks were autonomous and had own responsibility for their actions. In 1972 the cooperative Boerenleenbank and Raiffeisenbank merged into Rabobank. A main reason for this merger was the increasing importance of economies of scale as in the 60s and 70s several other firms in the Dutch banking sector had merged. Another trigger for the merger was the need to offer a wider range of products to customers; more non-agricultural customers entered the customer base, as well as small and medium sized firms. The next two decades are characterized by further growth -also through acquisitions—, diversification, and a start is made with internationalization. In the last decade of the 20th century, the strategy to become an integrated financial services provider translates itself, for instance, into the acquisition of the insurer Interpolis in 1990 and the investment banker Robeco, in 1997. To provide

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¹ Based on Sluyterman et al. (1998) and Van Wijk (2003)

international clients with products, Rabobank enters into alliances with other European financial cooperatives such as, for instance, Credit Agricole in 1990.

Rabobank Group and its Local Banks: Figures, Structure, and Recent Developments

In 2004, the Rabobank Group comprised 288 independent local cooperative banks. Together, they own the supra-local organization, Rabobank Nederland, which is responsible for managing the Group's interest. The local banks enable the group to function as an all-financial services provider together with the specialized business of the group which engage in asset management, insurance, leasing, private banking, venture capital, and corporate and investment banking (Smits & Groeneveld, 2001). The Group employed in 2004 about 56,000 employees, had total assets of \in 475 billion, a total income of \in 10 billion, and net profits of \in 1.5 billion. It ranks among the top 30 on the Fortune Global 500 in terms of revenues in the banking industry. About 20% of the incomes are generated from activities in other countries than the Netherlands. Total assets increased last decade with a factor of about 3.5, revenues and net profits increased with a factor of approximately 2.5, the number of employees increased with a factor 1.5 (see also figure 4.1).

Assets (billion) Revenues (100 million) Net profits (100 million) No. of local banks

Figure 4.1 – Rabobank: Total Assets, Revenues, Net Profits, and Number of Local Banks

Source: Rabobank, Annual Reports 1995-2004

One of the strategic ambitions of the Rabobank Group is being the Dutch Allfinanz market leader (annual reports 2003-2005). The group partly aims at realizing this ambition through acquisitions. In 2005, for instance, the merger of the Group's insurance subsidiary with the insurance company Achmea, resulted in the largest Dutch insurance company. Another way of realizing the ambition to become the leading Dutch Allfinanz company is by increasing both the scale and scope of financial products and services offered by the local banks. Therefore, since over a decade, the number of independent local banks has decreased from 547 in 1995 to 288 in 2004 due to local banks merging with each other (see also figure 4.1). The larger local banks are assumed to have an increased ability to offer complex financial products, to better serve large local firms, and to profit from economies of scale. Rabobank furthermore tries to increase market share by exploring new distribution channels such as the internet and by increasing the number of small branches which customers may visit for standard products. Another strategic ambition of Rabobank is becoming the world leading financial player in the food & agri business by acquiring financial institutions which focus on the agricultural sector (annual report 2004).

The Rabobank Group is owned by local banks which each provide financial services and products to distinct geographical areas of the Dutch retail and business markets. Each bank has an own board of directors and autonomy with respect to operational and strategic decisions, i.e. with respect to products and services offered, the allocation of their resources, the markets they wish to serve, and processes and systems they employ. The local banks have a cooperative structure as well; their local customers may become 'member' of the bank. These members influence the banks' policy, especially about the provision of services, customer relations, and social activities through various panels and committees which act as a sounding board for the bank, increasing the Rabobanks local orientation and their customer knowledge (Van der Steen, 2004). A typical local Rabobank has a business unit which focuses on the business market and a business unit which focuses on the private, or retail, market. Each business unit is comprised of several organizational units, focusing either on distinct market segments within business and retail and/ or on distinct products and services such as mortgages, savings, loans, insurance, leasing, asset management, investments banking, and private and business accounts. Each local bank also has organizational units focusing distinct aspects of internal operations such as HRM,

risk management, marketing and communication, and ICT. Each organizational unit has its own management team and responsibility for its own activities.

Managers' Exploration and Exploitation Activities

The managers of the local Rabobanks are confronted with the same developments which characterize the financial services industry as a whole; i.e. challenges with respect to regulation, technology, and customer preferences. Moreover, each current bank has recently been, is, or will be soon, in the process of a merger with one or more other local banks. Interviews with managers of several local banks revealed that these developments challenge managers to conduct exploration activities; i.e. to increase variety in experience and to broaden their knowledge base. Managers, for instance, engage in activities related to developing new products or product combinations, renewing internal processes and systems, learning about new information and communication technologies, experimenting with new distribution channels, searching for new opportunities in existing or new markets, and discovering changing customer preferences. Managers are also challenged to conduct exploitation activities; i.e. to increase reliability in experience and to deepen their knowledge base. For instance, they increasingly have to improve, refine, and specialize their knowledge and experience in specific limited areas of expertise because of increasing economies of scale and because of an increased competition among managers caused by the ongoing merger between banks. Other exploitation activities include activities related to fine tuning processes, procedures, and tasks throughout the newly merged bank, increasing efficiency through standardization of simple products, services and tasks in more stable markets, and consolidating, extending, and/ or divesting existing activities.

4.3.2 – Philips

Industry

The second company at which the empirical research of this study has been conducted is an international electronics firm; Philips. Julien de Jong assisted us in collecting the data. Research in this firm was carried out in one of the three divisions of the firm's semiconductor group. Regarding the selection of this group, several challenges in the semiconductor industry confront managers with the challenge to increasingly focus upon exploration and exploitation activities

(Burgelman. 2002: Nonaka, 1994; Rosenkopf & Nerkar, semiconductor industry, as we know it today, traces its origins to the inventions of the point-contact and the junction transistor by Bell Labs in the late 1940s and early 1950s (Holbrook et al., 2000). The Philips semiconductor group has a track record that spans 50 years, making it one of the long-term players in the industry. There are a few general, interrelated, characteristics which shaped this industry, from its origins to today, such as an ongoing trend of miniaturization, fierce competition on low costs and first-to-market, rapid technological progress, manufacturing complexity, and globalization (Henisz & Macher, 2004; Holbrook et al., 2000; Methe, 1992). The performance of semiconductor firms is to an important extent determined by their ability to lead, or keep up with, the pace of miniaturization in the industry (Iansiti & West, 1999; Methe, 1992), i.e. the increasing number of semiconductor components placed onto a given area of chip. The advantages of miniaturization come in the form of lower costs, resulting from smaller transistor and chip size, and improvements of product functionality, resulting from the device components being placed closer together which consequently increases the speed with which the components can perform their functions (Iansiti & West, 1999; Methe, 1992). To gain these advantages, semiconductor firm R&D projects not only focus on the generation of novel technologies, but also on the rapid introduction of new manufacturing process generations to implement technological innovations timely into effective products (Iantisi, 2000). Speed to market indeed is important as the industry's product generations are characterized by price declines of 25%-30% per year and shortening product life cycles (Henisz & Macher, 2004). Besides the great weight semiconductor firms place on R&D, manufacturing capabilities matter as well. One of the factors driving a semiconductor firm's success is the quality of chips it produces (Langlois & Steinmueller, 2000) which is expressed in defect rates, i.e. the fraction of chips that proves to be defective. These industry characteristics as described above illustrate that success in the industry is largely determined by low costs, operational excellence, radical and incremental technological innovations, and speed to market.

A recent trend in the industry is the increasing demand for interconnectedness among a broad range of diverse semiconductor devices. Changes is the market demand, for instance, multiple functions per products such as a cell phone containing a camera and fm radio, or a television including an internet browser. The change from a preference of stand-alone products to wireless

interconnected products also increasingly demands interconnectedness between diverse semiconductor devices. This trend increasingly forces semiconductor firms to collaborate with each other and with diverse content and software providers through, for instance, alliances, joint ventures, or mergers (Philips annual report, 2004).

Philips: Short Historical Overview²

The foundations for the Royal Philips Electronics Company, Philips for short, were laid in Eindhoven, the Netherlands, by Frederik Philips and his son Gerard, in 1891. It started by making carbon-filament lamps and soon became one of the largest producers in Europe. In 1918, it introduced a medical X-ray tube, which marked the beginning of an internationalization and diversification processes driven by innovative research and development. In the 1920s it started developing and producing radios and televisions. After WOII, Philips Research invented the rotary heads that led to the development of the Philishave electric shaver. Moreover, it contributed to the development of the recording, transmission and reproduction of television pictures. In 1963, it introduced the Compact Audio Cassette. In 1965, it produced its first integrated circuits. In the 1970s, research in lighting contributed to the new PL and SL energy-saving lamps, while Philips Research made breakthroughs in the processing, storage and transmission of images, sound and data. These led to the inventions of the LaserVision optical disc, the Compact Disc (launched in 1983) and optical telecommunication systems. In 1997, in cooperation with several other companies, by building on its Compact Disc technology, Philips invented and jointly introduced with Sony the DVD. The 1990s was a decade of significant change for Philips. The company carried out a major restructuring program to return it to a healthy footing, simplifying its structure and reducing the number of business areas. Moving into the 21st century, Philips has continued to change; it has dedicated itself to projecting a new and more representative image that reflects the products it offers in the areas of Healthcare, Lifestyle and Technology. By following this up in 2004 with a massive advertising campaign to unveil its new brand promise of 'Sense and Simplicity', the company aims at confirming its dedication to offering consumers around the world products that are advanced, easy to use and, above all, designed to meet their needs.

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² Based on Philips Company Manual, 2004; and Metze (1991)

Today, Philips is an international company with five product groups; medical systems, domestic appliances & personal care, semiconductors, consumer electronics, and lightning. It had sales of slightly over \in 30 billion in 2004, and employs over 161 thousand employees, which makes that it ranks within the top 10 in the electronics industry on the Fortune Global 500 (2005) in terms of revenue. Whereas sales yearly decreased in the 2000 – 2003 period with on average 8 % due to divestitures and losses in market share, and net losses were made in 2001 and 2002, sales increased in 2004 with 4%, and a net profit was made of \in 2.8 billion.

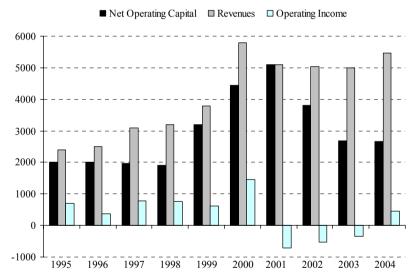
Philips Semiconductors: Figures, Structure, and Recent Developments

The empirical research took place in the international multi-market semiconductor division of Philips' semiconductor group. The choice for this division was made because it serves multiple markets with different degrees of dynamism and competitiveness, which increases the probability of observing managers with a broad variety in terms of exploration and/ or exploitation activities they engage in (Cheng & Van De Ven, 1996; Garcia et al., 2003; Luo, 2002). The other two group's divisions each serve a single market. In the period 2000 - 2003, yearly sales of the semiconductor group were about 5.0 billion, but decreased each year with about 1%. In the same period the group suffered negative profit results. In 2004 sales increased to ϵ 5.5 billion and the group made a profit of ϵ 450 million. Figure 4.2 shows group level figures.

The selected division employs over 7,000 employees and has R&D and production facilities in the Americas, Asia, and Europe. With sales of € 1.2 billion in 2004, profits of € 180 million, and a market share of about 4,2%, the division ranked in 2004 worldwide 5th in terms of sales (annual report 2004, Royal Philips Electronics). The division is active in the entire semiconductor industry, most notably the automotive, communications, computing, and consumer electronics markets. Each market is served by a range of product types; i.e. power management products, interface products, standard ICs, and general application discretes. The division is a conglomerate of five business units which focus on specific market segments, customers and/ or technologies, supported by a headquarters and a production support unit. For three business units, research, development, and design are particular critical key success factors as they focus on systems, applications, and niche products (internal company document 'sustaining profitable growth', 2004). These are the 'automotive' business unit which

develops in-vehicle network applications, the 'interface products' business unit, which offers customer specific interface solutions, and the 'power management' business unit, which has a variety of MOS and bipolar power discrete devices and power management ICs. For the other two business units, low costs are a particular critical success factor (internal company document 'sustaining profitable growth', 2004). These are the 'general applications' business unit, which delivers transistors and diodes for several markets, and the 'standard ICs' business unit, which delivers microcontrollers and general purpose logic solutions. The five business units are supported by the 'production support unit', which has four plants for high-volume manufacturing, and packaging, and test platforms. The headquarters holds final responsibility for the division towards the semiconductor group and steers the business units with respect to strategy formulation and resource allocation.

Figure 4.2 – Philips Semiconductor Group: Net Operating Capital, Revenues, and Operating Income (million euro)



Source: Philips, Annual Reports 1995-2004

Currently, Philips investigates options for its semiconductor group, such as divestment or close collaboration with other semiconductor companies. A reason for this are disappointing financial results, which mainly result, according to financial annalists (het Financieele Dagblad, December 16th, 2005) from lack of

economies of scale. Another reason for divestment is that the semiconductor group makes Philips' stock prices to fluctuate too much according to Philips due to its fluctuating market. As other semiconductor companies continue to merge, Philips' semiconductor group has lost in 2005 a position in the world's top 10 semiconductor companies in terms of sales.

Managers' Exploration and Exploitation Activities

The managers of the Philips multi-market semiconductor division are confronted with the same developments which characterize the industry as a whole as described above. This makes managers to focus on exploration activities; i.e. to increase variety in experience and to broaden their knowledge base. Managers engage, for instance, in activities related to exploring new and emerging markets, searching for, discovering, experimenting with, and developing new technologies and products, experimenting with new distribution channels, and searching for leading customers, content and service providers with whom partnerships can be established to extent capabilities in technology, manufacturing and access to customers. Managers are also challenged to conduct exploitation activities; i.e. to increase reliability in experience and to deepen their knowledge base. For instance, they conduct activities related to improving, refining, and standardizing existing technologies, products, procedures, and processes, achieving operational excellence, increasing economies of scale, aiming at utilizing 100% of the own production capacity, and divesting or outsourcing activities.

4.3.3 – **Deloitte**

Industry

The third company at which the empirical research of this study has been conducted is an international accountancy and (financial) advisory firm; Deloitte. Firms in the accountancy and financial advisory industry are generally active in providing accounting and auditing services including compilations, special reports, and reviews in addition to engagements involving the attest function, tax services including tax research, planning, and preparation work, and management advisory services including consulting, systems development, integrating and reselling computer equipment and software, and any other management assistance. Several developments within the accountancy and financial advisory industry, most notably those pertaining to changing customer demands, information technology,

changing regulation, and increased competition (Banker, et al., 2005; Greenwood et al., 2005; Tarca, 2005), confront managers of firms in this industry with the challenge to increasingly focus upon exploration and exploitation activities.

Several transformations characterize the accounting and financial advisory industry in the last decade. Global competition, technological change, and advances in information technology had a significant impact on the survival and growth of accounting and financial advisory firms' client organizations during the last decade. This, in turn, led to considerable growth in the demand for management advisory services (Banker et al., 2005). Consequently, the accounting and financial advisory firms diversified; next to the traditional, low-margin revenue product areas of accounting, auditing, and tax services they also went into the high margin revenue product area of management advisory services (Firth, 1997). These services yield higher returns because they allow for more differentiation as compared to the traditional services. The increasing demand for services in different areas triggered consolidation in the industry to address the "one-stop shopping" needs of the consumers of accounting and financial advisory firms. Hence, firms in the late 1990s and early 2000s reduced their reliance on traditional accounting, auditing, and tax services and moved into the practice of new assurance services and consulting services (Rankin & Sharp 2000).

Investments in IT, both by clients and accounting and financial advisory firms themselves, also changed the industry (Siegel, 1999; Stiroh, 2001; Van Den Bosch et al., 2005). Accounting and financial advisory firms started assisting their clients in the computerization of their information systems. This also enabled the automation of many routine accounting and auditing tasks, changing the traditional way of doing business (Stiroh, 2001).

In 2002, a number of large enterprises, also in the Netherlands, such as Ahold and firms in the building sector, were under fire because their accounting raised questions. In response to this, new rules and market developments were imposing restrictions on the combination of auditing and consultancy. This not only made firms in the accounting and financial advisory industry to start worrying about maintaining or improving their reputation (Greenwood et al., 2005; Moore et al., 2006), but also that often firms should make a choice as to which form of service can and may be offered to (potential) clients for which new restrictions apply. This has led to some accounting and financial advisory firms divesting their management advisory services divisions or setting them up as independent companies (Banker et al., 2005; Greenwood et al., 2005).

Consequently these firms will need to develop new services in the attest and tax areas or improve productivity in these traditional services if they do not provide management advisory services because of regulatory pressure. This is because the profitability of the accounting and financial advisory firms has been sustained in recent years largely by the impact that management advisory services have had on their profitability (Banker et al., 2005).

Finally, increased competition for market share, pressure on prices and a deteriorating economy, put pressures on firms in the accounting and financial advisory industry to become leaner, more productive, more specialized, and more quality and customer oriented than before (Banker et al., 2005; Dopuch et al., 2003).

Deloitte: Short Historical Overview³

Deloitte Touche Tohmatsu belongs together with Ernst & Young, PriceWaterhouseCoopers, and KPMG to the largest four accounting and financial services companies in the world. Sales increased since 2000 each year with on average 13% to \$18.2 in 2004/5. The company is active in nearly 150 countries, employing 121 thousand people. The origins of today's Deloitte Touche Tohmatsu trace back to 1845 when William Welch Deloitte opens an accountancy office in London. history is characterized by mergers, acquisitions, internationalization. The accountancy firm established by George Touche in 1900 in New York and the accountancy firm established by Nobuzo Tohmatsu in 1952 in Tokyo merge in 1975. A subsequent merger with Deloitte Haskins & Sells in 1990 has lead to today's Deloitte Touche Tohmatsu. Since then, the company diversifies into management advisory services. It decides in 2003 to remain a broad-range financial services company by not divesting its consulting activities, despite changing regulation.

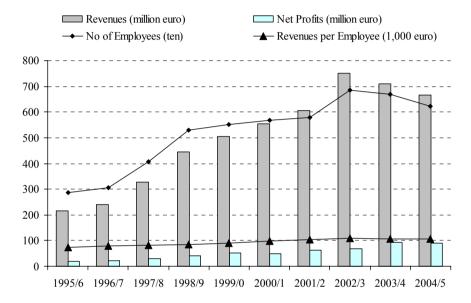
Deloitte Nederland: Figures, Structure, and Recent Developments

The empirical research took place at the Dutch member firm, further referred to as 'Deloitte', of the international Deloitte Touche Tohmatsu Company. Deloitte provides a broad range of financial services, targeting for the whole Dutch market; that is services in the area of accounting, consulting, and advisory services with respect to taxes and finance for small- and medium-sized organizations, and

³ Based on www.deloitte.com

large and multinational organizations in both the private and public sector. In terms of sales, \in 665 million in 2004/5, Deloitte is the largest of such financial services providers in the Netherlands. The accounting division accounted in 2004/5 for 57 % of total revenues, consulting for 14 %, tax advisory for 25 %, and financial advisory for 4 %.

Figure 4.3 – Deloitte Nederland: Revenues, Net Profits, Number of Employees, and Revenues per Employee



Source: Deloitte, Annual Reports 1995/6-2004/5

Sales of the company increased yearly in the period 1995/6 – 2002/3 from € 216 million to € 756 million, which corresponds to an average yearly growth of 36% (see also figure 4.3). The sales growth is mainly due to growth of existing markets and to two major acquisitions. In 1998 Deloitte acquired VB Groep, an accountants and financial advisory organization specialized in the non-for profit sector, employing 1,400 people. In 2002 it acquired Andersen Nederland which focused on large and multinational firms in both the private and public sector. Andersen employed about 1,200 employees. In the last two years, Deloitte's sales declined yearly with 6%. This decline of revenues is on one hand due to stagnation of the Dutch economy, which struck particularly the consulting division. On the other hand, Deloitte divested several segments of the consulting division due to

changing regulations which impose restrictions on combining accountancy and consulting activities within one firm. Other firms comparable to Deloitte, such as, Ernst & Young, KPMG, and PWC which are active in accounting and legal and financial advice, but not explicitly in consulting, did face since 2002/3 a decreasing growth, but not a decline in sales. Comparing the revenues per employee between the three firms, an often used measure for efficiency in the sector, reveals that Deloitte's efficiency clearly lacks behind to that of its main competitors. Although revenues per employee at Deloitte steadily increased from $\mathfrak E$ 75 thousand in 1995/6 to $\mathfrak E$ 107 thousand in 2004/5 (see also figure 4.3), revenues per employee in 2004/5 at Ernst & Young, KPMG, and PWC were between $\mathfrak E$ 150 and 170 thousand (based on annual reports Ernst & Young, 2004/5; KPMG 2004/5; PWC 2004/5).

Managers' Exploration and Exploitation Activities

Managers conduct both exploitation and exploration activities to deal with recent and intended future developments at Deloitte and to deal with the above described challenge for Deloitte to confront changes in the industry and to increase both growth and cost-effectiveness. Managers are triggered to increase reliability in experience and to increase the depth of their knowledge as Deloitte tries to increase efficiency and to gain market share by increasing the level of its managers' specialization. Within each of the four product divisions, different sections are created corresponding to segmentation of the market into small- and medium-sized firms, large and multinational firms, and public firms. As such, managers within each product group are encouraged to develop, improve, and refine in-depth knowledge pertaining to a certain market segment, product or service, or internal process, which should improve (potential) customers' impression about the ability of Deloitte to deliver valuable and suitable services to them. Furthermore, the reduction of the number of branches throughout the Netherlands from about 100 to about 50 by combining smaller branches into larger units, leads managers to engage into activities related to increasing economies of scale, improving the efficiency of internal operations, and standardizing products, processes and systems throughout the organization. Managers are also challenged to conduct exploration activities; i.e. to increase variety in experience and to broaden their knowledge base. Examples of exploration activities include those related to searching for and experimenting with new electronic distribution channels and online products, creating new product(combinations) by recombining

products across divisions, searching for, discovering, and experimenting with new business models, products, and services in both existing and previously un-served markets.

4.4 – Samples and Data Collection

As indicated in chapter one's section 1.4; quantitative data for this study was obtained through a questionnaire survey. Consistent with Ghoshal et al. (1994), the same survey was administered to managers of Rabobank, Philips, and Deloitte to reduce bias and increase comparability of results. This section describes the survey's samples (see also table 4.1) and elaborates on the data collection procedures.

At Rabobank, the survey was administered to all 237 managers of five local banks; hence, the sample covered all hierarchical levels, functions and organization units. In cooperation with Rabobank Nederland, we approached several local banks throughout the Netherlands to cooperate with this study's research; five of them agreed to join the research. With an average size of about 280 employees and an operating field in both urban and less urban like areas, the five local banks represent a cross-section of Rabobank's local banks. Based on interviews and company specific documents, this study distinguishes three hierarchical levels at the local Rabobanks. The highest level is comprised of the banks' director and the business units' directors; together, they comprise the banks' board of directors. The middle level managers are those who are responsible for the business units' organizational units. These managers typically are responsible for a functional area, market segment, or product group. The sample's lowest level managers are the 'team-managers'. A team manager is typically responsible for a distinct product or process within an organizational unit, or responsible for a geographically distinct set of customers. Their span of control typically ranges from three to seven.

At the multi-market semiconductor division of Philips, a sample was drawn, in cooperation with the division's headquarters, of 255 managers. These comprise managers of various hierarchical levels, functional areas, and of the division's business units and the division's production support unit. Chi-square tests (p < .05; $\alpha = .05$) indicate that the hypotheses that the distribution of the sample's managers over the hierarchical levels, functional areas, and units

corresponds to the distribution of all the division's managers, can not be rejected. This indicates that bias due to the sampling procedure may not be a problem. We distinguish the following hierarchical levels in the sample; the sample's highest level managers are those who report directly to the division's CEO. They typically are the business units' or production support unit's CEO, and the vice-president(s). The second level managers are those managers who are responsible for a functional area or a geographical area within a business unit or the production support unit, or responsible for product-market combinations within the business units. The sample's lowest level managers are those who are responsible for a functional area within a product-market combination, or a particular product or technology within a business unit or the production support unit.

Table 4.1 – Samples: Number of Respondents and Distribution

Company	Rabobank san	nple	Philips sample		Deloitte sam	ple
Usable respondents (n)	177		118		224	
Response rate	76%		53%		35%	
Distribution respo	ondents in absolut	e number	rs			
-Hierar. level	Тор	16	Тор	8	Тор	33
	Middle	34	Middle	32	Middle	76
	Front	127	Front	78	Front	115
-Function ^a	Back-office	71	R&D	53		
	Front-office	106	M&S	17		
			Other	48		
-Business Unit ^a	Retail	65	Innovative prods.	41	Audit	95
	Whole-sale	63	Standard prods.	51	Tax & Legal	48
	Operations	49	Production sup.	26	Consultancy	34
	-		•		Finance	13
					Centr. & Sup.	34

^aFor classification: see section 4.5.4 'control variables'

At Deloitte, it was decided, in cooperation with the Chief Knowledge Officer (CKO), to administer the survey to those managers who are subscribed to the CKO's weekly electronic newsletter. This sample includes 653 managers distributed among all hierarchical levels, functional areas, and business units. Chi-

square tests $(p < .05; \alpha = .05)$ indicate that the hypotheses that the distribution of the sample's managers over the hierarchical levels, functional areas, and business units, corresponds to the distribution of all Deloitte Nederland's managers, can not be rejected. This indicates that bias due to the sampling procedure may not be a problem. Based on interviews and company specific documents, this study distinguishes three hierarchical levels at Deloitte as well. The highest level is comprised of managers who, within Deloitte, have the label 'director' or 'partner'. They own the company and/ or mainly engage in large, unique projects and the acquisition of new customers or orders. The middle level managers are those who, within Deloitte, have the label 'manager'. They have responsibility for large projects, several teams, and the maintenance of customer relationships. They usually are specialized in several areas of expertise. The sample's lowest level managers have within Deloitte the label 'consultant' or 'senior assistant/ annalist'. They typically are specialized in one or two specific areas of expertise and have responsibility for a specific team. They support the middle level managers, based on quantitative analyses carried out by themselves or their assistants.

In each company, the survey was made electronically available to the managers. In the case of Rabobank and Deloitte, a special website was created which allowed the managers to access the survey. At Philips, we used the company's web-based electronic survey automation tool. confidentiality, we agreed not to reveal the names of the respondents and to return the electronic files, containing the data of completed surveys, to us without inference of the companies' management. To stimulate response rate, managers received an invitation to participate in the research at the moment that the survey became electronically available. The invitation, sent by email, included a short explanation about the research goals and relevance, and was undersigned by both the research team and a senior level manager; at Rabobank a member of each bank's board of directors, at Phillips the division's HRM manager, and at Deloitte the company's CKO. At each company, the survey was during a period of three consecutive weeks electronically available. After the first and second week, a reminder was sent to all managers by email, inviting them to fill out the survey if they had not done so. At Rabobank, we received a total of 181 surveys, corresponding to a response rate of 76 %. Listwise deletion of cases with missing values reduced the final sample size to 177. At Philips, we received a total of 136 surveys, corresponding to a response rate of 53 %. Listwise deletion of cases with missing values reduced the final sample size to 118. At Deloitte, We received a

total of 229 surveys, corresponding to a response rate of 35%. Listwise deletion of cases with missing values reduced the final sample size to 224.

To test for non-response bias, we first compared, for each firm, respondents and non-respondents based on hierarchical level, function, and organization unit. Chi-square tests indicate that the hypotheses that the distribution of the respondents over hierarchical levels, functions, and organization units, corresponds to the population's distribution, can not be rejected (p < .05; $\alpha = .05$). Only at Deloitte, the hypothesis that the distribution of the respondents over the business units corresponds to the population's distribution, has to be rejected (Chisquare = 10.01, df = 4, p > .05; $\alpha = .05$), due to an under-representation of managers of the business unit Audit (expected number of respondents is 107, whereas the actual number of respondents is 95). Possible bias due this underrepresentation will be overcome by controlling for business unit in the regression analyses. We furthermore compared, for each firm, early and late respondents in terms of model variables. No significant differences (t-test; p < .05) appeared, indicating that non-response bias is not a problem. To check for bias pertaining to the fact that the survey was administered electronically in stead of paper, we included in the survey three items, based on Davis (1989), measuring the respondent's computer efficacy in terms of the respondent's perceived ease of use of the company's intranet, as the electronic surveys were accessible via the companies' intranets. The z-values for skewness (Rabobank -.10; Philips .06; Deloitte .50) and kurtosis (Rabobank -.40; Philips -.95; Deloitte 1.15) indicate that the distribution of this measure not significantly deviates from a normal distribution. In other words, not only managers with high computer efficacy completed the survey; but also managers with low or average levels of computer efficacy completed the survey, corresponding to a normal distribution. It seems not to be the case that using an electronic survey in stead of paper work has created a response bias.

4.5 – Measurement Development and Validation

This section describes the sources and development of the survey's multiple-item scales meant to measure the study's constructs, as well as an assessment of their reliability and validity. Most of the scales are based on existing measures in the literature. If appropriate measures were not available in the literature, such as for

managers' exploration and exploitation activities, then these measures have been developed based on conceptualizations within the literature. Furthermore, reliability and validity of the measures has been enhanced by eight in-depth interviews and pre-testing of the survey within Rabobank, as Rabobank was the first company at which the survey has been conducted. Based on the literature, the in-depth interviews, and the pre-test, a final version of the survey was constructed. This survey was administered to the managers of Rabobank, Philips, and Deloitte, resulting in three separate data sets. Reliability and validity analyses are conducted for each data set.

4.5.1 – Exploration and Exploitation Activities

Scales for managers' exploration activities and exploitation activities were constructed, as appropriate scales at the individual level of analysis were not yet available in the literature. Several steps were taken to achieve reliable and valid new scales. To achieve content validity, i.e. that the scales capture the theoretical domain of the construct in question, we first developed exploration activity items and exploitation activity items based on the features by which March (1991: 71) characterizes the constructs of exploration and exploitation. As a next step, six indepth interviews were conducted at Rabobank with managers at various hierarchical levels, functions, and business units. Based on these interviews, the wording of the items was enhanced. Subsequently, the survey, with the items edited based on the interviews, was pre-tested to further allow enhancement of the reliability, unidimensionality, and convergent and discriminant validity of the items and scales. The pilot survey was administered to 50 managers of Rabobank, of which 33 returned a completed version. Based on reliability and validity analyses, ambiguous items were identified and rephrased with the help of two interviews with business unit managers. The final seven-item exploration scale determines the extent to which a manager engaged last year in exploration activities and the seven-item exploitation scale determines the extent to which the manager engaged last year in exploitation activities. The items can be found in table 4.2. Answers range on a 7-point Likert scale from 'to a very small extent' to 'to a very great extent'.

Table 4.2 – Exploratory Factor Analysis ^a of Managers' Exploration and Exploitation Activities

To what extent did you last year angage in work related activities that can be

To what extent did you last year engage in work related activities that can be	Rahohank	Jue	Philine	ou.	Deloitte	4
10 white caredit and you, instrying you, sugable in work related activities that our be	Tempor			5 <u>1</u>		3 5
characterized as tollows:	u = I//		n = 118	18	n = 224	77
	exr _c	ext ^d	exr	ext ^d	exr	ext _d
Searching for new possibilities with respect to products/ services, processes or markets	.80	03	.85	01	.82	18
Evaluating diverse options with respect to products/ services, processes or markets	.82	03	.87	03	.83	10
Focusing on strong renewal of products/ services or processes	.79	90	.82	.02	7.	Ξ.
Activities of which the associated yields or costs are currently unclear	.83	02			.84	10
Activities requiring much adaptability from your side	.84	.03	77.	.13	.8	12
Activities requiring you to learn new skills	.79	01	69.	80	.75	16
Activities that are not (yet) clearly existing company policy	.82	05			.74	18
	ć	í				
Activities of which a lot of experience has been accumulated by yourself	60.	.72	.25	.65	13	.82
Activities which you carry out as if it were routine	05	.81			25	.64
Activities which serve existing (internal) customers with existing services/ products	02	.75	90	.74	16	92:
Activities of which it is clear to you how to conduct them	12	.84	02	77:	13	.82
Activities primarily focused on achieving short-term goals	.01	.70	20	.64	03	.61
Activities which you can properly conduct by using your present skills	60:-	.83	.01	.84	16	62:
Activities which clearly fit into existing company policy	00.	.82	60.	.75	60	17:
Eigenvalue	4.81	4.14	3.37	3.21	5.82	2.82
Percentage of variance explained	34.4	29.6	30.6	29.2	41.5	20.1
Extraorion Mathod: Dringing Commonant Anglinde Detation Mothod: Vorimor with Voice Normalization	V dtir	JOHN NOW	nolization			

^a Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

 $^{^{\}rm b}$ All items were measured on a seven-point scale (1 = to a very small extent to 7 = to a very large extent)

^c Managers' Exploration Activities

^d Managers' Exploitation Activities

Exploratory factor analysis with varimax rotation for each data set (see table 4.2), reveals that two summated scales can be constructed; one exploration scale with seven exploration items (five for Philips), and one exploitation scale with seven exploitation items (six for Philips). Both the items pertaining to the exploration scale and those pertaining to the exploitation scale are unidimensional and posses good convergent and discriminant validity. For each data set, eigenvalues for the two factors more than 2.8, all items load on their appropriate factors with factor loadings above .61, and no item cross-loading is above .25. The reliability of the exploration scale, as represented by Cronbach's alpha, is .91 for Rabobank, .86 for Philips, and .91 for Deloitte. Cronbach's alphas for the exploitation scale are .89 for Rabobank, .83 for Philips, and .87 for Deloitte. Confirmatory factor analysis, conducted for each data set, allowing each item to load only on the factor for which it is a proposed indicator, indicates that a two factor model fits the data well (Rabobank: $\chi 2_{76df} = 164.61$; NFI = .90; CFI = .94; RMSEA = .08; Philips: $\chi 2_{43df} = 52.37$; NFI = .91; CFI = .98; RMSEA = .05; Deloitte: $\chi 2_{76df} = 158.90$; NFI = .91; CFI = .95; RMSEA = .07). Moreover, the competing model that the items of both scales converge on one common factor, i.e. the hypothesis that exploration and exploitation represent the extremes of one continuum, can be rejected. A comparison of the two factor model with the one factor model shows a significant improvement of the Chi-square pertaining to each dataset ($\Delta \chi^2_{1df}$ Rabobank = 469.23; Philips = 246.94; Deloitte = 555.67; all p <.001).

Regarding Philips, an investigation to create understanding about why the empirical data indicates that two of the exploration items (see table 4.2) and one of the exploitation items (see table 4.2) should be excluded from the construction of a summated exploration respectively a summated exploitation scale, indicates the following: the facts that, within the Philips dataset, the three items have the highest standard deviations among all the 14 items and that Cronbach's alphas of the two summated scales increase when the concerned three items are excluded indicate that the three items contain more random error than the other items. Moreover, the fact that the means of the two excluded exploration items and the mean of the excluded exploitation item are all significantly lower (t-test, p < .001) than the means of the summated exploration, respectively exploitation scales, indicates that the three items may have a systematic biasing effect as well, i.e. they may contain significant nonrandom error. Interviews with Philips' managers, conducted after the analysis of the data, indicate that managers engage in exploration activities,

such as searching, discovering, experimenting, and innovating, as long as these activities not conflict with existing company policy (referring to excluded exploration item seven) and clearly fit into pre-specified financial budgets (referring to excluded exploration item four). Regarding exploitation, the interviews indicate, referring to excluded exploitation item two that, as one manager expressed it 'people are not proud to say that they do boring routine work. That is not considered to be cool here. Instead, people are proud to say that they innovate'. These interviews indicate that the three excluded items all refer to activities which managers are 'not supposed to do' at the division, probably leading to the low mean values of the three items (nonrandom error) and probably also leading to some confusion about the items' meaning (random error).

4.5.2 – Organizational Factors

The scales used to measure the organizational factors are all related to existing scales in the literature. Answers of the scales' items range on a 7-point Likert scale from 'to a very small extent' or 'strongly disagree' to 'to a very great extent' or 'strongly agree'.

To measure participation in decision making, this study used, on the basis of Jansen et al. (2005), a four item scale 'participation in decision making' (Dewar et al., 1980), which assesses the extent to which a manager participates in decisions concerning the distribution of resources or policy formulation (a Rabobank = .89; Philips = .86; Deloitte = .91). To measure participation in crossfunctional interfaces, this study used a scale on the basis of Nadler and Tushman (1987) and Gupta and Govindarajan (2000) which assesses the extent to which a manager participates in formal cross-unit integrative mechanisms, asking each manager to what extent he or she (1) coordinates work across organizational units, (2) works in temporary cross-unit task forces, and (3) works in permanent crossunit teams. The final measure is constructed as a weighted average of the three items, where the first item is given a weight of 1, the second item a weight of 2, and the last item a weight of 3 (cf. Gupta & Govindarajan, 2000). To measure the extent to which a manager's rewards are based on overall firm performance in stead of individual performance, this study used a three-item scale on the basis of Lawler (1986) which measures the extent to which a manager's rewards such as pay increases, bonuses, and promotions are related to overall-firm performance (a Rabobank = .84; Philips = .86; Deloitte = .89). To asses the extent of *formalization*

of a manager's tasks, this study used a four item scale (α Rabobank = .86; Philips = .89; Deloitte = .91) from Desphande and Zaltman (1982), which measures the extent to which a manager's tasks are being defined by rules, procedures, or regulations. To measure the use of IT-systems for work related activities, some authors, e.g. Teo et al. (1999), use daily time spend at IT-systems by a manager as a standard. Using this standard during the survey's pretest resulted however in insufficient variation; most of the managers indicated to spend considerable amounts of time each day behind their pc. Another way to measure the use of ITsystems for work related activities, as used in the final survey, is to ask managers' to indicate the extent to which IT-systems support their daily activities (e.g. Doll & Torkzadeh, 1988; Sanders & Courtney, 1985). The three item scale (a Rabobank = .85; Philips = .91; Deloitte = .91), based on Davis (1989) and Sanders 1984) measures the extent to which IT-systems enable a manager to conduct work related activities. These exclude the use of IT by a manager as a communication device, as, for instance, is the case when using email or discussion boards on the company's intranet. To measure connectedness to other organization members, a four-item scale (α Rabobank = .88; Philips = .92; Deloitte = .87), based on Jaworski and Kohli (1993) was used, assessing the extent to which managers are networked or connected to other organization members, both along and across the vertical hierarchy. To assess tolerance for ambiguity, a four-item scale (a Rabobank = .86; Philips = .85; Deloitte = .89) was used based on Volberda (1998: 178), which measures the extent to which a manager's contacts, especially his or her peers and/or supervisor(s), tolerate deviant ideas, opinions, visions, etc.

Confirmatory factor analysis, conducted for each dataset, allowing each item to load only on the factor for which it is a proposed indicator, indicates that a six factor model fits the data well (the CFA excluded the scale for participation in cross-unit interfaces, due to its weighted structure); Rabobank: $\chi 2_{194df} = 291.89$; NFI = .88; CFI = .96; RMSEA = .05; Philips: $\chi 2_{194df} = 206.75$; NFI = .88; CFI = .99; RMSEA = .02; Deloitte: $\chi 2_{194df} = 361.75$; NFI = .91; CFI = .96; RMSEA = .06. All three datasets indicate that the six-factor model provides a better fit to the data than a one-factor model. Moreover, the six-factor model provides a better fit to the data that the three-factor rival in which the organization factors as common features of coordination capabilities converge on one factor, those of systems capabilities converge on a second factor, and those of socialization capabilities converge on a third factor ($\Delta \chi 2_{12df}$ Rabobank = 771.80; Philips = 649.45; Deloitte = 1659.79; all p < .001). Furthermore, a comparison of a one-factor model with a

two-factor model for every pair among the six factors shows a significant improvement of the Chi-square for each of the 15 pairs ($\Delta \chi^2_{1df}$ between 376.59 and 603.17; p < .001), providing evidence of discriminant validity (Bagozzi & Philips, 1982).

4.5.3 – Knowledge Inflows

Top-down knowledge inflows are associated with knowledge coming from persons and units at higher hierarchical levels than the recipient manager. Bottom-up knowledge inflows are associated with knowledge coming from persons and units at lower hierarchical levels than the recipient manager. Horizontal knowledge inflows are associated with knowledge coming from persons and units at the same hierarchical level. Following our conceptualization of knowledge (cf. Gupta & Govindarajan, 2000; Schulz, 2001; see also section 2.5 of this study), we informed respondents that we are not interested in operational or financial data or the taking and giving of orders, but rather in tacit and explicit knowledge pertaining to: technologies, processes, systems, products, strategies, and markets. Managers were instructed to think about different channels through which knowledge might flow such as formal and informal meetings, telephone conversations, e-mail, regular mail, face-to-face contacts, virtual meeting rooms on the company's intranet, etcetera.

Regarding top-down knowledge inflows three items were used; each manager was asked to indicate the extent of knowledge he or she received or gathered last year from: "your direct supervisor", "one more hierarchical level up than your direct supervisor". Regarding bottom-up knowledge inflows, one item was used; each manager was asked to indicate the extent of knowledge he or she received or gathered last year from: "your direct assistants". Because the items focused on different loci within the organization from where the knowledge comes from, it was not possible to develop more than one item regarding bottom-up knowledge inflows as the largest groups of managers, i.e. the front-line managers, only had one hierarchical level below them; their direct assistants. Regarding horizontal knowledge inflows three items were used. The wording of the items as used for Rabobank had to be slightly adapted to make them appropriate for the Philips context and for the Deloitte context. At Rabobank, each manager was asked to indicate the extent of knowledge he or she received or gathered last year from:

"peer managers within your business unit", "other business units", and "other local banks of the Rabobank Group". To make the items suitable to the sample's highest level managers, the following was added, in parentheses, to the first item: "for members of the board of directors refer to: 'other members of the board of directors". At Philips, each manager was asked to indicate the extent of knowledge he or she received or gathered last year from: "peer teams within your own organizational unit", "teams in other organizational units within your own division", and "teams in other divisions' units". At Deloitte, each manager was asked to indicate the extent of knowledge he or she received or gathered last year from: "peer managers within your department", "other departments within your division", and "other divisions of Deloitte Nederland". At Philips and Deloitte, it was not needed to adapt the first item for the sample's highest level managers, as each organizational unit or department, have several of these highest level managers.

Confirmatory factor analysis, conducted for each dataset, allowing each item to load only on the factor for which it is a proposed indicator, and allowing the three factors to be intercorrelated, indicates that a three factor model fits the data well (Rabobank: $\chi 2_{11df} = 21.73$; NFI = .94; CFI = .97; RMSEA = .09; Philips: $\chi 2_{11df} = 21.73$; NFI = .94; CFI = .97; RMSEA = .09; Deloitte: $\chi 2_{11df} = 20.22$; NFI = .97; CFI = .98; RMSEA = .06). All three datasets indicate that the competing model that the items converge on one common factor, can be rejected (Rabobank: $\Delta \chi 2_{3df} = 104.62$; Philips: $\Delta \chi 2_{3df} = 104.62$; Deloitte: $\Delta \chi 2_{3df} = 260.69$; all p < .001). There are, furthermore, three competing models where the items of the scales converge on two factors. All three datasets indicate that two of these competing models can be clearly rejected, i.e. the model where the top-down and bottom-up items load together on one factor and the horizontal items on another factor (Rabobank: $\Delta \chi 2_{2df} = 9.73$ (p < .01); Philips: $\Delta \chi 2_{2df} = 19.06$ (p < .001); Deloitte: $\Delta \chi 2_{2df} = 32.24 \ (p < .001)$), and the model where the top-down and horizontal items load together on one factor and the bottom-up item on another factor (Rabobank: $\Delta \chi 2_{2df} = 67$, 92; Philips: $\Delta \chi 2_{2df} = 104.62$; Deloitte: $\Delta \chi 2_{2df} = 260.73$; all p < .001). The change in $\chi 2_{2df}$ for the final competing model, i.e. where the horizontal and bottom-up items load together on one factor and the top-down items load on another factor is 6.12 for Rabobank, 5.13 for Philips, and 1.62 for Deloitte, indicating that the improvement of fit from this two factor model to the three factor model is only significant (one-tail testing) at the p < .05 level for Rabobank, p < .10 level for Philips, and not significant for Deloitte. Summarizing;

confirmatory factor analyses conducted at the three datasets indicate, albeit not always with very strong support, that the three factor model has the best fit. As this three factor model corresponds to the theoretical distinctions underlying the items, the following scales will be maintained; one top-down knowledge inflow summated scale based on the corresponding three top-down items, one horizontal knowledge inflow summated scale based on the corresponding three horizontal items, and one bottom-up knowledge inflow scale based on the corresponding bottom-up item. The reliability of the top-down knowledge inflow scale, as represented by Cronbach's alpha, is .76 for Rabobank, .82 for Philips, and .83 for Deloitte. Cronbach's alphas for the horizontal knowledge inflow scale are .81 for Rabobank, .83 for Philips, and .84 for Deloitte.

4.5.4 – Control Variables

As can be concluded from chapter two, hierarchical level, function, and unit effects can be expected to impact upon managers' exploration and exploitation activities. Some authors, e.g. Burgelman, (1983a; b), Floyd & Lane (2000), argue that between hierarchical levels, different degrees of exploration and exploitation may exists corresponding to different strategic processes, such as induced and autonomous strategic process (Burgelman, 1983a) or competence deployment and competence definition process (Floyd & Lane, 2000). Others, e.g. De Leede et al. (2002), argue that different degrees of exploration and exploitation may exist between functional areas. Typically, a functional area like R&D is characterized by explorative activities such as experimenting and discovering, whereas a functional area like production is characterized by exploitative activities such as producing and implementing. Finally, others, e.g. Benner and Tushman (2003) and Tushman and O'Reilly (1996) stress that between organizational units different degrees of exploration and exploitation exist. These authors typically argue that top-managers engage in high levels of both exploration and exploitation, whereas lower level managers specialize in either exploration or exploitation activities, depending on the level of dynamism in their unit's environment. The categorization of respondents into different hierarchical levels, functional areas, and organization units, is based on company documents and interviews.

Hierarchical Levels

As has been argued in section 4.4, based on interviews and company specific documents we distinguish three *hierarchical levels* at the local Rabobanks, the Philips division, and Deloitte Nederland (see section 4.4 for a description of managers' tasks pertaining to these levels). In each dataset, we control for hierarchical level effects using two dummy variables; one for top-level managers (*hierarchical level: top*) and another for middle-level managers (*hierarchical level: middle*). Based on the literature, we expect top-level managers to engage more than middle-level and front-line managers in both exploration and exploitation activities (Benner & Tushman, 2003; O'Reilly & Tushman, 2004), furthermore, middle-level and front-line managers are expected to focus on either exploration or exploitation, depending on their organizational unit and function (Benner & Tushman, 2003; De Leede et al., 2002; O'Reilly & Tushman, 2004).

Functional Areas

Regarding functional areas at Rabobank a distinction will be made between two broad *functional areas*; back-office and front-office, following the common functional typology as used within the local banks. Back-office refers to those internal operations or activities which do not directly relate to, or are not accessible for, customers. Front-office refers to those operations or activities with direct customer contact. Back- and front-office functions can be found in each business unit and at each hierarchical level. To control for functional effects within the Rabobank dataset, we include one dummy variable, *front/back-office* (1 = front-office; 0 = back-office). We expect managers with a back-office function to engage more than other managers in exploration tasks such as developing new products or product combinations and renewing internal processes and systems triggered by changes in technology. We expect managers in front-office functions to engage more than other managers in exploitation activities such as selling existing products and services, increasing market share in existing markets, and increasing efficiency through standardizing simple products and services.

At the multi-market semiconductor division of Philips, functional areas relate in particular to research & development and marketing & sales. Other functional areas are finance, human resources and logistics. We control for functional effects within the Philips dataset by using two dummy variables; one for research & development (function: R&D) and another for marketing & sales (function: M&S). We expect managers in research & development to engage more

in exploration activities as compared to managers in the other functional areas. Exploration related activities, like searching, experimenting, discovering, and innovating constitute an important part of R&D. We expect managers in marketing & sales, and those in the category 'other functional areas' to engage more in exploitation activities than R&D managers, like improving existing product market positions, focusing on short-term rent-generation, and conducting rather formalized routine tasks.

At Deloitte we will only distinguish hierarchical levels and organizational units, and not also functional areas. The reason for this is that the various hierarchical levels at Deloitte incorporate a different 'functional focus' as well (Banker et al., 2005; Dopuch et al., 2003). For instance, managers at higher hierarchical levels, the seniors or partners, typically focus on what traditionally could be called the 'sales function' and the 'research and development function'. Managers at lower hierarchical levels engage in what could be called the 'production function'.

Organizational Units

At Rabobank, a distinction will be made between three main organizational units, based on the local banks' business units; retail, whole-sale, and operations. To control for unit effects, two dummy variables are included; one for the retail unit (unit: retail), and one for the whole-sale unit (unit: whole-sale). We expect managers in the operations business unit to engage more than other managers in exploration tasks such as developing new products or product combinations and renewing internal processes and systems triggered by changes in technology. We expect managers in the retail and wholesale business units to engage more than other managers in exploitation activities such selling existing products and services, increasing market share in existing markets, and increasing efficiency through standardizing simple products and services.

Interviews at Philips with the divisions' top-management indicate that the automotive business unit and the two niche product business units operate in a business environment in which competition on technological innovations is fiercer as compared to the other units' environments. Therefore (e.g. cf. Cheng & Van De Ven, 1996; Sidhu et al., 2004) we expect managers of the automotive business unit and those of the two niche product business units to focus more on exploration activities as compared to the other managers of the division. We also expect managers of the production support unit, and those managers of the two business

units focusing on standardized products, to engage more in exploitation activities as compared to the other managers of the division as their focus is primarily centered on operational efficiency. Reflecting these expected effects, to control for unit effects, two dummy variables are included; one for the three exploration focused business units (*unit: innovative products*), and one for the two exploitation focused business units (*unit: standard products*).

Reflecting Deloitte's structure, a distinction will be made between four divisions and the central & support unit. To control for organizational unit effects, four dummy variables are included; for each division one (unit: Audit; unit: Tax & Legal; unit: Consulting; and unit: Finance). Based on the interviews and the literature, we expect managers of the Audit and the Tax & Legal divisions to focus more on exploitation as compared to the other managers as their business environments are the most stable ones (Banker et al., 2005; Firth, 1997; Rankin & Sharp, 2000). We also expect managers of the Consulting division to focus more on exploration as compared to the other managers as their business environment is the most dynamic one (Banker et al., 2005; Firth, 1997; Rankin & Sharp, 2000).

Control Variables in the Integrated Dataset

In the integrated dataset, i.e. the dataset in which the data of Rabobank, Philips, and Deloitte are combined, we use the same dummies to control for hierarchical level effects as in the separate datasets; i.e. hierarchical level: top, and hierarchical level: middle, to reflect the three hierarchical levels. Regarding functions, a distinction will be made between three broad functional areas; research & development, operations, and marketing & sales, using two dummy variables; function: R&D, and function: M&S. Although we acknowledge that at Rabobank and Deloitte the functions of operations and, especially, R&D are not present in a traditional way, some parallels exist. Concerning Rabobank, we classify in the integrated dataset managers with a back-office function as R&D managers as part of their job is related to developing new products or product combinations and renewing internal processes and systems. We classify managers with a front-office function as M&S managers, as they are the ones with direct customer contacts. Concerning Deloitte, we classify those who have at Deloitte the label 'senior assistant/ annalist' as operations managers, as their main job is to carry out quantitative analyses. We classify those who have the label 'director' or 'partner' as R&D managers as part of their job is to develop new products and to engage into rather unique than standard projects. Finally, we classify those who

have the label 'manager' or 'consultant' as M&S managers as one of their main responsibilities is to maintain customer relationships. To control for unit effects, we used the same control variables as in the separate datasets. However, to reduce the number of control variables, we merged Deloitte's Audit unit with the Tax & Legal unit. Within both units, managers appeared to focus on exploitation activities (see section 5.4) as their business environments are rather stable. We also merged Deloitte's Consultancy unit with the Finance unit. Within both units managers appeared to focus on exploration activities (see section 5.4) due to high levels of dynamism in both units' environments. The reference unit in the regression analysis will be Deloitte's central & support unit. We do not include in the integrated dataset separate dummies for the three companies, as we automatically control for firm-level effects by having included dummies for the firms' units.

4.6 – Conclusion

In this chapter we ensured that the level of theory, measurement, and analysis in this study is congruent, and that variation exists in our samples between managers in terms of the study's constructs. After we described the research setting, we described the sampling and data collection procedures. A comparison for each dataset, between respondents, non-respondents, and all managers of the study's companies, learned that no significant differences exist between them in terms of hierarchical levels, functional areas, organization units, and model variables, indicating that for each dataset, the respondents can be assumed to sufficiently represent the population. The final section of this chapter described the measurement development and validation. The study's scales are based on existing scales in the literature, except the managers' exploration and exploitation scales. We conducted several steps to develop valid and reliable exploration and exploitation scales. Reliability and validity analyses of the survey's items and summated scales, indicate that they are reliable and unidimensional, and posses good convergent and discriminant validity. Summarizing, we can proceed to analyze the collected data in the next chapter.

CHAPTER 5 – ANALYSES AND RESULTS

5.1 – Introduction

In this chapter, the data as collected by the survey will be analyzed. Sections 5.2, 5.3, and 5.4 present the results pertaining to the data collected at successively Rabobank, Philips, and Deloitte. Section 5.5 compares results across the three firms. Section 5.6 presents the results pertaining to the integrated dataset. In each section, we will first provide descriptive statistics illustrating how managers' exploration and exploitation activities differ along the control variables' groups. Subsequently, we analyze the data using OLS regression analyses. Analyzing the three datasets separately allows in section 5.5 to compare the three datasets and detect differences between the firms. As the findings between the three firms appear to be largely consistent, we decided in section 5.6 to merge the three datasets into one integrated dataset and to subsequently analyze this combined data. The hypotheses will be tested on the basis of the integrated dataset. The reason to analyze the integrated dataset is two fold; first it will facilitate our discussion of the results without loosing insights gained by the separate datasets as these appeared to be largely consistent. Hence, we base the discussion of this study's findings in chapter 6 mainly on the results as brought forward by the analysis of the integrated dataset. Second, the integrated dataset allowed us to do structural equation modeling to assess the goodness of fit of our model, and compare it with competing models. Structural equation modeling was not appropriate for the separate datasets, as this method for analyzing complex path models requires a sample size of at least about 500 (Byrne, 1994; Kline, 1998). Our integrated dataset has a sample size of 519.

5.2 – Rabobank Dataset

Control Variables and Descriptives

Table 5.1 shows managers' mean levels of exploration and exploitation activities at different hierarchical levels, functions, and organization units. We conducted t-tests to identify significant (p < .05; 1-tail) differences, such as the LDS (least-significant-difference) method, which compares the mean of each

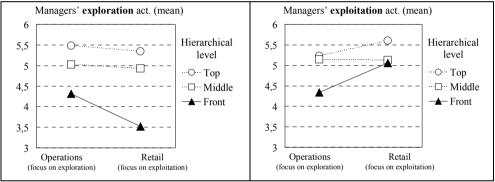
Table 5.1 – Rabobank: Control Variables' Categories with Corresponding Means and Standard Deviations^a of Outcome Variables

Control Variable	Explorati	on activities	Exploitati	on activities
Hierarchical level				
• Top $(N = 16)$	5.38	(.66)	5.19	(.75)
• Middle (N = 34)	4.92	(.77)	5.24	(.71)
• Front (N = 127)	3.89	(1.20)	4.86	(1.11)
Function				
• Back-office (N = 71)	4.62	(1.07)	4.70	(.93)
• Front-office (N = 106)	3.96	(1.24)	5.14	(1.06)
Business Unit				
• Retail (N = 65)	3.92	(1.30)	5.12	(1.11)
• Whole-sale (N = 63)	4.20	(1.17)	5.07	(.96)
• Operations (N = 49)	4.65	(1.04)	4.63	(.93)
Total (N = 177)	4.22	(1.22)	4.96	(1.03)

^aStandard deviation in parentheses

control variable's group with the mean of each other group of the same control variable. Regarding hierarchical levels, top-level managers do not have significant differences between exploration and exploitation. Middle- and front-line managers engage more in exploitation activities as compared to exploration activities. Moreover, top- and middle-level managers engage more in exploration activities than front-line managers. There is no significant difference between top- and middle-level managers. With respect to exploitation activities, middle-level manager engage more than front-line managers in exploitation. There is no significant difference between top- and middle-level managers. Regarding function, managers with a back-office function do not significantly differ in terms of exploration and exploitation. Managers with a front-office function engage significantly more in exploitation activities as compared to exploration activities. Moreover, managers with a back-office function engage significantly more in exploration activities as compared to managers with a front-office function. Frontoffice managers engage significantly more in exploitation activities compared to back-office managers. Regarding business unit; managers in the retail and wholesale units engage significantly more in exploitation activities as compared to exploration activities. Managers at the operations unit do not have significant differences between exploration and exploitation. The data indicates furthermore that managers in the operations business unit significantly engage more in exploration activities as compared to managers in the other two business units. There are no differences among the retail and whole-sale business units with respect to exploration. Furthermore, managers in the retail business unit and in the whole-sale business unit engage significantly more in exploitation activities as compared to managers in the operations business unit. There are no significant differences between the retail and whole-sale business units with respect to exploitation.

Figure 5.1 – Rabobank: Different Mean Values^a for Exploration and Exploitation across Units, at Various Hierarchical Levels



^aDotted lines: insignificant difference at hierarchical level between units; Straight lines: significant difference at hierarchical level between units (t-test, p < .05; 1-tail)

A closer examination of the data (see also figure 5.1) shows furthermore that differences between organization units in terms of exploration and of exploitation are strongly related to front-line managers' exploration and exploitation activities. Although variation analyses of the interaction effects between hierarchical level and organization unit on exploration and exploitation indicate that none of these effects is significant (p < .05 of F values interaction effects), t-tests (significant at p < .05; 1-tailed), conducted at all hierarchical levels, of differences between exploration activities of managers in different organization units, indicate that different levels of exploration between units are mainly due to front-line managers. For instance, front-line managers of the operations business unit significantly engage more in exploration activities than

Table 5.2 – Rabobank: Means, Standard Deviations, and Correlations

	mean	St.dev	1	2	3	4	5	6
1 Exploration activities	4.22	1.22						
2 Exploitation activities	4.96	1.03	06					
3 Top-down Kn. Inflows	4.63	1.02	.34	.28				
4 Bottom-up Kn. Inflows	4.49	1.66	.46	01	.34			
5 Horizontal Kn. Inflows	3.82	1.05	.54	05	.42	.38		
6 Part. in decision making	3.60	1.55	.54	17	.36	.47	.57	
7 Cross-functional interfaces	4.61	1.19	.31	.01	.14	.26	.32	.28
8 Rewards b.o. overall perf.	4.28	1.31	.34	.01	.36	.36	.41	.37
9 Formalization of tasks	3.84	1.30	.05	.22	.21	.00	.07	01
10 Use of IT-systems	4.10	1.16	23	.15	.07	06	26	19
11 Connectedness	4.92	1.25	.24	07	.26	.29	.39	.40
12 Tolerance Ambiguity	4.78	1.38	.48	04	.35	.46	.56	.63
13 Hierarchical level top	.09	.29	.30	.07	.22	.25	.27	.37
14 Hierarchical level middle	.19	.40	.28	.13	.23	.10	.18	.12
15 Hierarchical level front	.72	.45	44	16	34	25	32	34
16 Function back-office	.40	.49	.27	21	.13	.12	.28	.28
17 Function front-office	.60	.49	27	.21	13	12	28	28
18 Unit retail	.37	.48	19	.11	12	.02	06	19
19 Unit whole-sale	.36	.48	01	.07	.00	06	12	09
20 Unit operations	.28	.45	.22	20	.13	.05	.19	.30

N = 177. All correlations above | .20| are significant at p < .01, All correlations above | .15| are significant at p < .05 (2-tailed)

front line managers of the retail business unit, whereas there are no significant differences at the top- and middle-level. Similarly, regarding exploitation, differences between units are mainly due to front-line managers. For instance, front-line managers of the retail business unit significantly engage more in exploitation activities that front-line managers at the operations unit. There are no significant differences at the middle- and top-level.

Summarizing; the data indicates that differences between organization units and between functions in levels of exploration and/ or exploitation are largely as expected. Managers with a back-office function and those in the operations business unit engage more in exploration activities than other managers, whereas managers with a front-office function and those in the retail and whole-sale business units engage more in exploitation activities than other managers. We expected furthermore, based on Benner and Tushman (2003) and

Table 5.2 - (Cont.)

	7	8	9	10	11	12	13	14	15	16	17	18	19
1													
2													
3													
4													
5													
6													
7													
8	.17												
9	09	.11											
10	11	05	.02										
11	.22	.38	.04	10									
12	.25	.40	.00	15	.37								
13	.10	.03	.01	14	.23	.14							
14	.05	.04	.18	.03	05	.16	15						
15	11	05	16	.07	11	23	50	78					
16	.10	.10	.06	05	.05	.15	.14	.13	20				
17	10	10	06	.05	05	15	14	13	.20	-1.0			
18	05	02	.02	.10	05	10	04	01	.04	27	.27		
19	01	07	08	.01	03	.08	15	.03	.07	30	.30	57	
20	.06	.10	.06	12	.09	.03	.20	01	12	.60	60	47	46

O'Reilly and Tushman (1996) top-level managers to engage more than middle-level and front-line managers in both exploration and exploitation activities. The data indicates however that both top- and middle-level managers tend to have higher levels of both exploration and exploitation than front-line mangers. The data indicates furthermore that differences between organization units in terms of exploration and of exploitation are strongly related to front-line managers' exploration and exploitation activities. In other words; front-line managers tend to specialize in either exploration or exploitation within distinct organization units, whereas top- and middle-level managers have more consistent levels of exploration and exploitation across organization units.

Table 5.2 presents descriptive statistics and correlations for the variables as used in the study. The table shows that several of the predictor variables and several of the control variables significantly relate to each other. To examine the

issue of multicollinearity, variance inflation factors (VIF) have been calculated in each of the regression equations. VIF factors range between 1.06 and 2.40, which is below the rule-of-thumb cut-off of 10 (Hair et al., 1998).

Organizational Factors and Managers' Exploration & Exploitation Activities

The first part of this study's hypotheses is about the direct impact of the organizational factors on managers' exploration and exploitation activities. Table 5.3 shows the hierarchical regression results for exploration; table 5.4 shows the results for exploitation. In both tables, model 1 is the baseline models containing the control variables. The coefficients as shown in model 2 pertain to the total effect of the organizational factors on exploration (table 5.3) and on exploitation (table 5.4), i.e. both their direct and indirect effects. To gain insight into the direct effects only of the organizational factors, we have to look at the full model; model 5 of both tables.

Among the control variables, model 5 shows that top- and middle-level managers tend to engage significantly more in exploration activities (top-managers: β = .16, p < .05; middle managers: β = .21, p < .01) than front-line managers. Top-managers also engage more in exploitation activities (β = .20, p < .05) than front-line managers. Furthermore, front-office managers conduct more exploitation activities (β = .17, p < .10) than back-office managers. These regression analysis results give additional insight into the discussion, as conducted above, on control variables. Whereas table 5.1 and its corresponding discussion indicate that significant differences exist between hierarchical levels, between functions, and between units with respect to both exploration and exploitation, tables 5.3 and 5.4 show that, among the control variables, hierarchical level effects explain most of the variance of managers' exploration and exploitation activities.

Regarding managers' exploration activities, model 5 of table 5.3 shows that only participation in cross-functional interfaces has a significant, and positive direct effect (β = .10, p < .10). Regarding the total effect of the organizational factors; i.e. both their direct and indirect effects, model 2 of table 5.3 shows that all three organizational factors as common features of coordination capabilities; participation in decision making (β = .19, p < .05), participation in cross-functional interfaces (β = .14, p < .05), and rewards based on overall firm performance (β = .16, p < .05), are positively and significantly related to exploration activities. The coefficient for formalization of tasks is not significant. Hence, only the use of IT-

systems to conduct tasks, as an organization factor associated with systems capabilities, has a negative and significant effect on managers' exploration activities (β = -.11, p < .10). Finally, the coefficient for connectedness to other organization members is not significant, indicating that only tolerance for ambiguity of a manager's peers and/or superiors (β = .18, p < .05) as an organizational factor of socialization capabilities positively and significantly relates to managers' exploration activities. All significant relationships are as hypothesized.

Regarding managers' exploitation activities, model 5 of table 5.4 shows that managers' participation in decision making has a significant and negative direct effect ($\beta = -.28$, p < .01) and that formalization of tasks ($\beta = .15$, p < .05) has a significant and positive direct effect on managers' exploitation activities. Regarding the total effect of the organizational factors; i.e. both their direct and indirect effects, model 2 of table 5.4 shows that managers' participation in decision making ($\beta = -.28$, p < .01) is negatively and significantly related to their exploitation activities. The coefficients for participation in cross-functional interfaces and rewards based on overall firm performance are not significant. Both organizational factors as features of systems capabilities, formalization of tasks ($\beta = .20$, p < .01) and the use of IT-systems for conducting tasks ($\beta = .13$, p < .10) are positively and significantly related to exploitation activities. Finally, the coefficients for connectedness to other organization members and tolerance for ambiguity of a manager's peers and/ or superiors are not significant. All significant relationships are as hypothesized.

Organizational Factors and Managers' Knowledge Inflows

The second part of this study's hypotheses is about the impact of organizational factors on managers' knowledge inflows. Table 5.5 shows the corresponding hierarchical regression results for top-down, bottom-up, and horizontal knowledge inflows. In all three series of regression analyses, models 1 are the baseline models containing the control variables. Models 2 are the full models, which show that, among the *control variables*, mainly the coefficients pertaining to hierarchical levels are significant. More precisely, top-level managers tend to have more top-down ($\beta = .20$, p < .01) and bottom-up ($\beta = .15$, p < .05) knowledge inflows than front-line managers. Middle-level managers tend to have more top-down ($\beta = .19$, $\beta < .01$) and horizontal ($\beta = .11$, $\beta < .10$) knowledge

Table 5.3 - Rabobank: Results of Hierarchical Regression Analyses^a: Impact of Organizational Factors and Managers' Knowledge Inflows on Managers' Exploration Activities

			Exploratio	Exploration Activities		
Control Variables	Model 1	Model 2	Model 3	Model 4a	Model 4b	Model 5
Hierarchical level: top	.32 ***	.20 **	.16*	***	.17**	.16*
Hierarchical level: middle	.31 ***	.24 ***	.21 **	.23 ***	.22 ***	.21 **
Function: front-office	14	07	05	07	05	05
Unit: retail	14	60:-	16	11	10	12
Unit: whole-sale	01	00	02	01	00.	01
Org. Factors of Coordination Caps.		* C		÷-	÷-	Ç
Fart. in decision making Part. in cross-functional interfaces		. 41 . *		÷21.	12	10. 10.
Rewards based on overall firm perform.		.16*		.13†	.13 †	.10
Org. Factors of Systems Capabilities Formalization of tasks		00.		.01	00	00.
Use of IT-systems to conduct tasks		11		12*	60	10
Org. Factors of Socialization Capabilities Connectedness to other org. members		04		05	06	70
Tolerance for ambiguity		.18*		.15	.14†	.10
Knowledge Inflows			Ç			Ç
Lop-down Rottom-un			00 00	*		.00. **
Horizontal			.33 **	1.	*	.17*
R-squared	.25	.47	.45	.49	.48	.50
Adjusted R-squared	.23	.43	.43	.45	44.	.45
F improvement of fit	11.4 ***	9.54 ***	20.6 ***	6.47*	4.42 *	3.71*
^a Standardized regression coefficients; N = 177; † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$	177; † $p < .10$); * $p < .05$; *	* <i>p</i> < .01; ***	* p < .001		

Table 5.4 - Rabobank: Results of Hierarchical Regression Analyses^a: Impact of Organizational Factors and Managers' Knowledge Inflows on Managers' Exploitation Activities

		Exp	Exploitation Activities	ities	
Control Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Hierarchical level: top	.14†	.25 **	.12	**61.	.20 *
Hierarchical level: middle	.17*	.16*	.12	.10	.11
Function: front-office	.18↑	.18*	.15	.18*	.17
Unit: retail	.14	90.	.19†	60:	.10
Unit: whole-sale	.12	.07	.13	80.	80.
Org. Factors of Coordination Caps.					
Part. in decision making		28 **		30 **	28 **
Part. in cross-functional interfaces		60:		80.	60:
Rewards based on overall firm perform.		60.		.02	.03
Org. Factors of Systems Capabilities					
Formalization of tasks		.20**		.16*	.15*
Use of IT-systems to conduct tasks		.13†		60.	80.
Org. Factors of Socialization Capabilities					
Connectedness to other org. members		07		60'-	80
Tolerance for ambiguity		.10		90.	80.
Knowledge Inflows					
Top-down			.36 ***	.30 ***	.32 ***
Bottom-up			10		05
Horizontal			14		90
R-squared	60.	.20	.19	.27	.27
Adjusted R-squared	.07	.14	.16	.21	.20
F improvement of fit	3.56 **	3.47 ***	*** 96.9	13.8 ***	4.79 **
		3.4/ ***			7

^aStandardized regression coefficients; N = 177; † p < .10; * p < .05; ** p < .01; *** p < .001

Table 5.5 - Rabobank: Results of Hierarchical Regression Analyses^a. Impact of Org. Factors on Managers' Knowledge Inflows

Knowledge Inflows Knowledge Inflows Knowledge Inflows Control Variables Model 1a Model 2a Model 1b Hierarchical level: top .25 ** .20 ** .27 *** Hierarchical level: middle .26 ** .19 ** .13 * Function: front-office .03 .02 10 Unit: retail 11 11 .08 Unit: whole-sale .07 .05 Part. in decision making .07 .03 Part. in decision making .07 .03 Rewards on overall firm perf. .23 ** .23 ** Corg. Factors of Systems Capabilities .15 * .15 * Formalization of tasks .15 * .15 * Org. Factors of Socialization Caps. .06 .15 * Connectedness to other org. members .16 .14 R-squared .13 .31 .09	ponom-ob		Horizontal Knowledge
top	Knowledge Inflows	lows	Inflows
15 ** .20 ** .26 ** .19 ** .03 .02 .11 .11 11 12 02 02 02 02 02 02 02 02 03 03 03 04 04 05	Model 1b	Model 2b Model 1c	l 1c Model 2c
idle 26 ** 19 ** 03 0.2 11 11 02 0.2 nation Caps. s Capabilities 0.3 s Capabilities 1.5 * onduct tasks 1.5 * r org. members 0.6 y 1.13 1.9 **	.27 ***	.15*	
03 .02111102 .0202 nation Caps. stall firm perf. s Capabilities s Capabilities torg. members 1.5 * 1.6 * 1.6 * 1.7 * 1.8 * 1.8 * 1.9 * 1.15		.19**	** .11
11110202 nation Caps07 al interfaces .03 rall firm perf23 ** s Capabilities .15 * onduct tasks .15 * r org. members .06 y .13 .31	10	221*	
0202 nation Caps07 al interfaces .03 rall firm perf23 ** s Capabilities .15 * onduct tasks .15 * r org. members .06 sy .13 .31	.08	201	90.
nation Caps. 19 11 interfaces 103 123 ** s Capabilities 15 * onduct tasks 15 * ration Caps. 13 31	.05 .05	503	03
18 .07 19 interfaces .03 19 scapabilities .23 ** 10 conduct tasks .15 * 10 conduct tasks .15 * 11 cong. members .06 13 .31			
rall firm perf	.20	.20*	.17*
s Capabilities .23 ** s Capabilities .15 * onduct tasks .15 * cation Caps. .06 r org. members .06 ty .13	.10	0	.11
s Capabilities .15 * .noduct tasks .15 * .ration Capsnog. members .nog. members .nog. members .nog. members .nog. members .nog.	.13	.18*	.14*
.15 * onduct tasks .15 * ration Caps. r org. members .06 y .13 .31			
.15 *	02	2	.03
.06 .14 .13 .31	.04	4	15**
ors .06 .14 .13 .31			
guity .14 .31	.02	2	.11
.13 .31	2.	.21 *	.27 **
	.33	3 .16	.51
Adjusted R-squared .10 .26 .06	.06 .28	8 .14	.47
F improvement of fit 5.09 *** 6.32 *** 3.40 **	3.40 **	8.38 *** 6.72 ***	:** 16.3 ***

^aStandardized regression coefficients; N = 177; † p < .10; * p < .05; ** p < .01; *** p < .001

inflows than front-line managers. Furthermore, front-office managers ($\beta = -.13$, p < .10) have less horizontal knowledge inflows than back-office managers.

Regarding managers' top down- knowledge inflows, model 2a of table 5.5 shows that rewards based on overall firm performance (β = .23, p < .01), formalization of tasks (β = .15, p < .05), and the use of IT-systems to conduct tasks (β = .15, p < .05) are all positively related to top-down knowledge inflows. The coefficients of the other organizational factors are not significant. Hence, only rewards based on overall firm performance as an organizational factor of coordination capabilities affect top-down knowledge inflows, both organizational factors as common features of systems capabilities affect top-down knowledge inflows, and none of the organizational factors of socialization capabilities affect managers' top-down knowledge inflows. All significant relationships are as hypothesized.

Regarding managers' bottom-up knowledge inflows, model 2b of table 5.5 shows that two organizational factors as features of coordination capabilities are positively related to bottom-up knowledge inflows; participation in decision making (β = .20, p < .05) and rewards based on overall firm performance (β = .18, p < .05). None of the organizational factors pertaining to systems capabilities are significantly related to bottom-up knowledge inflows. Furthermore, only tolerance for ambiguity of a manager's peers and/or superiors (β = .21, p < .05) as an organizational factors as common feature of socialization capabilities is significantly related -positively- to bottom-up knowledge inflows. All significant relationships are as hypothesized.

Regarding managers' horizontal knowledge inflows, model 2c of table 5.5 shows that, as expected, all three organizational factors of coordination capabilities are significantly and positively related to horizontal knowledge inflows; participation in decision making (β = .17, p < .05), participation in crossfunctional interfaces (β = .11, p < .10), and rewards based on overall firm performance (β = .14, p < .05). Regarding organizational factors as common features of systems capabilities, the coefficient for formalization of tasks is not significant; only the use of IT-systems to conduct tasks (β = -.15, p < .01) is negatively related to horizontal knowledge inflows. Finally, as expected, with respect to organizational factors of socialization capabilities; connectedness to other organization members (β = .11, p < .10) and tolerance for ambiguity of a manager's peers and/ or superiors (β = .27, p < .01) positively relate to horizontal knowledge inflows. All significant relationships are as hypothesized.

Knowledge Inflows and Managers' Exploration and Exploitation Activities

The third part of this study's hypotheses is about the impact of managers' knowledge inflows on their exploration and exploitation activities. Model 5 of tables 5.3 and 5.4 show the corresponding hierarchical regression results for exploration (table 5.3) and exploitation (table 5.4). Table 5.3, model 5, shows that, regarding *exploration activities*, as expected, top-down knowledge inflows are not significantly related to managers' exploration activities, whereas both bottom-up knowledge inflows ($\beta = .18$, p < .05) and horizontal knowledge inflows ($\beta = .17$, p < .05) are significantly and positively related to managers' exploration activities. Table 5.4, model 5, shows that, regarding *exploitation activities*, as expected, top-down knowledge inflows ($\beta = .32$, p < .001) are significantly and positively related to managers' exploitation activities. As expected, bottom-up and horizontal knowledge inflows are not significantly related to managers' exploitation activities. All significant relationships are as hypothesized.

The Mediating Role of Knowledge Inflows

We argued in the previous chapters that managers' knowledge inflows act as mediators between the organizational factors and managers' exploration and exploitation activities. In this section, we will assess mediation effects with help of this section's regression analyses, i.e. those in tables 5.3, 5.4, and 5.5. Due to small sample size, we will not provide statistical tests for the mediation effects. However, in section 5.6, which is on the integrated data set, we will statistically test for the mediation effects. To assess mediation effects with regression analyses, the following regression equations should be estimated with several conditions to hold (Baron & Kenny, 1986; Gibson & Birkinshaw, 2004):

First, the independent variables (organizational factors) must affect the mediators (managers' knowledge inflows). This refers to models 2 in table 5.5, which indicate that, (1) participation in cross functional interfaces, formalization of tasks, and use of IT systems to conduct tasks affect top-down knowledge inflows, (2) participation in decision making, rewards based on overall firm performance, and tolerance for ambiguity of a manager's peers and/or superiors affect bottom-up knowledge inflows, and (3) all organizational factors, but formalization of tasks, affect horizontal knowledge inflows. All directionalities are as hypothesized.

Second, the independent variables (organizational factors) must be shown to affect the dependent variables (managers' exploration and exploitation activities). This refers to models 2 in tables 5.3 and 5.4, which show that all organizational factors, but two (formalization of tasks and connectedness to other organization members) significantly relate to exploration, whereas three organizational factors (participation in decision making, formalization of tasks and use of IT-systems to conduct tasks) significantly relate to exploitation. All directionalities are as hypothesized.

Third, the mediators (managers' knowledge inflows) must affect the dependent variables (managers' exploration and exploitation activities), with the independent variables controlled for. This refers to models 4 in tables 5.3 and 5.4, which show that managers' bottom-up (β = .17, p < .05) and horizontal (β = .17, p < .05) knowledge inflows positively and significantly relate to managers' exploration activities, and that top down knowledge inflows positively and significantly relate to manager's exploitation activities (β = .30, p < .001). All directionalities are as hypothesized.

If the previous three conditions all hold in the predicted directions, then, for mediation to exist, the effect of the organizational factors must be less in models 4 of tables 5.3 and 5.4 than in models 2 of tables 5.3 and 5.4; i.e. there should be a reduction of the size of the coefficients of organizational factors, and a reduction in significance level (Baron & Kenny, 1986). Taking the above mentioned conditions into consideration, and examining tables 5.3, 5.4, and 5.5 teaches that 4 top-down knowledge inflows mediate the relation between formalization of tasks and use of IT-systems to conduct tasks, and managers' exploitation activities. Bottom-up knowledge inflows mediate the relation between participation in decision making, rewards based on overall firm performance, and tolerance for ambiguity of a manager's peers and/ or superiors, and managers' exploration activities. Horizontal knowledge inflows mediate the relation between all organization factors, but formalization of tasks and connectedness to other organization members, and managers' exploration activities.

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⁴ As models 3 and 5 in tables 5.3 and 5.4 show, as expected, that top-down knowledge inflows not significantly relate to exploration, and that bottom-up and horizontal knowledge inflows not significantly relate to exploitation, it makes no sense to examine either mediation effects of top-down knowledge inflows regarding exploration, or mediation effects of bottom-up and horizontal knowledge inflows regarding exploitation.

5.3 – Philips Dataset

Control Variables and Descriptives

Table 5.6 shows managers' mean levels of exploration and exploitation activities at different hierarchical levels, functions and organization units. We conducted t-tests to identify significant (p < .05; 1-tail) differences, such as the LDS (least-significant-difference) method, which compares the mean of each control variable's group with the mean of each other group of the same control variable. *Regarding hierarchical level*, top managers engage more in exploration as compared to exploitation, whereas middle managers engage more in exploitation as compared to exploration. There is no significant difference between exploration and exploitation at front-line managers. The only significant difference between hierarchical levels is that middle level managers engage more in exploitation activities as compared to top-managers.

Regarding *function*; managers with a R&D function and managers with a marketing and sales function engage significantly more in exploration activities as compared to exploitation activities. Managers with 'other' functions engage more in exploitation as compared to exploration. The data indicates moreover that managers with a R&D function and managers with a marketing and sales function engage significantly more in exploration activities as compared to managers with a function other than R&D or marketing and sales. There is no significant difference between R&D and marketing and sales managers. Moreover, there are no significant differences between functions in terms of exploitation.

Regarding *organization unit*, managers in the innovative product units engage significantly more in exploration as compared to exploitation, whereas managers in the production support unit engage significantly more in exploitation activities as compared to exploration. There is no significant difference between exploration and exploitation within the standard products units. The data indicates furthermore that, between units, there are no significant differences in terms of managers' exploration activities. With respect to exploitation, however, managers in the production support unit and those in the standard products units significantly engage more in exploitation activities as compared to managers in the innovative products units. There are no significant differences between managers of the production support and standard products units.

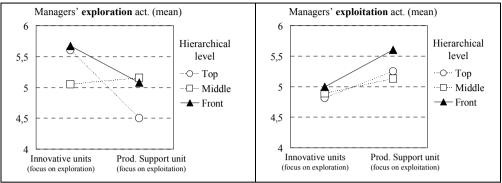
Table 5.6 – Philips: Control Variables' Categories with Corresponding Means and Standard Deviations^a of Outcome Variables

Control Variable	Explorati	on activities	Exploitati	on activities
Hierarchical level				
• Top $(N = 8)$	5.08	(.66)	4.77	(.73)
• Middle (N = 32)	5.01	(.89)	5.32	(.90)
• Front $(N = 78)$	5.31	(.98)	5.12	(.76)
Function				
• $R\&D (N = 53)$	5.34	(.86)	5.11	(.72)
• M&S (N = 17)	5.54	(1.09)	5.01	(.92)
• Other $(N = 48)$	4.95	(.93)	5.35	(.82)
Unit				
• Innovative prod. (N = 41)	5.44	(.80)	4.93	(.87)
• Standard prod. (N = 51)	5.13	(1.05)	5.29	(.74)
• Prod. support (N = 26)	5.02	(.95)	5.42	(.71)
Total (N = 118)	5.21	(.95)	5.19	(.80)

^aStandard deviation in parentheses

A closer examination of the data (see also figure 5.2) shows furthermore that differences between organization units in terms of exploration and of exploitation are strongly related to front-line managers' exploration and exploitation activities. Although variation analyses of the interaction effects between hierarchical level and organization unit on exploration and exploitation indicate that none of these effects is significant (p < .05 of F values interaction effects), t-tests (significant at p < .05; 1-tailed), conducted at all hierarchical levels, of differences between exploration activities of managers in different organization units, indicate that different levels of exploration between units are due to front-line managers. For instance, front-line managers of the innovative products units engage significantly more in exploration activities than front-line managers in the production support unit. There are no such significant differences at the top or middle-level. The large difference between top-managers is not significant due to small sample size. Similarly, regarding exploitation, differences between units are mainly due to front-line managers. For instance, front-line managers of the production support unit significantly engage more in exploitation activities than front line managers of the innovative products units, whereas there are no significant differences at the top- and middle-level.

Figure 5.2 – Philips: Different Mean Values^a for Exploration and Exploitation across Units, at Various Hierarchical Levels



^aDotted lines: insignificant difference at hierarchical level between units; Straight lines: significant difference at hierarchical level between units (t-test, p < .05; 1-tail)

Table 5.7 – Philips: Means, Standard Deviations, and Correlations

	mean	St.d.	1	2	3	4	5	6	7
1 Exploration activities	5.21	.95							
2 Exploitation activities	5.19	.80	.02						
3 Top-down Kn. Inflows	3.74	1.28	.20	.41					
4 Bottom-up Kn. Inflows	5.27	1.48	49	.23	.39				
5 Horizontal Kn. Inflows	4.37	1.11	.56	.12	.31	.42			
6 Part. in decision making	5.11	1.25	.35	.06	.05	.33	.37		
7 Cross-unit interfaces	4.71	1.39	.32	.14	.22	.30	.51	.13	
8 Rewards b.o. overall perf.	3.45	1.51	.47	.13	.37	.38	.56	.31	.41
9 Formalization of tasks	4.58	1.12	07	.42	.33	.01	.04	05	.10
10 Use of IT-systems	4.29	1.56	11	.13	.24	.08	15	15	.02
11 Connectedness	3.92	1.41	.13	.11	.20	.10	.38	.11	.22
12 Tolerance Ambiguity	5.09	1.10	.44	01	.16	.29	.44	.13	16
13 Hierar. level top	.07	.25	04	14	02	10	.10	05	.10
14 Hierar. level middle	.27	.45	13	.09	.02	.03	10	05	.04
15 Hierar. level front	.66	.46	.14	01	00	.02	.04	.07	09
16 Function R&D	.45	.50	.12	09	24	04	.02	.01	09
17 Function M&S	.14	.35	.14	10	.08	.09	.13	.01	.14
18 Function Other	.41	.49	23	.16	.18	02	11	02	02
19 Innovative products unit	.35	.48	.18	24	01	.07	.02	.03	05
20 Standard products unit	.43	.50	08	.11	.00	.01	.02	12	.16
21 Production support unit	.22	.42	11	.15	.01	10	04	.11	13

N = 118. All correlations above | .24| are significant at p < .01, All correlations above | .20| are significant at p < .05 (2-tailed)

Summarizing; the data indicates that differences between organization units and between functions in levels of exploration and/ or exploitation are largely as expected. Although we only expected managers in research & development to engage more in exploration activities as compared to managers in the other functional areas, the data indicates that managers in marketing and sales also engage significantly more in exploration. Regarding marketing and sales, the company launched a new company-wide publicity campaign in 2004 which may have force these managers to engage more in exploration activities than we initially expected. Between organizational units we found, as expected, managers in the production support unit and those in the standard products units to engage significantly more in exploitation activities as compared to managers in the innovative products units. With respect to exploration, we did not find differences between units. We expected, furthermore, top-level managers to engage more than

Table 5.7 - (Cont.)

21

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- 401	0 0.7	(Cont.	,										
	8	9	10	11	12	13	14	15	16	17	18	19	20
1													
2 3													
3													
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5													
6													
7													
8													
9	.14												
10	.04	.13											
11	.36	.04	.08										
12	31	02	09	.11									
13	01	25	.07	.27	12								
14	12	07	.21	03	17	17							
15	.12	.20	23	11	.23	38	85						
16	16	02	06	13	.09	11	13	.18					
17	.14	11	11	.02	.12	.08	09	.04	37				
18	.06	.10	.13	.12	17	.05	.19	21	75	34			
19	.13	-21	00	07	.16	.09	.16	19	09	.06	.05		
20	.00	.16	05	21	12	.,10	03	.08	.11	.03	13	64	

-.39 -.46

middle-level and front-line managers in both exploration and exploitation activities. The data does not confirm this however. The data indicates furthermore that differences between organization units in terms of exploration and of exploitation are strongly related to front-line managers' exploration and exploitation activities. In other words; front-line managers tend to specialize in either exploration or exploitation within distinct organization units, whereas top-and middle-level managers have more consistent levels of exploration and exploitation across organization units.

Table 5.7 presents descriptive statistics and correlations for the variables as used in the study. The table shows that several of the predictor variables and several of the control variables significantly relate to each other. To examine the issue of multicollinearity, variance inflation factors (VIF) have been calculated in each of the regression equations. VIF factors range between 1.08 and 2.48, which is below the rule-of-thumb cut-off of 10 (Hair et al., 1998).

Organizational Factors and Managers' Exploration & Exploitation Activities

The first part of this study's hypotheses is about the direct impact of the organizational factors on managers' exploration and exploitation activities. Table 5.8 shows the hierarchical regression results for exploration; table 5.9 shows the results for exploitation. In both tables, model 1 is the baseline models containing the control variables. The coefficients as shown in model 2 pertain to the total effect of the organizational factors on exploration (table 5.8) and on exploitation (table 5.9), i.e. both their direct and indirect effects. To gain insight into the direct effects only of the organizational factors, we have to look at the full model; model 5 of both tables.

Among the *control variables*, model 5 shows that managers with a R&D function (β = .18, p < .05) significantly engage more in exploration activities than managers with a function labeled as 'other'. Managers of the innovative products units engage significantly more in exploration activities (β = .19, p < .10) and less in exploitation activities (β = -.29, p < .05) as compared to managers of the production support unit. These regression analysis results are in line with the findings of table 5.6. Moreover, they indicate that among the control variables functional and organization unit effects explain most of the variance of managers' exploration and exploitation activities.

Regarding managers' exploration activities, model 5 of table 5.8 shows that only rewards based on overall firm performance has a significant, and positive direct effect ($\beta = .23$, p < .05). Regarding the total effect of the organizational factors; i.e. both their direct and indirect effects, model 2 of table 5.8 shows that all three organizational factors as common features of coordination capabilities: participation in decision making ($\beta = .18, p < .05$), participation in cross-functional interfaces ($\beta = .14$, p < .10), and rewards based on overall firm performance ($\beta =$.35, p < .001), are positively and significantly related to exploration activities. With respect to organizational factors of systems capabilities; the coefficients for formalization of tasks and for use of I-T-systems to conduct tasks are both negative, but only the coefficient for use of I-T-systems to conduct tasks is significant ($\beta = .12$, p < .10). Finally, the coefficient for connectedness to other organization members is not significant, indicating that only tolerance for ambiguity of a manager's peers and/ or superiors ($\beta = .20, p < .05$) as an organizational factors of socialization capabilities affects managers' exploration activities. All significant relationships are as hypothesized.

Regarding managers' *exploitation activities*, model 5 of table 5.9 shows that only formalization of tasks has a significant and positive direct effect (β = .32, p < .01). Regarding the total effect of the organizational factors, i.e. both their direct and indirect effects, model 2 of table 5.9 shows that, unexpectedly, none of the coefficients of the organizational factors associated with coordination capabilities are significantly related to exploitation. Both organizational factors as features of systems capabilities; formalization of tasks (β = .40, p < .001) and the use of IT-systems for conducting tasks (β = .17, p < .10) are positively and significantly related to exploitation activities. Finally, the coefficients for connectedness to other organization members and tolerance for ambiguity of a manager's peers and/or superiors are not significant. So, unexpectedly, organizational factors of socialization capabilities have no effect on exploitation. All significant relationships are as hypothesized.

Organizational Factors and Managers' Knowledge Inflows

The second part of this study's hypotheses is about the impact of organizational factors on managers' knowledge inflows. Table 5.10 shows the corresponding hierarchical regression results for top-down, bottom-up, and horizontal knowledge inflows. In all three series of regression analyses, models 1 are the baseline models containing the control variables. Models 2 are the full

Table 5.8 - Philips: Results of Hierarchical Regression Analyses^a: Impact of Organizational Factors and Managers' Knowledge Inflows on Managers' Exploration Activities

			Exploratio	Exploration Activities		
Control Variables	Model 1	Model 2	Model 3	Model 4a	Model 4b	Model 5
Hierarchical level: top	07	05	80	03	07	05
Hierarchical level: middle	14	90:-	11	90	90'-	90'-
Function: R&D	.19†	.20*	.15†	.20*	.17*	.18*
Function: M&S	.19†	60:	.11	80.	80.	80.
Unit: innovative products	.23 †	.25 *	.17	.21	.22	.19†
Unit: standard products	.03	60:	01	.05	.05	.02
Org. Factors of Coordination Caps.				:		,
Part. in decision making		.18 * + <u>-</u>		.11	.12	.07
Fart. in cross-runctional interfaces		4.		II.	.0.	co:
Rewards based on overall firm perform.		.35 **		.29 * *	** **	.23 *
Org. Factors of Systems Capabilities						
Formalization of tasks		60:-		60'-	60:-	10
Use of IT-systems to conduct tasks		12↑		60'-	05	60'-
Org. Factors of Socialization Caps.						
Connectedness to other org. members		.01		.01	04	04
Tolerance for ambiguity		.20 *		.16†	.13	.11
Knowledge Inflows						
Top-down			02			.02
Bottom-up			.30 ***	.25 **		.22 *
Horizontal			.42 **		.27 *	.22 *
R-squared	.11	.45	.46	.50	.48	.52
Adjusted R-squared	90:	.39	.42	.43	.41	.45
F improvement of fit	2.25 *	23.5 ***	23.5 ***	9.35 **	6.10*	4.74 **
^a Standardized regression coefficients; N = 118; † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$	= 118; † <i>p</i> < .1	* $(0; * p < .05; *$	* <i>p</i> < .01; **	p < .001		

Table 5.9 - Philips: Results of Hierarchical Regression Analyses^a: Impact of Organizational Factors and Managers' Knowledge Inflows on Managers' Exploitation Activities

		Exp	Exploitation Activities	/ities	
Control Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Hierarchical level: top	12	04	60:-	05	03
Hierarchical level: middle	60.	.10	.10	.10	.10
Function: R&D	16	10	07	90'-	07
Function: M&S	12	90:-	12	07	07
Unit: innovative products	30*	24	31 **	27 *	29*
Unit: standard products	07	08	60:-	10	12
Org. Factors of Coordination Caps.					
Part. in decision making		.10		60:	.05
Part. in cross-functional interfaces		60:		80.	.04
Rewards based on overall firm perform.		90		12	15
Org. Factors of Systems Capabilities					
Formalization of tasks		.40 ***		.30 **	.32 **
Use of IT-systems to conduct tasks		.17		80.	80.
Org. Factors of Socialization Caps.					
Connectedness to other org. members		.03		.01	.01
Tolerance for ambiguity		90:-		03	01
Knowledge Inflows					
Top-down			.35 **	.29 **	.23 *
Bottom-up			.11		.16
Horizontal			.01		.05
R-squared	.12	.28	.27	.34	.37
Adjusted R-squared	.07	.36	.21	.25	.25
F improvement of fit	2.41 *	3.47 **	7.80 ***	8.59 **	3.82*
^a Standardized regression coefficients; N = 118; † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$	$= 118; \dagger p < .1$	p < .05; *	** <i>p</i> < .01; ***	* p < .001	

Table 5.10 - Philips: Results of Hierarchical Regression Analyses^a: Impact of Org. Factors on Managers' Knowledge Inflows

	Top-	Top-Down	Bottom-Up	m-Up	Horizontal	Horizontal Knowledge
	Knowled	Knowledge Inflows	Knowledg	Knowledge Inflows	Infl	Inflows
Control Variables	Model 1a	Model 2a	Model 1b	Model 2b	Model 1c	Model 2c
Hierarchical level: top	05	.02	11	60:-	60:	80.
Hierarchical level: middle	03	00	00.	.03	07	00.
Function: R&D	25*	17*	02	00.	80.	.10
Function: M&S	01	.02	80.	.02	.14	.03
Unit: niche products	.01	.11	.13	.17	.04	.12
Unit: standard products	.02	80.	80.	.15	.03	.13
Org. Factors of Coordination Caps.						
Part. in decision making		.03		.25 **		.21 **
Part. in cross-functional interfaces		.04		.14		.27 ***
Rewards based on overall firm perform.		.21 *		.21		.27 **
Org. Factors of Systems Capabilities						
Formalization of tasks		.35 ***		01		.01
Use of IT-systems to conduct tasks		.29 **		.13		15
Org. Factors of Socialization Caps.						
Connectedness to other org. members		90.		.01		.20*
Tolerance for ambiguity		.12		.16†		.26 **
R-squared	90.	.34	.03	.28	. 00	.57
Adjusted R-squared	.01	.26	02	.20	02	.52
F improvement of fit	1.17	6.40 ***	.54	5.31 ***	.70	18.6***
. 20	- 0	÷ ;	4.4.4.4			

^aStandardized regression coefficients; N = 118; † p < .10; * p < .05; ** p < .01; *** p < .001

models, which show that, among the *control variables*, only one coefficient is significant. More precisely, managers with an R&D function tend to have significantly less top-down knowledge inflows ($\beta = -.17$, p < .10) as compared to managers with functions as labeled 'others'.

Regarding managers' top down- knowledge inflows, model 2a of table 5.10 shows that rewards based on overall firm performance (β = .21, p < .05), formalization of tasks ($\beta = .55$, p < .001), and the use of IT-systems to conduct tasks ($\beta = .29$, p < .01) are all positively and significantly related to top-down knowledge inflows. The coefficients of the other organizational factors are not significant. Hence, only rewards based on overall firm performance as an organizational factor of coordination capabilities affect top-down knowledge inflows, both organizational factors associated with of systems capabilities affect top-down knowledge inflows, and none of the organizational factors of socialization capabilities affect top-down knowledge inflows. Regarding managers' bottom-up knowledge inflows, model 2b of table 5.10 shows that two organizational factors as features of coordination capabilities are positively and significantly related to bottom-up knowledge inflows; participation in decision making ($\beta = .25$, p < .01) and rewards based on overall firm performance ($\beta = .21$, p < .10). None of the organizational factors pertaining to systems capabilities are significantly related to bottom-up knowledge inflows. Furthermore, only tolerance for ambiguity of a manager's peers and/or superiors ($\beta = .16$, p < .10) as an organizational factors as common feature of socialization capabilities is significantly related -positively- to bottom-up knowledge inflows. Regarding managers' horizontal knowledge inflows, model 2c of table 5.10 shows that, as expected, all three organizational factors as common features of coordination capabilities are significantly and positively related to horizontal knowledge inflows; participation in decision making ($\beta = .21, p < .01$), participation in crossfunctional interfaces ($\beta = .27$, p < .001), and rewards based on overall firm performance ($\beta = .27$, p < .01). Regarding organizational factors of systems capabilities, formalization of tasks is not significantly related, whereas the use of IT-systems to conduct tasks is significantly and negatively related to horizontal knowledge inflows ($\beta = -.15$, p < .10). Finally, as expected, with respect to organizational factors as features of socialization capabilities; connectedness to other organization members ($\beta = .20$, p < .05) and tolerance for ambiguity of a manager's peers and/or superiors ($\beta = .26$, p < .01) positively relate to horizontal knowledge inflows. All significant relationships are as hypothesized.

Knowledge Inflows and Managers' Exploration and Exploitation Activities

The third part of this study's hypotheses is about the impact of managers' knowledge inflows on their exploration and exploitation activities. Model 5 of tables 5.8 and 5.9 show the corresponding hierarchical regression results for exploration (table 5.8) and exploitation (table 5.9). Table 5.8, model 5 shows that, regarding *exploration activities*, as expected, top-down knowledge inflows are not significantly related to managers' exploration activities, whereas both bottom-up knowledge inflows ($\beta = .22$, p < .05) and horizontal knowledge inflows ($\beta = .22$, p < .05) are significantly and positively related to managers' exploration activities. Table 5.9, model 5, shows that, regarding *exploitation activities*, as expected, top-down knowledge inflows ($\beta = .23$, p < .05) are significantly and positively related to managers' exploitation activities. As expected, bottom-up and horizontal knowledge inflows are not significantly related to managers' exploitation activities. All significant relationships are as hypothesized.

The Mediating Role of Knowledge Inflows

We argued in the previous chapters that managers' knowledge inflows act as mediators between the organizational factors and managers' exploration and exploitation activities. In this section, we will assess mediation effects with help of this section's regression analyses, i.e. those in tables 5.8, 5.9, and 5.10. Due to small sample size, we will not provide statistical tests for the mediation effects. However, in section 5.6, which is on the integrated data set, we will statistically test for the mediation effects. To assess mediation effects with regression analyses, the following regression equations should be estimated with several conditions to hold (Baron & Kenny, 1986; Gibson & Birkinshaw, 2004):

First, the independent variables (organizational factors) must affect the mediators (managers' knowledge inflows). This refers to models 2 in table 5.10, which indicate that, (1) rewards based on overall firm performance, formalization of tasks, and use of IT-systems to conduct tasks affect top-down knowledge inflows, (2) that participation in decision making, rewards based on overall firm performance, and tolerance for ambiguity of a manager's peers and/ or superiors affect bottom-up knowledge inflows, and (3) that all organizational factors, but formalization of tasks, affect horizontal knowledge inflows. All directionalities are as hypothesized.

Second, the independent variables (organizational factors) must be shown to affect the dependent variables (managers' exploration and exploitation activities). This refers to models 2 in tables 5.8 and 5.9, which show that all three organizational factors of coordination capabilities, the use of IT-systems to conduct tasks, and tolerance for ambiguity of a manager's peers and/ or superiors significantly relate to exploration, whereas both organizational factors as common features of systems capabilities significantly relate to exploitation. All directionalities are as hypothesized.

Third, the mediators (managers' knowledge inflows) must affect the dependent variables (managers' exploration and exploitation activities), with the independent variables controlled for. This refers to models 4 in tables 5.8 and 5.9, which show that managers' bottom-up (β = .25, p < .01) and horizontal (β = .27, p < .05) knowledge inflows positively and significantly relate to managers' exploration activities, and that top down knowledge inflows positively and significantly relate to manager's exploitation activities (β = .29, p < .01). All directionalities are as hypothesized.

If the previous three conditions all hold in the predicted directions, then, for mediation to exist, the effect of the organizational factors must be less in models 4 of tables 5.8 and 5.9 than in models 2 of tables 5.8 and 5.9; i.e. there should be a reduction of the size of the coefficients of organizational factors, and a reduction in significance level (Baron & Kenny, 1986). Taking the above mentioned conditions into consideration, and examining tables 5.8, 5.9, and 5.10 teaches that top-down knowledge inflows mediate the relation between formalization of tasks and use of IT-systems to conduct tasks, and managers' exploitation activities. Bottom-up knowledge inflows mediate the relation between participation in decision making, rewards based on overall firm performance, and tolerance for ambiguity of a manager's peers and/ or superiors, and managers' exploration activities. Horizontal knowledge inflows mediate the relation between all organization factors and managers' exploration activities, but not for formalization of tasks, and connectedness to other organization members.

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⁵ As models 3 and 5 in tables 5.8 and 5.9 show that top-down knowledge inflows not significantly relate to exploration, and that bottom-up and horizontal knowledge inflows not significantly relate to exploitation, it makes no sense to examine either mediation effects of top-down knowledge inflows regarding exploration, or mediation effects of bottom-up and horizontal knowledge inflows regarding exploitation.

5.4 – Deloitte Dataset

Control Variables and Descriptives

Table 5.11 shows managers' mean levels of exploration and exploitation activities at different hierarchical levels and organization units. As explained in section 4.5.4, we only distinguish hierarchical levels and organizational units at Deloitte, and not also functional areas. We conducted t-tests to identify significant (p < .05; 1-tail) differences, such as the LDS (least-significant-difference) method, which compares the mean of each control variable's group with the mean of each other group of the same control variable. Regarding *hierarchical levels*, managers of all levels significantly engage more in exploitation activities as compared to exploration activities. Moreover, top- and middle-level managers engage more in exploration activities than front-line managers. There is no significant exploration difference between top- and middle-level managers. With respect to exploitation activities, there are no significant differences between the three hierarchical levels.

Table 5.11 – Deloitte: Control Variables' Categories' with Corresponding Means and Standard Deviations^a of Outcome Variables

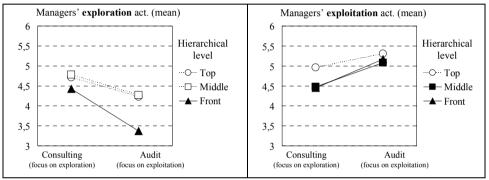
Control Variable	Explorati	on activities	Exploitati	on activities
Hierarchical level				
• Top $(N = 33)$	4.49	(1.06)	4.94	(.79)
• Middle (N = 76)	4.49	(1.01)	4.85	(.85)
• Front $(N = 115)$	3.91	(1.23)	4.96	(.88)
Unit				
• Audit (N = 95)	3.95	(1.13)	5.16	(.86)
• Tax & Legal (N = 48)	4.29	(1.02)	4.90	(.71)
• Consultancy (N = 34)	4.76	(1.27)	4.45	(.78)
• Finance (N = 13)	4.51	(1.17)	4.34	(.75)
• Central & Support (N = 34)	4.27	(1.12)	4.92	(.83)
Total ($N = 224$)	4.23	(1.16)	4.91	(.85)

^aStandard deviation in parentheses

Regarding *organization unit*, managers in the audit, tax & legal division, and central & support unit engage more in exploitation activities as compared to exploration activities. There are no significant differences between exploration and exploitation in the other two divisions. Moreover, managers in the consultancy

division engage significantly more in exploration activities as compared to managers in the audit and tax & legal division and central & support unit. There are further no differences among divisions with respect to exploration. Finally, managers in the audit, tax & legal, and central & support unit engage more in exploitation activities as compared to managers in the consultancy and the finance division. There are further no differences between organization units with respect to exploitation.

Figure 5.3 – Deloitte: Different Mean Values^a for Exploration and Exploitation across Units, at Various Hierarchical Levels



^aDotted lines: insignificant difference at hierarchical level between units; Straight lines: significant difference at hierarchical level between units (t-test, p < .05; 1-tail)

A closer examination of the data (see also figure 5.3) shows furthermore that differences between organization units in terms of exploration and of exploitation are strongly related to front-line managers' exploration and exploitation activities. Although variation analyses of the interaction effects between hierarchical level and organization unit on exploration and exploitation indicate that none of these effects is significant (p < .05 of F values interaction effects), t-tests (significant at p < .05; 1-tailed), conducted at all hierarchical levels, of differences between exploration activities of managers in different organization units, indicate that different levels of exploration between units are mainly due to front-line managers. For instance, front-line managers of the consulting division significantly engage more in exploration activities than front-line managers of the audit division, whereas there are no significant differences at the top- and middle-level. Regarding exploitation, differences between units are due to both front-line and middle managers. For instance, both front-line and

Table 5.12 – Deloitte: Means, Standard Deviations, and Correlations

	mean	St.d.	1	2	3	4	5	6	7
1 Exploration activities	4.23	1.16							
2 Exploitation activities	4.91	.85	35						
3 Top-down Kn. Inflows	3.35	1.14	.02	.19					
4 Bottom-up Kn. Inflows	3.81	1.56	.38	11	00				
5 Horizontal Kn. Inflows	4.14	1.03	.42	13	.17	.38			
6 Part. in decision making	3.52	1.65	.37	23	06	.27	.33		
7 Cross-unit interfaces	4.05	1.40	.19	.04	.32	.20	.30	.19	
8 Rewards overall perf.	4.25	1.46	.32	20	.24	.21	.35	.31	.25
9 Formalization of tasks	3.47	1.54	33	.44	.19	23	10	23	.05
10 Use of IT-systems	4.61	1.53	05	.14	.32	02	.04	00	.53
11 Connectedness	4.06	1.42	.20	05	.03	.08	.22	.29	.14
12 Tolerance Ambiguity	4.54	1.56	.36	17	.12	.34	.34	.34	.26
13 Hierar. level top	.17	.37	.10	.02	10	.13	.11	.08	.02
14 Hierar. level middle	.38	.49	.18	06	15	.14	.01	.13	.01
15 Hierar. level front	.45	.50	25	.05	.23	24	08	19	03
16 Unit: Audit	.42	.50	20	.25	.06	.03	01	14	.01
17 Unit: Tax & Legal	.21	.41	.03	01	01	.00	04	09	.09
18 Unit: Consultancy	.15	.36	.20	23	07	.03	.14	.19	12
19 Unit: Finance	.06	.23	.06	17	.05	.13	.04	.08	.01
20 Unit: Central & Sup.	.15	.36	.02	.01	04	16	10	.06	.01

N = 224. All correlations above | .17| are significant at p < .01, All correlations above | .13| are significant at p < .05 (2-tailed)

middle managers of the audit division significantly engage more in exploitation activities than front-line and middle managers at the consulting division. There are no such significant differences at the top-level.

Summarizing; the data indicates that differences between organization units in levels of exploration and exploitation are as expected. Managers of the audit and tax divisions and the central & support unit focus on exploitation, managers of the consulting division focus on exploration. Furthermore, at Deloitte, we expected higher level managers to engage more than lower-level managers in exploration, whereas we expected lower-level managers to engage more than other managers in exploitation. The data confirms this regarding exploration; top- and middle managers engage more in exploration activities than front-line managers. There are, however, no significant differences in terms of exploitation activities between the three hierarchical levels. The data indicates furthermore that

Table 5.12 – (Cont.)

	8	9	10	11	12	13	14	15	16	17	18	19
1												
2												
3												
4												
5												
6												
7												
8												
9	12											
10	.18	.12										
11	.35	09	.00									
12	.46	19	.12	.22								
13	.12	04	08	.20	15							
14	.04	14	04	.01	08	35						
15	13	.17	.09	16	.19	40	72					
16	.04	.12	.06	.01	.02	02	.03	02				
17	18	09	07	04	.00	.00	.17	17	45			
18	.13	12	02	.08	12	.15	10	01	36	22		
19	.10	11	.01	15	16	01	04	.04	21	13	11	
20	05	.13	00	.05	.20	12	10	.19	36	22	18	11

differences between organization units in terms of exploration and of exploitation are strongly related to front-line managers' exploration and exploitation activities. In other words; front-line managers tend to specialize in either exploration or exploitation within distinct organization units, whereas top- and middle-level managers have more consistent levels of exploration and exploitation across organization units.

Table 5.12 presents descriptive statistics and correlations for the variables as used in the study. The table shows that several of the predictor variables and several of the control variables significantly relate to each other. To examine the issue of multicollinearity, variance inflation factors (VIF) have been calculated in each of the regression equations. VIF factors range between 1.21 and 2.42, which is below the rule-of-thumb cut-off of 10 (Hair et al., 1998).

Organizational Factors and Managers' Exploration & Exploitation Activities

The first part of this study's hypotheses is about the direct impact of the organizational factors on managers' exploration and exploitation activities. Table 5.13 shows the hierarchical regression results for exploration; table 5.14 shows the results for exploitation. In both tables, model 1 is the baseline models containing the control variables. The coefficients as shown in model 2 pertain to the total effect of the organizational factors on exploration (table 5.13) and on exploitation (table 5.14), i.e. both their direct and indirect effects. To gain insight into the direct effects only of the organizational factors, we have to look at the full model; model 5 of both tables.

Among *the control variables*, model 5 shows that middle-level managers engage significantly more in exploration activities (β = .16, p < .05) than front-line managers. Managers of the audit division engage significantly less in exploration activities (β = -.26, p < .01) as compared to managers of the central & support unit. These findings correspond to table 5.12, and give no further insight into its corresponding on control variables. Thus, among the control variables, both hierarchical level and organization unit effects explain variance of managers' exploration activities.

Regarding managers' exploration activities, model 5 of table 5.13 shows that only formalization of tasks has a significant, and negative direct effect ($\beta = -$.20, p < .01). Regarding the total effect of the organizational factors; i.e. both their direct and indirect effects, model 2 of table 5.13 shows that all three organizational factors as common features of coordination capabilities; participation in decision making ($\beta = .12$, p < .10), participation in cross-functional interfaces ($\beta = .19$, p < .10) .01), and rewards based on overall firm performance ($\beta = .14$, p < .05), are positively and significantly related to exploration activities. The coefficients for formalization of tasks ($\beta = -.21$, p < .01), and for use of IT-systems to conduct tasks ($\beta = -.15$, p < .05), are negative, and significant. Hence, the data show significant negative effects of organizational factors associated with systems capabilities on exploration. Finally, the coefficient for connectedness to other organization members is not significant, indicating that only tolerance for ambiguity of a manager's peers and/ or superiors ($\beta = .16$, p < .05) as an organizational factors of socialization capabilities affects managers' exploration activities. All significant relationships are as hypothesized.

Regarding managers' *exploitation activities*, model 5 of table 5.14 shows that rewards based on overall firm performance has a significant and negative direct effect ($\beta = -.19$, p < .05) and that formalization of tasks ($\beta = .34$, p < .001) has a significant and positive direct effect on managers' exploitation activities.

Regarding the total effect of the organizational factors; i.e. both their direct and indirect effects, model 2 of table 5.14 shows that only rewards based on overall firm performance as an organizational factor associated with coordination capabilities is significantly, and negatively, related to exploitation. Both organizational factors as features of systems capabilities, formalization of tasks (β = .36, p < .001) and the use of IT-systems for conducting tasks (β = .13, p < .10) are positively related to exploitation activities. Finally, the coefficients for connectedness to other organization members and tolerance for ambiguity of a manager's peers and/ or superiors are not significant. So, unexpectedly, organizational factors as common features of socialization capabilities have no effect on exploitation. All significant relationships are as hypothesized.

Organizational Factors and Managers' Knowledge Inflows

The second part of this study's hypotheses is about the impact of organizational factors on managers' knowledge inflows. Table 5.15 shows the corresponding hierarchical regression results for top-down, bottom-up, and horizontal knowledge inflows. In all three series of regression analyses, models 1 are the baseline models containing the control variables. Models 2 are the full models, which show that, among the *control variables*, coefficients pertaining to the hierarchical levels and vertical knowledge inflows are significant. More precisely, top- and middle-level managers tend to have less top-down knowledge inflows ($\beta = .20$, p < .01; $\beta = .22$, p < .01) and more bottom-up knowledge inflows ($\beta = .12$, p < .10; $\beta = .13$, p < .10) as compared to front-line managers. Regarding horizontal knowledge inflows, managers of the consultancy division have more ($\beta = .15$, p < .10) horizontal knowledge inflows as compared to managers of the central &support unit.

Regarding managers' top down- knowledge inflows, model 2a of table 5.15 shows that participation in cross-functional interfaces (β = .18, p < .05) and rewards based on overall firm performance (β = .24, p < .01) as organizational factors of coordination capabilities are positively related to top-down knowledge inflows. Participation in decision making is not significantly related to top-down knowledge inflows. Both organizational factors of systems capabilities are positively related to top-down knowledge inflows; formalization of tasks (β = .16, p < .05) and use of IT-systems to conduct tasks (β = .13, p < .10). Unexpectedly, the organizational factors of socialization capabilities are not significantly related to top-down knowledge inflows. All significant relationships are as hypothesized.

Table 5.13 - Deloitte: Results of Hierarchical Regression Analyses^a: Impact of Organizational Factors and Managers' Knowledge Inflows on Managers' Exploration Activities

				• • • • • • • • • • • • • • • • • • • •		
			Exploratio	Exploration Activities		
Control Variables	Model 1	Model 2	Model 3	Model 4a	Model 4b	Model 5
Hierarchical level: top	.18*	.07	.11	.05	.07	90.
Hierarchical level: middle	.27 ***	.16*	.21 **	.13*	.17**	.16*
Unit: Audit	20*	21*	27 **	24 **	24 **	26 **
Unit: Tax & Legal	80	-11	11	11	12	13
Unit: Consultancy	.11	.03	.03	.02	01	02
Unit: Finance	.03	90:-	04	80	07	60:-
Org. Factors of Coordination Caps.						
Part. in decision making		.12		60:	80.	.07
Part. in cross-functional interfaces		**61.		.15*	.11	60.
Rewards based on overall firm perform.		.14*		.13 †	60.	80.
Org. Factors of Systems Capabilities						
Formalization of tasks		21 **		18**	21 ***	20 **
Use of IT-systems to conduct tasks		15*		12 [†]	11	10
Org. Factors of Socialization Caps.						
Connectedness to other org. members		.01		.02	00	.01
Tolerance for ambiguity		.16*		.13†	.13†	.11
Knowledge Inflows						
Top-down			.04			.05
Bottom-up			.24 ***	.21 **		.16*
Horizontal			.30 ***		.26 ***	.22 **
R-squared	.13	.33	.32	.37	.38	.52
Adjusted R-squared	.10	.29	.29	.33	.34	.45
F improvement of fit	5.26 ***	9.33 ***	20.6 ***	11.0 **	16.8 ***	7.98 ***
^a Standardized regression coefficients; N = 224; † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$	$= 224; \dagger p < .10$	0; * p < .05; *	* <i>p</i> < .01; ***	* p < .001		

Table 5.14 – Deloitte: Results of Hierarchical Regression Analyses^a: Impact of Organizational Factors and Managers' Knowledge Inflows on Managers' Exploitation Activities

		Exp	Exploitation Activities	ities	
Control Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Hierarchical level: top	.02	80:	80.	.12	.11
Hierarchical level: middle	60	.01	02	.05	.04
Unit: Audit	.15	.16†	.14	.14	.14
Unit: Tax & Legal	.01	.04	01	.02	.02
Unit: Consultancy	21*	11	18*	12	11
Unit: Finance	16*	07	16*	80	60'-
Org. Factors of Coordination Caps.					
Part. in decision making		90'-		04	04
Part. in cross-functional interfaces		03		05	05
Rewards based on overall firm perform.		15*		* 17*	19*
Org. Factors of Systems Capabilities		* * 20		**	** */
I se of IT-systems to conduct tasks		13.		ţ; -	ţ =
		?			1
Org. Factors of Socialization Caps.		5		2	30
Connectedness to other org. members		40. 4		9. 9. 8	co.
l olerance for ambiguity		01		02	02
Knowledge Inflows					
Top-down			.21 **	.16*	.17*
Bottom-up			05		.05
Horizontal			11		05
R-squared	.12	.30	.17	.32	.32
Adjusted R-squared	60:	.26	.13	.27	.27
F improvement of fit	4.76 ***	6.92 ***	4.29 **	*60.9	2.30^{\dagger}
		+		Ι.	

^aStandardized regression coefficients; N = 244; † p < .10; * p < .05; ** p < .01; *** p < .001

Table 5.15 – Deloitte: Results of Hierarchical Regression Analysis^a: Impact of Org. Factors on Managers' Knowledge Inflows

	Top-Down	Own	Botto	Bottom-Up	Horizontal	Horizontal Knowledge
	Knowledge Inflows	e Inflows	Knowledg	Knowledge Inflows	Inf	Inflows
Control Variables	Model 1a	Model 2a	Model 1b	Model 2b	Model 1c	Model 2c
Hierarchical level: top	19*	20**	.19**	.12 *	.10	01
Hierarchical level: middle	24 **	22 **	.21 **	.13*	.05	04
Unit: Audit	.14	.10	.15	.13	60.	.11
Unit: Tax & Legal	.11	.14	80.	.04	.04	90.
Unit: Consultancy	.02	.04	.11	.05	.18*	.15*
Unit: Finance	80.	.07	*61.	.11	60:	40.
Org. Factors as c.f. Coordination Caps.						
Part. in decision making		60:-		.13*		.16*
Part. in cross-functional interfaces		.18*		.20*		.29 ***
Rewards based on overall firm perform.		.24 **		.04		.17*
Org. Factors as c.f. Systems Capabilities						
Formalization of tasks		.16*		13*		.01
Use of IT-systems to conduct tasks		.13*		13*		16*
Org. Factors as c.f. Socialization Caps.						
Connectedness to other org. members		.01		90'-		.12*
Tolerance for ambiguity		.04		.18*		.13*
R-squared	70.	.26	60.	.23	.04	.26
Adjusted R-squared	.04	.21	90.	.18	.01	.21
F improvement of fit	2.52*	*** 19.7	3.47**	5.30 ***	1.41	***00.6
^a Standardized regression coefficients; N = 224; † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$	= 224; † p < .10); * <i>p</i> < .05; **	p < .01; *** p	<.001		

Regarding managers' bottom-up knowledge inflows, model 2b of table 5.15 shows that two organizational factors as features of coordination capabilities are positively related to bottom-up knowledge inflows; participation in decision making ($\beta = .13$, p < .10) and participation in cross-functional interfaces ($\beta = .20$,p < .05). Rewards based on overall firm performance have no significant relationship. Both of the organizational factors pertaining to systems capabilities are significantly and negatively related to bottom-up knowledge inflows; formalization of tasks ($\beta = -.13$, p < .05) and use of IT-systems to conduct tasks ($\beta = -.13$, p < .10). Furthermore, only tolerance for ambiguity of a manager's peers and/ or superiors ($\beta = .18$, p < .05) as a common feature of socialization capabilities is significantly related -positively- to bottom-up knowledge inflows. All significant relationships are as hypothesized.

Regarding managers' horizontal knowledge inflows, model 2c of table 5.15 shows that, as expected, all three organizational factors as common features of coordination capabilities are significantly and positively related to horizontal knowledge inflows; participation in decision making (β = .16, p < .05), participation in cross-functional interfaces (β = .29, p < .001), and rewards based on overall firm performance (β = .17, p < .05). Regarding organizational factors related to systems capabilities, only the use of IT-systems to conduct tasks (β = .16, p < .05) is significantly and negatively related to horizontal knowledge inflows. Finally, as expected, connectedness to other organization members (β = .12, p <.10) and tolerance for ambiguity of a manager's peers and/ or superiors inflows (β = .13, p <.10) as organizational factors as common feature of socialization capabilities are positively and significantly related to horizontal knowledge inflows. All significant relationships are as hypothesized.

Knowledge Inflows and Managers' Exploration and Exploitation Activities

The third part of this study's hypotheses is about the impact of managers' knowledge inflows on their exploration and exploitation activities. Model 5 of tables 5.13 and 5.14 show the corresponding hierarchical regression results. Table 5.13, model 5 shows that, regarding *exploration activities*, as expected, top-down knowledge inflows are not significantly related to managers' exploration activities, whereas both bottom-up knowledge inflows ($\beta = .16$, p < .05) and horizontal knowledge inflows ($\beta = .22$, p < .01) are significantly and positively related to managers' exploration activities. Table 5.14, model 5, shows that, regarding *exploitation activities*, as expected, top-down knowledge inflows ($\beta = .17$, p < .05)

are significantly and positively related to managers' exploitation activities. As expected, bottom-up and horizontal knowledge inflows are not significantly related to managers' exploitation activities. All significant relationships are as hypothesized.

The Mediating Role of Knowledge Inflows

We argued in the previous chapters that managers' knowledge inflows act as mediators between the organizational factors and managers' exploration and exploitation activities. In this section, we will assess mediation effects with help of this section's regression analyses, i.e. those in tables 5.13, 5.14, and 5.15. Due to small sample size, we will not provide statistical tests for the mediation effects. However, in section 5.6, which is on the integrated data set, we will statistically test for the mediation effects. To assess mediation effects with regression analyses, the following regression equations should be estimated with several conditions to hold (Baron & Kenny, 1986; Gibson & Birkinshaw, 2004):

First, the independent variables (organizational factors) must affect the mediators (managers' knowledge inflows). This refers to models 2 in table 5.15, which indicate that, (1) participation in cross functional interfaces, rewards based on overall firm performance, formalization of tasks, and use of IT-systems to conduct tasks affect top-down knowledge inflows, (2) that all organizational factors, but rewards based on overall firm performance and connectedness to other organization members affect bottom-up knowledge inflows, and (3) that all organizational factors, but formalization of tasks and connectedness to other organization members affect horizontal knowledge inflows. All directionalities are as hypothesized.

Second, the independent variables (organizational factors) must be shown to affect the dependent variables (managers' exploration and exploitation activities). This refers to models 2 in tables 5.13 and 5.14, which show that all organizational factors, but connectedness to other organization members significantly relate to exploration, whereas both organizational factors as features of systems capabilities, and rewards based on overall firm performance significantly relate to exploitation. All directionalities are as hypothesized.

Third, the mediators (managers' knowledge inflows) must affect the dependent variables (managers' exploration and exploitation activities), with the independent variables controlled for. This refers to models 4 in tables 5.13 and 5.14, which show that managers' bottom-up ($\beta = .21$, p < .01) and horizontal ($\beta = .01$) and horizontal ($\beta =$

.26, p < .001) knowledge inflows positively and significantly relate to managers' exploration activities, and that top down knowledge inflows positively and significantly relate to manager's exploitation activities ($\beta = .16$, p < .05). All directionalities are as hypothesized.

If the previous three conditions all hold in the predicted directions, then. for mediation to exist, the effect of the organizational factors must be less in models 4 of tables 5.13 and 5.14 than in models 2 of tables 5.13 and 5.14; i.e. there should be a reduction of the size of the coefficients of organizational factors, and a reduction in significance level (Baron & Kenny, 1986). Taking the above mentioned conditions into consideration, and examining tables 5.13, 5.14, and 5.15 teaches that top-down knowledge inflows mediate the relation between the use of IT-systems to conduct tasks and managers' exploitation activities. Bottomup knowledge inflows mediate the relation between participation in decision making, participation in cross-functional interfaces, the use of IT-systems to conduct tasks, and tolerance for ambiguity of a manager's peers and/ or superiors and managers' exploration activities. Horizontal knowledge inflows mediate the relation between participation in decision making, participation in cross-functional interfaces, rewards based on overall firm performance, the use of IT-systems to conduct tasks, and tolerance for ambiguity of a manager's peers and/ or superiors and managers' exploration activities.

5.5 – Comparing Results across Datasets

A comparison of the results across the three datasets teaches that the results are quite consistent. Regarding the control variables, within all three companies, front-line managers tend to specialize in either exploration or exploitation within distinct organization units, whereas top- and middle-level managers have more consistent and relatively high levels of exploration and exploitation across organization units. Moreover, differences with respect to managers' exploration and exploitation

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⁶ As models 2 and 5 in tables 5.13 and 5.14 show that top-down knowledge inflows not significantly relate to exploration, and that bottom-up and horizontal knowledge inflows not significantly relate to exploitation, it makes no sense to examine either mediation effects of top-down knowledge inflows regarding exploration, or mediation effects of bottom-up and horizontal knowledge inflows regarding exploitation.

activities between functions and between organization units within the companies are as expected (see chapter 4, section 4.5.4 for a discussion on control variables).

With respect to the total impact, i.e. both direct and indirect, of organizational factors on managers' exploration and exploitation activities, all three datasets show that the three organizational factors as common features of coordination capabilities positively and significantly relate to exploration, whereas their effect on exploitation is far less. Only at Rabobank did participation in decision making negatively and significantly relate to exploitation, and only at Deloitte, rewards based on overall firm performance negatively and significantly relate to exploitation. Regarding the two organizational factors as common features of systems capabilities in the three datasets; the use of IT-systems to conduct tasks negatively and significantly relates to exploration. Only at Deloitte does formalization of tasks also negatively and significantly relate to exploration. Moreover, within all three companies, both organizational factors as common features of systems capabilities positively and significantly relate to exploitation. Finally, organizational factors as common features of socialization capabilities appear to have a rather limited influence; all three datasets indicate that only tolerance for ambiguity of a manger's peers and/ or superiors has a positive effect on exploration.

Regarding the effect of organizational factors on managers' knowledge inflows; we found within each dataset the same 12 significant relationships. Additionally, at Deloitte, four significant relationships were found. Roughly speaking, the organizational factors of coordination capabilities positively relate to bottom-up and horizontal knowledge inflows, organizational factors of systems capabilities positively relate to top-down knowledge inflows, connectedness to other organization members as a common feature of socialization capabilities positively relates to horizontal knowledge inflows, whereas tolerance for ambiguity of a manager's peers and/ or superiors positively relates to bottom-up and horizontal knowledge inflows.

With respect to the impact of managers' knowledge inflows on their exploration and exploitation activities, the data pertaining to all three companies indicate that top-down knowledge inflows positively and significantly relate to exploitation activities, whereas bottom-up and horizontal knowledge inflows positively and significantly relate to exploration activities. Not surprisingly, we finally found consistent effects across the three companies regarding the mediating role of knowledge inflows.

5.6 – Analysis of Integrated Dataset

As the findings between the three datasets appear to be largely consistent, we merge the three datasets into one integrated dataset and subsequently analyze this combined data. We test the hypotheses based on this integrated dataset. The reason to analyze the combined dataset is twofold; first it will facilitate our discussion of the results without loosing insights gained by the separate datasets as they appeared to be largely consistent. Hence, we base our discussion of this study's findings in chapter 6 mainly on the results as brought forward in this section 5.6. Second, the combined dataset allows us to do structural equation modeling to assess the goodness of fit of our model, and compare it with competing models.

Control Variables and Descriptives

Table 5.16 shows managers' mean levels of exploration and exploitation activities at different hierarchical levels, functions, and organization units. We conducted t-tests to identify significant (p < .05; 1-tail) differences, such as the LDS (least-significant-difference) method, which compares the mean of each control variable's group with the mean of each other group of the same control variable. Chapter 6 discusses implications of the findings regarding the control variables.

Regarding hierarchical levels, top-level managers do not have significant differences between exploration and exploitation; i.e. they conduct both activities to the same extent. Middle- and front-line managers engage more in exploitation activities as compared to exploration activities. A comparison across hierarchical levels shows that top- and middle-level managers engage significantly more in exploration activities than front-line managers. However (see also figure 5.4), this difference with respect to exploration activities is most prevalent in units which focus on exploitation activities, such as Rabobank's retail unit, Philips' production support unit, and Deloitte's audit and tax & legal divisions. In units focusing on exploration activities, such as Philips' innovative products units and Deloitte's consulting and financial advisory divisions, top-, middle-, and frontline managers tend to engage to the same extent in exploration activities. There are no significant differences between levels with respect to exploitation activities. Moreover, as also illustrated by figure 5.4, front-line managers specialize in either exploration or exploitation depending on the focus of their unit (t-test of differences between units significant at p < .05, 2-tailed), whereas top- and middle- level managers have not significant differences across units in terms of exploration or exploitation. The regression analyses with respect to exploitation (table 5.19), indicate that, while controlling for function and unit effect, top- and middle-level managers also engage significantly more in exploitation activities than front-line managers.

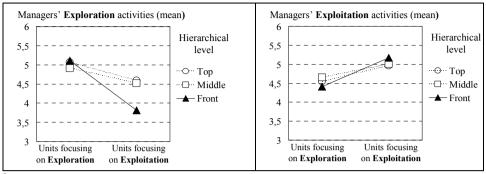
Table 5.16 – Integrated Data (Rabobank and Philips and Deloitte): Control Variables' Categories with Corresponding Means and Standard Deviations^a of Outcome Variables

Control Variable	Exploration	activities	Exploitation	on activities
Hierarchical level				
• Top $(N = 57)$	4.80	(1.00)	4.98	(.77)
• Middle (N = 142)	4.70	(.96)	5.03	(.85)
• Front (N = 320)	4.26	(1.31)	4.98	(.96)
Function				
• 'R&D' $(N = 241)$	4.70	(1.06)	4.87	(.85)
• 'M & S' (N = 161)	4.16	(1.33)	5.07	(1.01)
• 'operations' (N = 117)	4.33	(1.20)	5.14	(.85)
Organization Unit				
• Retail (Rabobank) (N = 65)	3.97	(1.29)	5.13	(1.09)
• Whole-sale (Rabobank) (N = 63)	4.20	(1.17)	5.07	(.96)
• Operations (Rabobank) (N = 49)	4.65	(1.04)	4.63	(.93)
• Innovative products (Philips) (N = 41)	5.44	(.80)	4.93	(.87)
• Standard products (Philips) (N = 51)	5.13	(1.05)	5.29	(.74)
• Production support (Philips) (N = 26)	5.02	(.91)	5.42	(.71)
• Audit + tax & legal (Deloitte) (N = 143)	4.07	(1.10)	5.07	(.82)
• Consultancy + finance (Deloitte) (N = 47)	4.69	(1.23)	4.42	(.76)
• Central & support (Deloitte) (N = 34)	4.20	(1.14)	4.88	(.85)
Total (N = 519)	4.45	(1.20)	4.99	(.91)

^aStandard deviation in parentheses

Regarding *functions*, for all three functional areas applies that managers engage significantly more in exploitation activities than in exploration activities. As expected, across functions, managers with research and development type of functions conduct significantly more exploration activities and significantly less exploitation activities than other managers.

Figure 5.4 – Integrated Data (Rabobank and Philips and Deloitte): Different Mean Values^a for Exploration and Exploitation across Units, at Various Hierarchical Levels



^aDotted lines: insignificant difference at hierarchical level between units; Straight lines: significant difference at hierarchical level between units (t-test, p < .05; 2-tail). Units focusing on exploration in figure include Philips' innovative products units and Deloitte's Consulting and Financial Advisory divisions. Units focusing on exploitation in figure include Rabobank's retail unit, Philips' production support unit, and Deloitte's Audit and Tax & Legal divisions.

Regarding *organizational units*, as expected, managers of Philips' innovative products units and those of Deloitte's consultancy and financial advisory divisions conduct more exploration activities as compared to exploitation activities. Managers of Rabobank's retail and whole sale units, of Philips' production support unit, and of Deloitte's audit and tax & legal divisions engage more in exploitation as compared to exploration. Managers of the other units, i.e. Rabobank's operations unit and Philips' standard products units, conduct both exploration and exploitation to the same extent.

Table 5.17 presents descriptive statistics and correlations for the variables as used in this study. About three quarters of the hypothesized relationships between variables show significant correlations in table 5.17. They are furthermore in the direction, i.e. positive or negative, as hypothesized, proving a kind of preliminary confirmation of our conceptual model. The table shows furthermore that several of the predictor variables significantly relate to each other, this is also the case for several of the control variables. To examine the issue of multicollinearity, variance inflation factors (VIF) have been calculated in each of the regression equations. VIF factors of the study's constructs range between

Table 5.17 - Integrated Data (Rabobank and Philips and Deloitte): Means, Standard Deviations, and Correlations

)	•											
	mean	St.dev	1	2	3	4	5	9	7	8	6	10
1 Exploration activities	4.45	1.20										
2 Exploitation activities	5.00	.91	11									
3 Top-down Kn. Inflows	3.88	1.26	.12	24								
4 Bottom-up Kn. Inflows	4.37	1.67	.48	.03	.23							
5 Horizontal Kn. Inflows	4.10	1.06	.50	01	.19	39						
6 Part. in decision making	3.90	1.66	.50	10	90:	.42	.41					
7 Cross-functional interfaces	4.39	1.36	.28	.07	.28	.29	.33	24				
8 Rewards based on overall firm perform.	4.07	1.45	.23	60:-	.28	.20	36	.19	.23			
9 Formalization of tasks	3.85	1.43	05	.37	.22	00.	.01	00	.07	07		
10 Use of IT-systems to conduct tasks	4.36	1.44	12	.13	41.	04	04	80	.20	80.	.10	
11 Connectedness to other org. members	4.32	1.43	.13	03	.25	14	.22	.20	.20	.37	03	04
12 Tolerance Ambiguity of peers/ superiors	4.75	1.42	.43	07	.20	39	.42	.42	.26	36	90	01
13 Hierarchical level: top	.12	.32	11.	00	04	80.	.15	11.	.03	60.	60	04
14 Hierarchical level: middle	.29	.46	.13	.03	60:-	90.	.05	.07	01	.01	90'-	.07
15 Hierarchical level: front	.59	.49	19	02	.10	10	14	14	01	07	.12	07
16 Function: 'R & D'	.46	.50	.19	13	14	.10	.15	.14	00.	90.	07	03
17 Function: 'M & S'	.31	.46	16	90.	.20	03	13	14	.07	90.	03	00
18 Function: 'operations'	.23	.42	05	60:	05	80	02	01	08	10	.11	.04
19 Unit: retail (Rabobank)	.13	.33	17	.05	.18	.03	10	16	.00	.05	.01	03
20 Unit: whole-sale (Rabobank)	.12	.33	08	.03	.22	01	16	11	90.	.02	04	90:-
21 Unit: operations (Rabobank)	60:	.29	.05	13	.25	.05	.02	60:	80.	60:	.03	-:11
22 Unit: innovative products (Philips)	80.	.27	24	02	04	.18	80.	.22	.05	18	80.	02
23 Unit: standard products (Philips)	.10	.30	.19	.11	04	.18	60.	.20	.14	15	.22	04
24 Unit: production support (Philips)	.05	.22	.11	.11	02	60:	.04	.19	00	05	.14	.02
25 Unit: audit + tax & legal (Deloitte)	.28	.45	20	.05	23	19	.01	25	11	.03	14	11:
26 Unit: consultancy + finance (Deloitte)	60:	.29	90.	20	15	05	.10	90.	14	.15	20	.05
27 Unit: central & support (Deloitte)	.07	.25	04	02	13	18	05	03	07	00.	.02	.05
		, ,		,		•			1	:		

N = 519. Correlations above |.12| are significant at p < .01, correlations above |.09| are significant at p < .05 (2-tailed)

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	90. 0.9 1. 0. 0.0 1. 0. 0.0 1. 0. 0.0 1. 0. 0.0 1. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.
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Fable 5.17 – Cont.	- 2 & 4 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
Та	

1.22 and 1.78, which is below the rule-of-thumb cut-off of 10 (Hair et al., 1998), hence, multicollinearity issues seem not to be a problem.

T-tests (p < .05; two tailed) indicate that the mean level of managers' exploration activities (4.45) is significantly lower than the mean level of exploitation activities (5.00). Furthermore, the mean level of top-down knowledge inflows (3.88) is significantly lower than horizontal (4.10) knowledge inflows, which in turn is significantly lower than bottom-up (4.37) knowledge inflows. The fact that the level of top-down knowledge inflows is that low could indicate that, as intended, we did not measure with the top-down knowledge inflow scale the taking of commands or orders, as in that case, the extent of top-down 'knowledge' inflows would probably have been larger.

Finally, the correlations as shown in table 5.17 of the relationships between the knowledge inflow scales and between the organizational factors give some interesting insights; first, the three knowledge inflow scales, i.e. the topdown, bottom-up, and horizontal knowledge inflow scale, all significantly and positively relate to each other. This is a common finding in studies measuring various knowledge inflow directionalities (Gupta & Govindaraja, 2000; Schulz, 2001; 2003), indicating that the three types of knowledge inflows 'are distinct, albeit related, variables not only conceptually (Gupta & Govindarajan, 1991), but also empirically' (Gupta & Govindarajan, 2000: 484). The positive correlations indicate furthermore that the various types of knowledge inflows are not mutually exclusive. Second, organizational factors as common features of coordination capabilities all significantly and positively relate to each other. This is also the case for the two organizational factors as common features of systems capabilities and the two organizational factors as common features of socialization capabilities. Third, organizational factors as common features of systems capabilities tend neither to significantly relate to organization factors associated with coordination capabilities, nor with those associated with socialization capabilities. Organizational factors as common features of coordination capabilities significantly and positively relate to organizational factors as common features of and socialization capabilities. Implications of these findings are discussed in the concluding chapter.

Organizational Factors and Managers' Exploration & Exploitation Activities

The first part of this study's hypotheses is about the *direct impact* of the organizational factors on managers' exploration and exploitation activities. Table 5.18 shows the hierarchical regression results for exploration; table 5.19 shows the results for exploitation. In both tables, model 1 is the baseline models containing the control variables. The coefficients as shown in model 2 pertain to the total effect of the organizational factors on exploration (table 5.18) and on exploitation (table 5.19), i.e. both their direct and indirect effects. To gain insight into the direct effects only of the organizational factors, we have to look at the full model; model 5 of both tables.

Regarding the control variables, hierarchical level, functional, and unit effects on managers' exploration and exploitation activities are significantly present in all models. We already learned from sections 5.2, 5.3, and 5.4 that, within all three companies, front-line managers tend to specialize in either exploration or exploitation within distinct organization units, whereas top- and middle-level managers have more consistent levels of exploration and exploitation across organization units. Model 5 of tables 5.18 and 5.19 show furthermore that top-level managers tend to engage significantly more in exploitation activities than front-line managers, and that middle-level managers tend to engage significantly more in both exploration and exploitation activities than front-line managers. Furthermore, managers with a research and development function conduct significantly more exploration activities than managers with an operations function. Finally, managers at Rabobank's retail unit and whole sale unit, and managers at Deloitte's audit, tax & legal units have significantly lower levels of exploration activities than those at the reference group, i.e. Deloitte's central & support unit, whereas managers at Philips' innovative products units have significantly higher levels of exploration. Managers at Rabobank's operations unit and those at Deloitte's consulting and finance units have lower levels of exploitation activities than managers at Deloitte's central & support unit, whereas managers at Philips' production support unit have higher levels of exploitation. Concluding, the data confirms that hierarchical level, functional, and unit effects influence managers' exploration and exploitation activities. Moreover, differences with respect to managers' exploration and exploitation activities between hierarchical levels, functions, and organization units within the companies are largely as expected (see chapter 4, section 4.5.4 for a discussion on control variables).

Table 5.18 - Integrated Data (Rabobank and Philips and Deloitte): Results of Hierarchical Regression Analyses^a: Impact of Organizational Factors and Managers' Knowledge Inflows on Managers' Exploration Activities

			Exploration	Exploration Activities		
Control Variables	Model 1	Model 2	Model 3	Model 4a	Model 4b	Model 5
Hierarchical level: top	.14 **	[†] 70.	90.	.05	90.	.05
Hierarchical level: middle	.16 ***	.12 **	** 11.	.10 **	.12**	.11 **
Function: 'R & D'	* 14	80.	*10	80.	.07	.08
Function: 'M & S'	90.	.02	.05	.02	.02	.03
Unit: retail (Rabobank)	12	15*	18 **	20 **	13*	19**
Unit: whole-sale (Rabobank)	03	10	07	14*	90:-	11*
Unit: operations (Rabobank)	40.	05	04	80	03	08
Unit: innovative products (Philips)	.24 ***	.16 **	*11.	.10*	.15**	.10*
Unit: standard products (Philips)	.19 **	*11.	.05	.05	*11.	.05
Unit: production support (Philips)	.13 **	.07	.05	.04	.08	.04
Unit: Audit, Tax, Legal (Deloitte)	17*	17*	21 **	19 **	19**	21 **
Unit: Cons., Finance (Deloitte)	90.	03	02	04	05	05
Organizational Factors of Coordination Capabilities						
Participation in decision making		.18 ***		.13 **	.13 **	.10*
Participation in cross-functional interfaces		.15 ***		.12 **	* 60.	*80
Rewards based on overall firm perform.		.16 ***		.13 **	.11**	* 60.
Organizational Factors of Systems Capabilities						
Formalization of tasks		* 60'-		* 80'-	10**	10**
Use of IT-systems to conduct tasks		13 ***		13 ***	10**	11 **
Organizational Factors of Socialization Capabilities						
Connectedness to other organization members		01		00	03	02
Tolerance for ambiguity of mgr.'s peers and/ or superiors		.19 ***		.14**	.14**	.11**
Knowledge Inflows						
Top-down			.02			.05
Bottom-up			.26 ***	.22 ***		.18***
Horizontal			.34 ***		.26 ***	.22 ***
R-squared	.22	.43	4.	.46	.47	.50
Adjusted R-squared	.20	.41	.43	4.	.45	.47
F improvement of fit	11.8 ***	26.4 ***	67.1 ***	30.1 ***	40.5 ***	21.4 ***
a Standardized represeive coefficients: $N=510 \div n < 10 \cdot * n < 05 \cdot ** n < 01 \cdot *** n < 001$	/10.*n/	15. ** " / 01.	*** 0/1			

^aStandardized regression coefficients; N = 519; † p < .10; * p < .05; ** p < .01; *** p < .001

Table 5.19 - Integrated Data (Rabobank and Philips and Deloitte): Results of Hierarchical Regression Analyses^a: Impact of Organizational Factors and Managers' Knowledge Inflows on Managers' Exploitation Activities

		Ex	Exploitation Activities	ties	
Control Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Hierarchical level: top	*10	.13 **	*10	.13 **	.12 **
Hierarchical level: middle	*11.	.12 **	*10	*11.	*11.
Function: 'R & D'	15*	12	07	90	90:-
Function: 'M & S'	.03	90.	90:	.07	.07
Unit: retail (Rabobank)	90:	90:	05	03	04
Unit: whole-sale (Rabobank)	9.	90.	60:-	04	05
Unit: operations (Rabobank)	05	04	18 **	14*	15*
Unit: innovative products (Philips)	00.	01	02	04	05
Unit: standard products (Philips)	.14 *	60:	.12	90:	.05
Unit: production support (Philips)	.14*	*11.	*11.	.10	₊ 60°
Unit: Audit, Tax, Legal (Deloitte)	80.	.10	90:	.07	90.
Unit: Cons., Finance (Deloitte)	16 *	10	17 **	11	11
Organizational Factors of Coordination Capabilities					
Participation in decision making		± 60° -		+60	10*
Participation in cross-functional interfaces		.03		.01	00.
Rewards based on overall firm perform.		04		⁺ 60	10
Organizational Factors of Systems Capabilities					
Formalization of tasks		.34 ***		.28 ***	.29 ***
Use of IT-systems to conduct tasks		*10		,02 ,07	⁺ 20.
Organizational Factors of Socialization Capabilities					
Connectedness to other organization members		01		02	02
Tolerance for ambiguity of mgr.'s peers and/ or superiors		.01		03	03
Knowledge Inflows					
Top-down			.32 ***	.25 ***	.24 ***
Bottom-up			03		.05
Horizontal			08		01
R-squared	.10	.23	.17	.27	.27
Adjusted R-squared	80.	.20	.15	.24	.23
F improvement of fit	4.68 ***	11.7 ***	14.4 ***	26.0 ***	9.05 ***
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^aStandardized regression coefficients; N = 519; $\dagger p < .10$; * p < .05; ** p < .01; *** p < .001

Regarding managers' exploration activities, model 5 of table 5.18 shows the direct effects of the organizational factors. That is the effect of the organizational factors on managers' exploration activities while controlling for the effect of managers' knowledge inflows on their exploration activities. Model 5 shows that, as expected, all three organizational factors of coordination capabilities are positively, significantly, and directly related to exploration activities; participation in decision making ($\beta = .10$, p < .05), participation in cross-functional interfaces ($\beta = .08$, p < .05), and rewards based on overall firm performance ($\beta = .09$, p < .05). Hence, hypotheses 1a, 2a, and 3a are supported. Furthermore, as expected, both organizational factors of systems capabilities are negatively, significantly, and directly related to exploration activities; formalization of tasks ($\beta = -.10$, p < .01) and the use of IT-systems to conduct tasks ($\beta = -.11$, p < .01), indicating that hypotheses 4a and 5a are supported. Finally, the coefficient for connectedness to other organization members is not significant; hypothesis 6a not supported. Only tolerance for ambiguity of a manager's peers and/ or superiors ($\beta = .11$, p < .01) as an organizational factor of socialization capabilities affects, positively and directly, managers' exploration activities; hypothesis 7a is supported.

Regarding managers' exploitation activities, model 5 of table 5.19 shows the direct effects of the organizational factors. That is the effect of the organizational factors on managers' exploitation activities while controlling for the effect of managers' knowledge inflows on their exploitation activities. Model 5 shows that two coefficients of the organizational factors associated with coordination capabilities are significantly and negatively related to exploitation; participation in decision making ($\beta = -.10$, p < .10) and rewards based on overall firm performance ($\beta = .10$, p < .10), hence, hypotheses 1b and 3b are supported whereas hypothesis 2b is not supported. Both organizational factors of systems capabilities; formalization of tasks ($\beta = .29$, p < .001) and the use of IT-systems for conducting tasks ($\beta = .07$, p < .10) are, as expected, positively, significantly, and directly related to exploitation activities; hypotheses 4b and 5b are supported. Finally, the coefficients for connectedness to other organization members and tolerance for ambiguity of a manager's peers and/or superiors are not significant. So, unexpectedly, organizational factors of socialization capabilities have no direct effect on managers' exploitation activities; hypotheses 6b and 7b are not confirmed.

Organizational Factors and Managers' Knowledge Inflows

The second part of this study's hypotheses is about the impact of organizational factors on managers' knowledge inflows. Table 5.20 shows the corresponding hierarchical regression results for top-down, bottom-up, and horizontal knowledge inflows. In all three series of regression analyses, models 1 are the baseline models containing the control variables. Models 2 are the full models, which show that, among the *control variables*, hierarchical level effects can be found regarding bottom-up knowledge inflows; top- and middle-level managers have more bottom-up knowledge inflows than frontline managers. Significant functional effects can only be found regarding top-down knowledge inflows; R&D managers and marketing and sales managers significantly have less top-down knowledge inflows than operations managers. Significant unit effects are mainly present for top-down and bottom-up knowledge inflows. Managers at Rabobank's and Philips' units significantly have more top-down and bottom-up knowledge inflows than managers at Deloitte's central & support unit. Managers at Rabobank's whole sale unit tend to have less horizontal knowledge inflows than managers Deloitte's central & support unit.

Regarding managers' top down- knowledge inflows, model 2a of table 5.20 shows that two organizational factors of coordination capabilities are positively and significantly related to top-down knowledge inflows; participation in cross-functional interfaces ($\beta = .09$, p < .05) and rewards based on overall firm performance ($\beta = .19$, p < .001); hypothesis 8a is not confirmed; hypotheses 9a and 10a are confirmed. Both organizational factors of systems capabilities are, as expected, positively and significantly related to top-down knowledge inflows; formalization of tasks ($\beta = .20$, p < .001), and the use of IT-systems to conduct tasks ($\beta = .17$, p < .001); hypotheses 11 and 12a are confirmed. Finally, the data does not confirm the expected influence of organizational factors of socialization capabilities on top-down knowledge inflows; whereas the coefficient of connectedness to other organization members is not significant, the coefficient of tolerance for ambiguity of a manager's peers and/ or superiors is significant, but positive ($\beta = .11, p < .05$), hence tolerance for ambiguity of a manager's peers and/ or superiors positively, in stead of negatively, relates to a manager's top-down knowledge inflows; hypotheses 13a and 14a are not confirmed.

Regarding managers' bottom-up knowledge inflows, model 2b of table 5.20 shows that, as expected, all three organizational factors of coordination capabilities are significantly and positively related to bottom-up knowledge

inflows; participation in decision making (β = .20, p < .001), participation in cross-functional interfaces (β = .12, p < .01), and rewards based on overall firm performance (β = .13, p < .01). Unexpectedly, none of the organizational factors pertaining to systems capabilities are significantly related to bottom-up knowledge inflows. Furthermore, only tolerance for ambiguity of a manager's peers and/ or superiors (β = .18, p < .001) as an organizational factor of socialization capabilities is significantly, and as expected positively, related to bottom-up knowledge inflows. Hypotheses 8b, 9b, 10b, and 14b are confirmed; hypotheses 11b, 12b, and 13b are not.

Regarding managers' horizontal knowledge inflows, model 2c of table 5.20 shows that, as expected, all three organizational factors of coordination capabilities are significantly and positively related to horizontal knowledge inflows; participation in decision making (β = .18, p < .001), participation in crossfunctional interfaces (β = .22, p < .001), and rewards based on overall firm performance (β = .20, p < .001); hypotheses 8c, 9c, and 10c are confirmed. Regarding organizational factors associated with systems capabilities, the coefficient for formalization of tasks is not significant; hypothesis 11c is not confirmed. Hence, only the use of IT-systems to conduct tasks (β = -.11, p < .01) is negatively related to horizontal knowledge inflows; hypothesis 12c is confirmed. Finally, as expected, with respect to organizational of socialization capabilities; connectedness to other organization members (β = .09, p < .05) and tolerance for ambiguity of a manager's peers and/ or superiors (β = .19, p < .001) positively and significantly relate to horizontal knowledge inflows; hypotheses 13c and 14c are confirmed.

Knowledge Inflows and Managers' Exploration and Exploitation Activities

The third part of this study's hypotheses is about the impact of managers' knowledge inflows on their exploration and exploitation activities. Tables 5.18 and 5.19 show the corresponding regression analyses. On the impact of managers' knowledge inflows on their *exploration activities*, table 5.18, model 5, shows that, as expected, top-down knowledge inflows are not significantly related to managers' exploration activities, whereas both bottom-up knowledge inflows ($\beta = .18$, p < .001) and horizontal knowledge inflows ($\beta = .22$, p < .001) are significantly and positively related to managers' exploration activities; hypotheses 16 and 17 are confirmed. Table 5.19, model 2, shows that, regarding *exploitation activities*, also as expected, top-down knowledge inflows ($\beta = .24$, p < .001) are

Table 5.20 - Integrated Data (Rabobank and Philips and Deloitte): Results of Hierarchical Regression Analyses^a: Impact of Organizational Factors on Managers' Knowledge Inflows

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	Top-Down Knowl. Inflows	owl. Inflows	Bottom-∪p K	Bottom-Up Knowl. Inflows	Horizontal K	Horizontal Knowl. Inflows
Control Variables	Model 1a	Model 2a	Model 1b	Model 2b	Model 1c	Model 2c
Hierarchical level: top	.05	.03	.13 **	.08	.14 **	.03
Hierarchical level: middle	90.	.04	.12*	,02 ,02	90:	00.
Function: 'R & D'	22 ***	23 ***	.05	01	90:	.02
Function: 'M & S'	80	11	.01	03	.03	03
Unit: retail (Rabobank)	.36 ***	.34 ***	.26 ***	.24 ***	90:-	80
Unit: whole-sale (Rabobank)	.40 ***	.39 ***	.22 **	.19 **	80	15*
Unit: operations (Rabobank)	.45 ***	.42 ***	.22 **	.15*	.03	80
Unit: innovative products (Philips)	.12*	*11.	.34 ***	.26 ***	.11	.04
Unit: standard products (Philips)	.16*	.12*	.36 ***	.28 ***	.13*	.03
Unit: production support (Philips)	.11*	.07	.23 ***	.17**	80.	01
Unit: Audit, Tax, Legal (Deloitte)	.10	.11	.11	.12	40.	.07
Unit: Cons., Finance (Deloitte)	.05	.05	.12	90.	.11	.07
Organizational Factors of Coordination Capabilities						
Participation in decision making		00.		.20 ***		.18 **
Participation in cross-functional interfaces		* 60.		.12 **		.22 ***
Rewards based on overall firm perform.		.19 ***		.13 **		.20 ***
Organizational Factors of Systems Capabilities						
Formalization of tasks		.20 ***		05		.04
Use of IT-systems to conduct tasks		.17***		03		11 **
Organizational Factors of Socialization Capabilities						
Connectedness to other organization members		.02		03		* 60.
Tolerance for ambiguity of mgr.'s peers/ superiors		.11 **		.18***		.19 ***
R-squared	.23	.39	.16	.33	80.	.38
Adjusted R-squared	.21	.37	.14	.30	90.	.36
F improvement of fit	12.4 ***	19.5 ***	7.95 ***	17.8 ***	3.85 ***	34.5 ***
	4	**	***	001		

^aStandardized regression coefficients; N = 519; † p < .10; * p < .05; ** p < .01; *** p < .001

significantly and positively related to managers' exploitation activities; hypothesis 15 is confirmed. Furthermore as expected, bottom-up and horizontal knowledge inflows are not significantly related to managers' exploitation activities.

The Mediating Role of Knowledge Inflows

Finally, this study argues that managers' knowledge inflows act as mediators between the organizational factors and managers' exploration and exploitation activities, or, in other words, that the organizational factors indirectly effect managers' exploration and exploitation activities through their influence on managers' knowledge inflows. See table 5.21 for an overview of these indirect effects. In this section, we will assess these mediation effects of knowledge inflows, or, in other words, the indirect effects of the organizational factors, with help of this section's regression analyses, i.e. those in tables 5.18, 5.19, and 5.20. We will also provide statistical tests for the mediation effects. To assess mediation effects with regression analyses, the following regression equations should be estimated with several conditions to hold (Baron & Kenny, 1986; Gibson & Birkinshaw, 2004):

First, the independent variables (organizational factors) must affect the mediators (managers' knowledge inflows). This refers to models 2 in table 5.20, which indicate that, (1) participation in cross functional interfaces, rewards based on overall firm performance, formalization of tasks, the use of IT-systems to conduct tasks, and tolerance for ambiguity of a manager's peers and/ or superiors affect top-down knowledge inflows, (2) that participation in decision making, participation in cross functional interfaces, rewards based on overall firm performance, and tolerance for ambiguity of a manager's peers and/ or superiors affect bottom-up knowledge inflows, and (3) that all organizational factors, but formalization of tasks, affect horizontal knowledge inflows. All, but one (the relation between tolerance for ambiguity of a manager's peers and/ or superiors and top-down knowledge inflows), directionalities are as hypothesized.

Second, the independent variables (organizational factors) must be shown to affect the dependent variables (managers' exploration and exploitation activities). This refers to models 2 in tables 5.18 and 5.19, which show that all organizational factors, but one (formalization of tasks) significantly relate to exploration. Four organizational factors significantly relate to exploitation; participation in decision making and rewards based on overall firm performance as organizational factors of coordination capabilities, and both common features of

systems capabilities, i.e. formalization of tasks and use of IT-systems to conduct tasks. All directionalities are as hypothesized.

Third, the mediators (managers' knowledge inflows) must affect the dependent variables (managers' exploration and exploitation activities), with the independent variables controlled for. This refers to models 4 in tables 5.18 and 5.19, which show that managers' bottom-up (β = .22, p < .001) and horizontal (β = .26, p < .001) knowledge inflows positively and significantly relate to managers' exploration activities, and that top down knowledge inflows positively and significantly relate to manager's exploitation activities (β = .25, p < .001). All directionalities are as hypothesized.

If the previous three conditions all hold in the predicted directions, then, for mediation to exist, the effect of the organizational factors must be less in models 4 of tables 5.18 and 5,19 than in models 2 of tables 5.18 and 5.19 (Baron & Kenny, 1986)⁷. Perfect mediation holds if the organizational factors have no effect when the knowledge inflows are controlled for. As expected, this is not the case as show models 4 in tables 5.18 and 5.19; the organizational factors in models 4 have coefficients larger than zero. It matters in that case to examine if these coefficients are smaller than in models 3. A reduction of the size of the coefficients of organizational factors, but not to zero, and a reduction in significance level, indicates that the knowledge inflows mediate the relation between these organizational factors and managers' exploration and exploitation activities, and that either the organizational factors also directly affect exploration and exploitation activities, or the operation of multiple mediating factors (Baron & Kenny, 1986).

Taking the above mentioned conditions into consideration, and examining tables 5.18, 5.19, and 5.20 shows that *top-down knowledge inflows* mediate the relation between and the use of IT-systems to conduct tasks and managers' exploitation activities. *Bottom-up knowledge inflows* mediate the relation between participation in decision making, participation in cross-functional interfaces, rewards based on overall firm performance, and tolerance for ambiguity of a manager's peers and/or superiors, and managers' exploration activities. *Horizontal*

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⁷ As models 3 and 5 in tables 5.17 and 5.18 show that top-down knowledge inflows not significantly relate to exploration, and that bottom-up and horizontal knowledge inflows not significantly relate to exploitation, it makes no sense to examine either mediation effects of top-down knowledge inflows regarding exploration, or mediation effects of bottom-up and horizontal knowledge inflows regarding exploitation.

Table 5.21^{ab} – The Mediating Role of Managers' Knowledge Inflows: Indirect Effects of Organizational Factors on Managers' Exploration and Exploitation Activities via Managers' Knowledge Inflows

	Indirec	Indirect effect organizational	izational	Indirect 6	Indirect effect organizational	izational
	fact	factors on exploration	<u>ation</u>	factor	factors on exploitation	tation
	Top-down	Fop-down Bottom-up Horizontal	Horizontal	Top-down	Bottom-up	Fop-down Bottom-up Horizontal
Org. factors as common features of coordination caps.	as mediator	as mediator as mediator as mediator	as mediator	as mediator as mediator as mediator	as mediator	as mediator
Participation in decision making	00	** 40.	** **	00	.01	00.
Participation in cross-functional interfaces	00.	* 70.	*** 50.	.02	.01	00.
Rewards based on overall firm perform.	.01	.02 *	.04 **	*** 50.	.01	00.
Org. factors as common features of systems caps.						
Formalization of tasks	.01	01	.01	*** 50.	00	00.
Use of IT-systems to conduct tasks	.01	00	03 *	.04 **	00	00
Org. factors as common features of socialization caps.						
Connectedness to other organization members	00.	00	.02	.01	00	00.
Tolerance for ambiguity of mgr.'s peers and/ or superiors	.01	.03 **	.04 ***	.03 *	.01	00.
action direction to the state of the state o	hasad on 7 r	/ u * . 2011/07	05. ** 2 01.	*** n < 001		

^aStandardized coefficients; N = 519; Significance levels based on Z-values: *p < .05; **p < .01; *** p < .001

^bAccording to Kenny et al. (1998: 260), "The amount of mediation is defined as the reduction of the effect on the initial variation on the of bottom-up knowledge inflows on exploration ('b') is .18 (see model 5 table 5.17). The mediating effect then is $.20^*.18 = .04$ (see this table). Baron & Kenny (1986) provide a significance test for ab: the standard error of ab equals approximately the square root of $(b^2s_a^2)$ or ab". Example: the effect of participation in decision making on bottom-up knowledge inflows ('a') is .20 (see table 5.19). The effect $+ a^2 s_b^2 + s_a^2 s_b^2$), hence the Z-value of ab equals approximately ab/sqrt($b^2 s_a^2 + a^2 s_b^2 + s_a^2 s_b^2$); Z-values larger than 1.96 in absolute value outcome. This difference in coefficients can be shown to equal exactly the product of the effect of X on M times the effect of M on Y are significant at the .05 level. Table 5.20 shows the mediating effects and corresponding significance levels. *knowledge inflows* mediate the relation between all organizational factors and managers' exploration activities, but not for formalization of tasks and connectedness to other organization members.

Following Gibson and Birkinshaw (2004), we also conducted statistical significance tests for mediation; i.e. we conducted significance tests for the indirect effects of the organizational factors on managers' exploration and exploitation activities via managers' knowledge inflows; see table 5.21. These tests indicate that the mediating roles as identified above are significant (absolute Z-values of indirect effects > 1.96 are significant at p > .05). Moreover, three other significant indirect effects are identified; first, top-down knowledge inflows significantly mediate the relation between rewards based on overall firm performance and managers' exploitation activities. Whereas rewards based on overall firm performance have a direct negative effect on exploitation ($\beta = -.10$, p < .10; see model 5 of table 5.19), they have a positive indirect effect on exploitation ($\beta = .05$, p < .001; see table 5.21) via their positive effect on managers' top-down knowledge inflows. Second, top-down knowledge inflows significantly mediate the relation between formalization of managers' tasks and managers' exploitation activities. Although the significance level of the coefficient of formalization of tasks did not reduce when the top-down knowledge inflow scale was entered into the regression equation, its size decreased (compare models 2 and 4 of table 5.19), resulting into a significant indirect effect on exploitation via top-down knowledge inflows ($\beta = .05$, p < .001; see table 5.21). Third, top-down knowledge inflows significantly mediate the relation between tolerance for ambiguity of a manager's peers and/or superiors and this manager's exploitation activities. Whereas tolerance for ambiguity of a manager's peers and/or superiors has a direct negative effect on exploitation ($\beta = -.03$, not significant; see model 5 of table 5.19), it has a positive indirect effect on exploitation ($\beta = .03$, p < .05; see table 5.21) via its positive effect on managers' top-down knowledge inflows.

Structural Equation Modeling: Goodness of Fit Assessment and Comparison with Competing Models

We conducted structural equation modeling, using EQS, to assess the goodness of fit of our model, and compare it with competing models. Structural equation modeling was not appropriate for the separate datasets, as this method for analyzing path models requires a minimum sample size of about 200, although for

more complex models, a sample size of at least about 500 is recommended (Byrne, 1994; Kline, 1998). Our integrated dataset has a sample size of 519.

Regarding the mediating role of managers' knowledge inflows, we argued based on studies pertaining to the knowledge literature (e.g. Grant, 1996; Kogut & Zander, 1996) that knowledge inflows of a manager mediate the relationship between organizational factors as common features of combinative capabilities and this manager's exploration activities and exploitation activities. We did, however, not expect 'perfect mediation' (cf. Baron & Kenney, 1986: 1177) to hold, i.e. based on current studies which examine the role of organizational factors (e.g. Adler et al., 1999; Benner and Tushman, 2002; 2003; Ghemawat & Ricart I Costa, 1993; Gibson & Birkinshaw, 2004; Jansen et al., 2005a; McGrath, 2001; Rivkin & Siggelkow, 2003; Sheremata, 2000), we expect the organizational factors to have also a direct impact on managers' exploration and exploitation activities besides their indirect effect via managers' knowledge inflows.

Table 5.22 – Integrated Data (Rabobank and Philips and Deloitte): Comparison of Structural Equation Models^a

	Model and Structure	χ2	df	Δχ2	NFI	CFI	RMSEA
1 This study's model	OF \rightarrow KIF \rightarrow E + E and OF \rightarrow E + E	97.12	20		.93	.94	.086
2 Perfect mediation	$OF \rightarrow KIF \rightarrow E + E$	246.38	34	149.26	.81	.83	.110
3 No mediation	$OF + KIF \rightarrow E + E$	593.47	41	496.35	.54	.55	.161

 $^{^{}a}$ OF = organizational factors as common features of combinative capabilities (seven variables); KIF = managers' top-down, bottom-up, and horizontal knowledge inflows (three variables); E + E = managers' exploration activities and managers' exploitation activities (two variables).

To assess the extent to which the data provides support to our conceptual model as compared to competing models, we tested one nested model and one alternative model against the model of this study. As table 5.22 model 1 shows, fit indexes of our model show a good fit ($\chi 2_{20df} = 97.12$; NFI = .93; CFI = .94; RMSEA = .086). This model contains paths from the organizational factors to the knowledge inflows, from the knowledge inflows to exploration and exploitation activities, and from the organizational factors to exploration and exploitation activities. In the nested model, model 2 in table 5.22, knowledge inflows fully mediate the relationship between organizational factors and managers' exploration and exploitation activities, i.e. there are no direct relationships specified from the

organizational factors to exploration and exploitation activities. In the alternative model, model 3 in table 5.22, knowledge inflows do not mediate, i.e. knowledge inflows and organizational factors only directly relate to managers' exploration and exploitation activities. As table 5.22 shows, the chi-square of model 1 is significantly better than the chi-squares of models 2 and 3. Moreover, models 2 and 3 do not fit the data well. In all three models, the three organizational factors as common features of coordination capabilities were allowed to relate to each other. The same applies for the two organizational factors as common features of systems capabilities and the two organization factors as common features of socialization capabilities.

In summary, the results shown in table 5.22 support not only the proposition that managers' knowledge inflows mediate the relationship between organizational factors and managers' exploration and exploitation activities, but indicate moreover that direct relationships exist as well between the organizational factors and exploration and exploitation.

Finally, we estimated parameters of the paths in structural equation model 1, i.e. the model corresponding to our hypotheses, with their accompanying *t*-values and R-squares. As expected (Byrne, 1994; Kline, 1998), this structural equation analysis does not provide additional or different insights as compared to the regression analyses as already conducted in this section; it provides the same parameters, significance levels, and R-squares as reported in model 5 of tables 5.18 and 5.19, and models 2 of table 5.20. Therefore, we will limit our discussion on this study's findings to the findings reported from the regression analyses (tables 5.18, 5.19. and 5.20).

5.7 – Conclusion

We analyzed the quantitative data in this chapter. The results from the first three sections, pertaining to the data collected at successively Rabobank, Philips, and Deloitte, are consistent. This made us decide to merge the data and to subsequently analyze this combined dataset. About three quarters of the hypothesized relationships are supported by the data. The other relationships are not supported because the associated regression coefficients are not significant. There is one exception; the coefficient of the relationship between tolerance for ambiguity of a manager's peers and/ or superiors and top-down knowledge inflows is significant

(hypothesis 14a), but the relationships appears to be reversed as from predicted, i.e. positive in stead of negative. Results with respect to the control variables were largely as expected, i.e. as discussed in section 4.5.4. The data supported furthermore the argument that managers' knowledge inflows mediate the relationship between organizational factors and managers' exploration and exploitation activities. This mediating role appears to apply, however, with respect to certain, and not all, organizational factors. Structural equation modeling indicated that our model, i.e. the model in which organizational factors both directly and indirectly affect managers' exploration and exploitation activities and, hence, managers' knowledge inflows mediate the relationships between organizational factors and managers exploration and exploitation activities, has a good fit to the data. Moreover, our model has a significant better fit than the competing model in which the organizational factors have no direct effect on exploration and exploitation, i.e. the model in which the knowledge inflows perfectly mediate, and the model in which knowledge inflows not mediate at all. The next chapter will elaborately discuss the empirical findings.

CHAPTER 6 – DISCUSSION AND CONCLUSION

6.1 – Introduction

Firms face difficulties to manage concurrently exploration and exploitation, because of tensions between the two (Levinthal & March, 1993; March, 1991). Previous research illustrates how various organizational factors impact upon firm or unit level exploration and exploitation processes or outcomes (e.g. Adler et al., 1999; Benner & Tushman, 2002; 2003; Ghemawat & Ricart I Costa, 1993; Gibson & Birkinshaw, 2004; Jansen et al, 2005a; Leana & Barry, 2000; Levinthal & March, 1993; Rivkin & Siggelkow, 2003; Sheremata, 2000). There is, however, a lack of understanding about exploration and exploitation at the manager level of analysis; the literature review indicated as a valuable subject of investigation, managers' exploration and exploitation activities, and, to understand how these activities come about, to investigate the impact of organizational factors and managers' knowledge acquisition activities. Accordingly, the purpose of this study was to enhance conceptually and empirically validated understanding about how organizational factors and managers' knowledge inflows influence managers' exploration and exploitation activities. We specified organizational factors as common features of combinative capabilities (c.f. De Boer et al., 1999; Jansen et al., 2005b; Van Den Bosch et al., 1999), and managers' top-down, bottom-up, and horizontal knowledge inflows (cf. e.g. Floyd & Lane, 2000; Gupta & Govindarajan, 2000; Schulz, 2003) as antecedents of managers' exploration and exploitation activities.

To achieve this study's purpose, we first developed, based on the literature, a conceptual model and corresponding hypotheses indicating the causal relationships between the constructs. The conceptual model indicates that the organizational factors not only directly impact upon managers' exploration and exploitation activities, but indirectly as well, i.e. through their impact on managers knowledge inflows. In other words, we argue, based on studies on combinative capabilities and the knowledge literature (e.g. Grant, 1996; Gupta & Govindarajan, 2000; Kogut & Zander, 1992; Schulz, 2003; Van Den Bosch et al., 1999) that knowledge inflows mediate the relationship between organizational factors and managers' exploration and exploitation activities. Subsequently, we tested the hypotheses for managers of large multi-unit knowledge-intense firms operating in

dynamic environments, controlling for hierarchical level, function, and organization unit. We used qualitative data to support the development of the conceptual model, hypotheses, and survey, and to help interpret the quantitative results.

In this final chapter we discuss the empirical findings, illustrate theoretical and managerial implications of the study, discuss its limitations, and identify some interesting directions for future research.

6.2 – Discussion of Findings

Tables 6.1, 6.2, 6.3, and 6.4 show this study's hypotheses and the corresponding empirical findings. Moreover, table 6.1 shows the mediating role of managers' knowledge inflows with respect to exploration; table 6.2 with respect to exploitation. The main research question of this study is 'How do organizational factors and knowledge inflows of managers influence managers' exploration activities and exploitation activities?' Structural equation modeling indicated that our model, i.e. the model in which organizational factors both directly and indirectly affect managers' exploration and exploitation activities and, hence, managers' knowledge inflows mediate the relationships between organizational factors and managers exploration and exploitation activities, has a good fit to the data. Moreover, our model has a significant better fit than the competing model in which the organizational factors have no direct effect on exploration and exploitation, i.e. the model in which knowledge inflows perfectly mediate, and a significant better fit than the model in which knowledge inflows not mediate at all.

The Role of Organizational Factors

We distinguish between direct, indirect, and total effects of organizational factors on manager's exploration (see table 6.1) and exploitation (see table 6.2) activities. The direct effect of an organizational factor is the influence it has on exploration and/ or exploitation while controlling for its influence via knowledge inflows. Hypotheses 1 through 7 (a and b versions) refer to these direct effects. The indirect effect of an organizational factor is the influence it has on exploration and/ or exploitation via its impact on managers' knowledge inflows. Indirect effects can be assessed by examining the influence of the organizational factors on managers' knowledge inflows (see table 6.3 and hypotheses 8 through 14; a, b, and c versions), and the influence of managers' knowledge inflows on their exploration

and exploitation activities (see table 6.4 and hypotheses 15 through 17). The total effect of an organizational factor on exploration and/ or exploitation equals the sum of its direct and indirect effects.

Regarding *direct effects on exploration* (see table 6.1); participation in decision making, participation in cross-functional interfaces, rewards based on overall firm performance, and tolerance for ambiguity of managers' peers and/ or superiors have direct positive impact. Formalization of tasks and use of IT-systems to conduct tasks, have direct negative impact on managers' exploration activities. The relations are as hypothesized and the effects are of the same magnitude; absolute values of the standardized coefficients range between .08 and .11.

Regarding *indirect effects on exploration* (see table 6.1); participation in decision making, participation in cross-functional interfaces, rewards based on overall firm performance, and tolerance for ambiguity of managers' peers and/ or superiors, have indirect positive impact through their positive impact on bottom-up and horizontal knowledge inflows. Use of IT-systems to conduct tasks has indirect negative impact on managers' exploration activities through its negative impact on horizontal knowledge inflows. The coefficients, which indicate the size of these indirect effects, range between .02 and .05.

Regarding *direct effects on exploitation* (see table 6.2); participation in decision making and rewards based on overall firm performance, have direct negative impact. Formalization of tasks and use of IT-systems to conduct tasks, have direct positive impact on managers' exploitation activities. The relations are as hypothesized. The impact of formalization of tasks (standardized coefficient of .29) is larger than the impact of the other organizational factors; absolute values of standardized coefficients of the other organizational factors range between .07 and .10.

Indirect effects on exploitation (see table 6.2) only take place through top-down knowledge inflows; rewards based on overall firm performance, formalization of managers' tasks, use of IT-systems to conduct tasks, and tolerance for ambiguity of managers' peers and/ or superiors have indirect positive effect on managers' exploitation activities. We did not expect a positive indirect effect of tolerance for ambiguity of managers' peers and/ or superiors; we expected negative effect instead. The reason for positive effect to come about is that tolerance for ambiguity of managers' peers and/ or superiors influences the extent to which managers acquire top-down knowledge positively in stead of negatively. The effects of rewards based on overall firm performance and

Table 6.1 – Impact of **Organizational Factors** on **Managers' Exploration Activities** (based on integrated dataset; i.e. Rabobank + Philips + Deloitte)

	Direct effect on exploration and corresponding hypothesis		Indirect effect on exploration via knowledge inflows: knowledge inflows as mediator	loration via knowledge iator	Total
Org. factors as common features of coordination caps.• Manager's participation in decision making	.10* H1a supported	top-down 00	top-down bottom-up00	horizontal .04 **	.18 **
 Manager's participation in cross-functional interfaces 	.08 * H2a supported	00.	*00.	*** 50.	.15 ***
• Manager's rewards based on overall firm performance	.09 * H3a supported	.01	* 700.	.04 ***	.16***
Org. factors as common features of systems caps.					
 Formalization of manager's tasks 	10 ** H4a supported	.01	01	.01	* 60'-
 Manager's use of IT-systems to conduct tasks 	11 ** H5a supported	.01	00	03 *	13 **
Org. factors as common features of socialization caps.					
 Manager's connectedness to other org. members 	02 H6a not supported	d .00	00	.00	01
• Tolerance for ambiguity of mgr.'s peers and/or superiors	.11 ** H7a supported	.01	.03 **	.04 **	***
					Model 2,
Source of standardized regression coefficients ^a . Model 5, table 5.18	Model 5, table 5.18		Table 5.21	_	table 5.18
a † $p < .10; * p < .05; ** p < .01; *** p < .001$					

Table 6.2 - Impact of Organizational Factors on Managers' Exploitation Activities (based on integrated dataset; i.e. Rabobank + Philips +Deloitte)

		Lang and the state of the	Indirect effect on exploitation via	ect on expl	oitation via	Total
	corresp	corresponding hypothesis	knowledge inflows: knowledge inflows as mediator	ledge inflows: know inflows as mediator	knowledge iator	effect
Org. factors as common features of coordination caps.			top-down bottom-up horizontal	pottom-up	horizontal	
Manager's participation in decision making	10	H1b supported	00	.01	00.	+60
 Manager's participation in cross-functional interfaces 	00.	H2b not supported	.02	.01	00.	.03
 Manager's rewards based on overall firm performance 	10	H3b supported	*** 50.	.01	00.	04
Org. factors as common features of systems caps.						
 Formalization of manager's tasks 	***67	29 *** H4b supported	*** 50.	00	00.	.34 ***
 Manager's use of IT-systems to conduct tasks 	[†] 20.	H5b supported	** 40.	00	00	*01.
Org. factors as common features of socialization cans						
Manager's connectedness to other org. members	02	H6b not supported	.01	00	00.	01
 Tolerance for ambiguity of mgr.'s peers and/or superiors 	03	H7b not supported	.03 *	.01	00.	.01
						Model 2, table
Source of standardized regression coefficients ^a : Model 5, table 5.19	Model 5, tal	ole 5.19		Table 5.21		5.19
^a † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$						

Table 6.3 - Impact of Organizational Factors on Managers' Knowledge Inflows (based on integrated dataset; i.e. Rabobank + Philips +Deloitte)

	op-doL	Top-down Kn. Inflows	Bottom	Bottom-up Kn. Inflows	Horizor	Horizontal Kn. Inflows
		Hypothesis		Hypothesis		Hypothesis
Org. factors as common features of coordination caps.						
 Manager's participation in decision making 	00.	H8a not supp.	.20***	20*** H8b supported	.18**	.18*** H8c supported
 Manager's participation in cross-functional interfaces 	*60	H9a supported	.12**	H9b supported	.22**	H9c supported
 Manager's rewards based on overall firm perform. 	.19***	H10a supported	.13**	H10b supported	.20***	20*** H10c supported
Org. factors as common features of systems caps.						
 Formalization of manager's tasks 	.20***	H11a supported	05	H11b not supp.	.04	H11c not supp.
 Manager's use of IT-systems to conduct tasks 	.17**	H12a supported	03	H12b not supp.	11**	H12c supported
Org. factors as common features of socialization cans.						
 Manager's connectedness to other org. members 	.02	H13a not supp.	03	H13b not Supp.	*60	H13c supported
• Tol. for ambiguity of mgr.'s peers and/or superiors	**11.	H14a not supp	.18**	18*** H14b supported	.19***	H14c supported
Standardized regression coefficients (source: table 5.20); $\uparrow p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$	(0); † $p < .1$	0; *p < .05; **p	, < .01; **	* p < .001		

Table 6.4 -Impact of Managers' Knowledge Inflows on Managers' Exploration & Exploitation Activities (based on integrated dataset; i.e. Rabobank + Philips +Deloitte)

	Managers exploration activities		managers exploitation activities	ulon acuvines
Predictor Variables	Hypothesis	hesis		Hypothesis
 Managers' top-down knowledge inflows 	90.		.24**	.24*** H15 Supported
 Managers' bottom-up knowledge inflows 	.18*** H16 Supported	ported	.05	
 Managers' horizontal knowledge inflows 	.22*** H17 Supported	poorted	01	

Standardized regression coefficients (source: model 5 of tables 5.18 and 5.19); $\dagger p < .10$; * p < .05; ** p < .01; *** p < .001

tolerance for ambiguity of managers' peers and/ or superiors are remarkable; their positive and significant indirect effect on exploitation via top-down knowledge inflows is cancelled out by their negative direct effect on exploitation resulting in a non-significant total effect on exploitation.

Regarding the effect of organizational factors on managers' knowledge inflows (see table 6.3), the three organizational factors of coordination capabilities have most effect; they positively influence all three types of knowledge inflows. Organizational factors of systems capabilities have least effect; both of them positively influence only top-down knowledge inflows. One of these factors, managers' use of IT-systems to conduct tasks, also negatively impacts upon horizontal knowledge inflows. Finally, regarding organizational factors of socialization capabilities, managers' connectedness to other organization members positively influences managers' horizontal knowledge inflows. Tolerance for ambiguity of managers' peers and/ or superiors positively influences all three kinds of manager's knowledge inflows.

Summarizing, organizational factors as common features of coordination capabilities have positive direct and indirect effect on managers' exploration activities. They have negative direct effect on exploitation activities. Organizational factors as common features of systems capabilities have negative direct and indirect effect on managers' exploration activities and positive direct and indirect effect on managers' exploitation activities. Finally, regarding organizational factors as common features of socialization capabilities, only tolerance for ambiguity has effect; positive direct and indirect effect on managers' exploration activities and positive indirect effect on exploitation. The relationships as found in the data are merely as hypothesized. However, not all of them appeared to be significant; especially the impact of connectedness to other organization members appears to be rather limited.

The Role of Managers' Knowledge Inflows

Regarding the impact of managers' knowledge inflows on their exploration and exploitation activities (see table 6.4), the empirical findings illustrate, as expected, that top-down knowledge inflows of a manager positively impact upon this manager's exploitation activities, while they do not relate to a manager's exploration activities. Furthermore, as expected, bottom-up and horizontal knowledge inflows of a manager positively impact upon this manager's

exploration activities, while they do not relate to a manager's exploitation activities.

Regarding the mediating role of managers' knowledge inflows, we argued. based on studies pertaining to the knowledge literature and studies on combinative capabilities (e.g. Grant, 1996; Kogut & Zander, 1996; Jansen et al., 2005b; Van Den Bosch et al., 1999), that knowledge inflows of a manager mediate the relationship between organizational factors and this manager's exploration activities and exploitation activities. As expected, we did not find 'perfect mediation' (cf. Baron & Kenney, 1986: 1177). Instead, as expected based on current studies which examine the impact of organizational factors on exploration and exploitation (e.g. Adler et al., 1999; Benner & Tushman, 2002; 2003; Ghemawat & Ricart I Costa, 1993; Gibson & Birkinshaw, 2004; Jansen et al., 2005a; McGrath, 2001; Rivkin & Siggelkow, 2003; Sheremata, 2000), we empirically found the organizational factors to also have direct impact on managers' exploration and exploitation activities, besides their indirect effect via managers' knowledge inflows. Structural equation modeling indicated that the data supports our arguments. The corresponding structural model, i.e. the model which contains paths from the organizational factors to the knowledge inflows, from the knowledge inflows to exploration and exploitation activities, and from the organizational factors to exploration and exploitation activities, has a good fit to the data. Moreover, it has a significant better fit than the competing model in which knowledge inflows perfectly mediate, and the model in which knowledge inflows not mediate at all (see table 5.22; section 5.6).

We used several regression analyses to gain further insight into how managers' knowledge inflows mediate the relationship between organizational factors and managers' exploration and exploitation activities. Tables 6.1 and 6.2 show the empirical findings; significant indirect effects of the organizational factors denote knowledge inflows to significantly mediate the relationship between the corresponding organizational factor and exploration (table 6.1) and/ or exploitation (table 6.2). The findings indicate that specific knowledge inflow directionalities, i.e. top-down, bottom-up, and horizontal, exert a mediating role with respect to certain organizational factors, and not with respect to all organizational factors. More precisely, the findings indicate that managers' top-down knowledge inflows mediate the relationship between rewards based on overall firm performance, formalization of managers' tasks, managers' use of IT-systems, and tolerance for ambiguity of a manager's peers and/ or superiors, and

managers' exploitation activities. Managers' bottom-up and horizontal knowledge inflows mediate the relationship between managers' participation in decision making, participation in cross-functional interfaces, rewards based on overall firm performance, and tolerance for ambiguity of a manager's peers and/ or superiors, and managers' exploration activities. Additionally, managers' horizontal knowledge inflows also mediate the relationship between use of IT-systems and managers' exploration activities.

Summarizing, the empirical findings illustrate that managers' bottom-up and horizontal knowledge inflows positively impact upon their exploration activities, whereas top-down knowledge inflows positively impact upon exploitation activities. The mediating role of knowledge inflows with respect to exploration takes place via bottom-up and horizontal knowledge inflows which particularly mediate the effect of organizational factors associated with coordination capabilities and tolerance for ambiguity of a manager's peers and/ or superiors. With respect to exploitation, the mediating role of knowledge inflows takes place via top-down knowledge inflows, which particularly mediate the effect of organizational factors associated with systems capabilities, rewards based on overall firm performance, and tolerance for ambiguity of a manager's peers and/ or superiors.

Control Variables

Regarding the control variables we found hierarchical level, functional, and organization unit effects on managers' exploration and exploitation activities largely as expected. For instance, managers in research and development type of functions (see section 4.5.4 for classifications) engage more in exploration activities as compared to managers of other functional areas. Managers of units with more dynamic business environments conduct more exploration activities as compared to managers of other units, whereas managers in units with relatively stable environments engage more in exploitation activities.

Regarding hierarchical level, findings indicate that both top-level and middle-level managers tend to engage significantly more in both exploration and exploitation activities than front-line managers. However, the difference with respect to exploration activities is most prevalent in units which focus on exploitation activities, such as Rabobank's retail unit, Philips' production support unit, and Deloitte's audit and tax & legal divisions. In units focusing on exploration activities, such as Philips' innovative products units and Deloitte's

consulting and financial advisory divisions, top-, middle-, and frontline managers tend to engage to the same extent in exploration activities. Furthermore, the differences between levels with respect to exploitation activities only appeared through the regression analyses; i.e. when controlling for the other control variables. The findings indicate furthermore that differences between organization units in terms of exploration and of exploitation are strongly related to front-line managers' exploration and exploitation activities. In other words; front-line managers tend to specialize in either exploration or exploitation within distinct organization units, whereas top- and middle-level managers have more consistent (and relatively high) levels of exploration and exploitation across organization units. Impactions will be discussed in the next section.

6.3 – Implications

Due to the importance for firms in dynamic environments to explore and exploit and difficulties they face doing so, notions on exploration and exploitation are a recurring underlying theme in various management literatures. Consequently, several studies on organizational design, organizational learning, innovation, and strategy research (e.g. Adler et al., 1999; Benner & Tushman, 2002; 2003; Ghemawat & Ricart I Costa, 1993; Gibson & Birkinshaw, 2004; Jansen et al. 2005a; Levinthal & March, 1993; Rivkin & Siggelkow, 2003; Sheremata, 2000), illustrate how various organizational factors impact upon firm or unit level exploration and exploitation processes or outcomes. Notwithstanding these valuable contributions, both researchers and managers still struggle to understand how firms may manage and organize exploration and exploitation and how they may combine the two (cf. Benner & Tushman, 2003; Gibson & Birkinshaw, 2004; Tushman & O'Reilly, 1996). This study contributes to current literature and management practice, having several implications, by increasing conceptually and empirically validated understanding about how organizational factors and intraorganizational knowledge inflows of managers influence managers' exploration activities and exploitation activities.

By investigating exploration and exploitation at the manager level of analysis, this study delivers a general contribution to current studies on exploration and exploitation which lack understanding about exploration and

exploitation at the individual level of analysis (e.g. Benner & Tushman, 2002; Floyd & Lane, 2000; Gibson & Birkinshaw, 2004; He & Wong, 2004; Levinthal & March, 1993; March, 1991; Tushman & O'Reilly, 1996). Based on the literature and in-depth interviews we conceptualized managers' exploration and exploitation activities. We also deliver a contribution by having conducted several steps to develop corresponding survey items as appropriate scale were not yet available in the literature. Reliability and validity analyses of the items and two summated scales indicate that they are reliable and unidimensional, and posses good convergent and discriminant validity.

Regarding the relationship between exploration and exploitation, March (1991: 72) argues that a trade-off exists between exploration and exploitation at several levels. Recently, studies show that exploration and exploitation are not mutually exclusive at the firm-level (He & Wong, 2004) or business unit-level (Gibson & Birkinshaw, 2004). With respect to the relationship between exploration and exploitation at the level of the manager level, this study's findings support the proposition that exploration and exploitation are not mutually exclusive at the manager level of analysis as well. Whereas some managers engage more in exploration activities as compared to exploitation activities, or the other way around, other managers have high levels of both exploration and exploitation. Examining the relation between exploration and exploitation at the three hierarchical levels, for instance, shows that the two only significantly negatively relate to each other at the lowest hierarchical level, i.e. front line managers. This study's data indicates that front-line managers tend to specialize in either exploration or exploitation within distinct organization units, whereas top- and middle-level managers have more consistent and relatively higher levels of both exploration and exploitation across organization units. The results of the exploratory and confirmatory factor analyses (table 4.2) also empirically indicate that exploration and exploitation are two separate dimensions and not the extremes of one continuum.

This study particularly contributes to research which illustrates *how organizational factors impact upon exploration and exploitation and the relation between these two* (e.g. Adler et al., 1999; Benner & Tushman, 2002; 2003; Ghemawat & Ricart I Costa, 1993; Gibson & Birkinshaw, 2004; Jansen et al., 2005a; Leana & Barry, 2000; McGrath, 2001; Rivkin & Siggelkow, 2003; Sheremata, 2000), by investigating conceptually and empirically how

organizational factors influence managers' exploration activities and exploitation activities. Notwithstanding existing studies, authors indicate that current literature and management practice could still benefit from increased understanding how organizational factors affect exploration and exploitation and the relationship between these two (cf. Benner & Tushman, 2003; Gibson & Birkinshaw, 2004; Tushman & O'Reilly, 1996). Existing studies suggest a variety of organizational factors and quite differ among each other with respect to specific organizational factors they consider (see Appendix A). Hence, we may not only deliver an empirical contribution, but also a conceptual one by proving a theoretical argument, based on studies on combinative capabilities, about what factors to include in an analysis about the impact of organizational factors on exploration and exploitation.

The findings (see table 6.1) of this study imply that merely increasing, within an organization or unit, participation in decision making, participation in cross-functional interfaces, rewards based on overall firm performance, and tolerance for ambiguity of organization members, and (consequently) stimulating horizontal and bottom-up flows of knowledge, would increasingly trigger managers' exploration activities without stimulating, or even inhibiting, their exploitation activities. This would eventually lead to 'exploration driving out exploitation' (cf. Levinthal & March, 1993). Furthermore, the findings (see table 6.2) of this study imply that merely increasing, within an organization or unit, formalization of managers' tasks, and managers' use of IT-systems to conduct tasks, and (consequently) stimulating top-down flows of knowledge, would increasingly trigger managers' exploitation activities without stimulating, or even inhibiting, their exploration activities. This would eventually lead to 'exploitation driving out exploration (cf. Levinthal & March, 1993).

Regarding *combining exploration and exploitation* at the manager level and the role of organizational factors, studies on organization design argue that combining various contradictory elements such as for instance centripetal and centrifugal forces (Sheremata, 2000), routine and non-routine tasks (Adler et al., 1999), and hard and soft processes or systems (Gibson & Birkinshaw, 2004) would encourage managers to conduct both exploration and exploitation related activities. As Gibson and Birkinshaw (2004, p. 210) point out, such a combination of organizational factors should enable managers 'to make their own judgments about how to divide their time between conflicting demands for alignment and adaptability'. Or, as Sheremata (2000: 401-2) argues, centrifugal and centripetal

forces must coexist to balance exploration and exploitation; there even may be a positive interaction effect between the two. Jansen et al. (2005a) also argue, and empirically demonstrate at the unit level of analysis, that the interaction between seemingly contradictory organizational factors increases a unit's ability to pursue exploratory and exploitative innovations simultaneously.

Two main arguments against combining, within the same unit, organizational factors which stimulate exploration with those factors which stimulate exploitation may be found in the literature. First, combining such organizational factors seems impossible, if not, then at least very difficult to realize (e.g. Benner & Tushman, 2002; 2003; Duncan, 1976; Ghemawat & Costa, 1993; O'Reilly & Tushman, 2004). Second, combining contradictory organizational factors may "neutralize" or "cancel out" their effect (Christensen & Bower, 1996). For instance, the positive effect of decentralization on exploration may be canceled out by the negative effect of formalization on exploration, and the positive effect of formalization on exploitation. Related to this, Volberda (1998: 61) quotes Weick (1979: 220), who argues that 'The crucial point is that, in effecting the compromise solution, important adaptive responses have been selected against and nonadaptive, moderate responses have been preserved'.

Concluding, different views exist in the literature about the possibility and desirability of combining, within the same unit, organizational factors conducive to exploration with organizational factors conducive to exploitation, and about the effect of combinations of factors on combining exploration and exploitation. Although it was not this study's research question (see chapter 1) to investigate how combinations of organizational factors impact upon managers' combination of both exploration and exploitation, the findings of this study may deliver a contribution to this issue.

First, regarding the possibility of combining organizational factors which positively relate to managers' exploration activities with those which positively relate to managers' exploitation activities, this study's findings suggests that these organizational factors *not* exclude each other; Pearson's correlation coefficients show no significant negative relationships between any pair of organizational factors (see table 5.2). The same applies for pairs of the three kinds of knowledge inflows. Second, regarding the effect of combinations of organizational factors on managers' combination of exploration and exploitation activities, comparing tables 6.1 and 6.2 shows that the positive effect of organizational factors on exploration

is larger than their negative effect on exploitation. Similarly, the positive effect of formalization on exploitation is larger than its negative effect on exploration. The same applies for the three kinds of knowledge inflows. As a result from this, the findings indicate that combinations of any of the four organizational factors which positively relate to exploration with any of the two factors which positively relate to exploitation, positively relate to managers' combination of both exploration and exploitation activities. The same applies for combinations of knowledge inflows. Moreover, post hoc analyses of the empirical data indicates significant positive interaction effects between several combinations of organizational factors on managers' combination of both exploration and exploitation activities.

Concluding, this study's findings contribute to 'contextual ambidexterity' (cf. Gibson & Birkinshaw, 2004) literatures which argue that combining various contradictory elements at lower levels of analysis than the firm level is possible, and that these combinations trigger exploration and exploitation simultaneously (e.g. Adler et al., 1999; Gibson & Birkinshaw, 2004; Rivkin & Siggelkow, 2003; Sheremata, 2000). Our findings indicates that, at the manager level of analysis, organizational factors conducive to exploration (see table 6.1) and organizational factors conducive to exploitation (see table 6.2) not exclude each other (see table 5.2) and that combinations of these factors positively relate to managers' combination of both exploration and exploitation activities. The same applies for combinations of top-down and bottom-up knowledge inflows, and top-down and horizontal knowledge inflows.

The study also delivers a particular contribution to studies on *combinative* capabilities and intra-organizational knowledge flows (Grant, 1996; Gupta & Govindarajan, 2000; Kogut & Zander, 1992; Schulz, 2001; 2003; Szulanski, 1996; Van Den Bosch et al., 1999). Studies on combinative capabilities (Grant, 1996; Kogut & Zander, 1992; Van Den Bosch et al., 1999) suggest that the raison d'être of firms is 'the sharing and transfer of the knowledge of individuals and groups within organizations' (Kogut & Zander, 1992: 383), triggered by organizational factors, to enable exploration and exploitation activities in the firm. This study illustrates this line of reasoning; hypotheses and empirical findings show that knowledge flows within the firm mediate the relationship between organizational factors and managers' exploration and exploitation activities. Hence, this research contributes to studies pertaining to the dynamic capabilities literature, especially to those on combinative capabilities, by conceptually and empirically illustrating the

importance of 'the sharing and transfer' of knowledge (cf. Kogut & Zander, 1992) within a firm for stimulating managers' exploration and exploitation activities. In other words, the effect of organizational factors on managers' exploration and exploitation activities will be limited if the sharing and transfer of knowledge within a firm is impeded.

Furthermore, whereas studies on intra-organizational knowledge flows tend to focus on illustrating how organizational factors impact upon knowledge flows within the firm (Gupta & Govindarajan, 2000; Szulanski, 1996), this study delivers a contribution by investigating and showing the consequences of such knowledge flows in terms of managers' exploration and exploitation activities as well.

We may also contribute to the literature and management practice regarding the issue of how *firms may manage and organize to combine exploration and exploitation* (e.g. Duncan, 1976; Gibson & Birkinshaw, 2004; Jansen et al., 2005; Levinthal & March, 1993; Tushman & O'Reilly, 1996). The findings of this study illustrate how the configuration of organizational factors and knowledge flows within an organization or unit may enable or inhibit managers to respond to particular ways by which a firm may combine exploration and exploitation. On the basis of Jansen (2005) and Volberda (1998), we distinguished three main organizational responses for combining exploration and exploitation; spatial separation, temporal separation and synthesis, as each of these ways place different demands on managers' exploration activities and exploitation activities.

The essence of spatial separation is simultaneously developing explorative and exploitative modes in different places in the organization. Spatial separation can occur by level, function, and/ or location (Volberda, 1998). An example of separation of level and location can be found in firms characterized by structural ambidexterity. According to proponents of structural ambidexterity (e.g. Benner & Tushman, 2003; Duncan, 1976; Tushman & O'Reilly, 1996), top- or corporate-level managers should engage in both exploration and exploitation activities, whereas business unit managers should focus on either exploration or exploitation activities, depending on the focus of their business unit which is either explorative or exploitative. Studies on technological innovation and strategic renewal indicate that firms may deal with tensions between exploration and exploitation by temporally separating the two (Audia et al., 2000; Shepard, 1967; Tushman & Anderson, 1986). This implies for managers at all levels and units that they shift

their focus over time from pursuing incremental innovations or stability to pursuing radical innovations or strategic renewal, or vice versa. Our findings illustrate that for managers in places or time periods focused on exploitation, top-down knowledge inflows, formalization of tasks, and using IT-systems to conduct tasks, would be of particular value. These managers are not helped by participation in decision making and rewards based on overall firm performance, as these negatively relate to managers' exploitation activities; see table 6.2. Our findings illustrate furthermore that for managers in places or time periods focused on exploration, bottom-up and/ or horizontal knowledge inflows, participation in decision making, participation in cross-functional teams, rewards based on overall firm performance, and tolerance for ambiguity of peers and/ or superiors would be of particular value. These managers are not helped by formalization of tasks and using IT-systems to conduct tasks; see table 6.1.

The results pertaining to the control variables illustrate, at least to some extent, spatial separation of exploration and exploitation on the basis of hierarchical level, function, and unit. Regarding hierarchical level and organization unit, studies advocating structural ambidexterity (e.g. Benner & Tushman, 2003; Duncan, 1976; O'Reilly & Tushman, 2004) indicate that managers pertaining to a certain unit should focus on either exploration activities or on exploitation activities, depending on the focus of their unit and that top-level managers should engage in both exploration and exploitation activities. Our data shows that front-line managers tend to specialize in either exploration or exploitation within distinct organization units. However, not only top-, but also middle-managers have more consistent and high levels of exploration and exploitation across organization units.

The third identified organizational response for pursuing both exploration and exploitation is by synthesizing them; that is by creating organizational units in which the tensions between exploration and exploitation are reconciled (Gibson & Birkinshaw, 2004). Such organizational units combine various contradictory elements (cf. Adler et al., 1999; Gibson & Birkinshaw, 2004; Sheremata, 2000) which should encourage managers at all levels, functions, and units to conduct both exploration and exploitation related activities. The discussion earlier in this section on the impact of organizational factors and knowledge inflows on managers' combination of both exploration and exploitation activities indicated that organizational factors conducive to exploration, i.e. participation in decision making, participation in cross-functional interfaces, rewards based on overall firm

performance, and tolerance for ambiguity of peers and/ or superiors, and organizational factors conducive to exploitation, i.e. formalization of tasks, and using IT-systems to conduct tasks, not seem to exclude each other. Moreover, the data indicates that combinations of factors conducive to exploration with factors conducive to exploitation, positively relate to managers' combination of both exploration and exploitation activities. The same applies for combinations of top-down and bottom-up knowledge inflows, and top-down and horizontal knowledge inflows. Hence, these study's findings would suggest that combining these "contradictory" organizational factors would create organizational units in which the tensions between managers' exploration and exploitation activities are reconciled.

Finally, the study may deliver a contribution to *strategy process research* (e.g. Bartlett & Ghoshal, 1993; Floyd & Lane, 2000; Rivkin & Siggelkow, 2003; Van Cauwenberg & Cool, 1982). Various 'organizational models' (Bartlett & Ghoshal, 1993: 44) can be distinguished in the literature on strategy process research in terms of the interaction between the levels of a firm's management structure, i.e. top-, middle-, and front-line managers, and in terms of the activities associated with each of these levels.

Regarding the interactions between hierarchical levels; the exchange of knowledge between managers constitutes an important aspect of these interactions (Floyd & Lane, 2000). This study may deliver a contribution, as quantitative research is lagging behind in the literature on strategy process research regarding the exchange of knowledge between managers across hierarchical levels and associated activities in terms of exploration and exploitation. In the literature on strategy process research, bottom-up knowledge flows are generally associated with exploratory processes such as competence definition processes (Floyd & Lane, 2000), or with autonomous strategic initiatives (Burgelman, 1983a; 1983b). Using quantitative data, this study confirms that bottom-up knowledge flows relate to exploration-related activities of managers. In the literature on strategy process research, top-down knowledge flows are generally associated with exploitative processes such as competence deployment processes (Floyd & Lane, 2000), or induced strategic behavior (Burgelman, 1983a; 1983b). This study shows confirms that top-down knowledge flows relate to exploitation related activities of managers. Moreover, whereas studies on strategy process research tend to focus on knowledge flows and interactions between managers across hierarchical levels,

this paper illustrates the importance of horizontal knowledge flows as well, especially in terms of stimulating managers' exploration activities, or, in combination with top-down knowledge flows, stimulating both exploration and exploitation activities.

Regarding the *locus* of exploration and exploitation activities at different hierarchical levels, various views exist. Traditionally, i.e. in Chandler's (1962) model (cf. Bartlett & Ghoshal, 1993), exploration activities such as searching for opportunities, building capabilities, and creating new strategic intent are assumed to take place at top management level, whereas the exploitation of such opportunities, capabilities and strategy are assumed to take place at lower levels in the organization. This perspective was supported by Prahalad and Hamel (1990) and Stalk et al. (1992), who argue that the development of adequate capabilities depends on the strategic intent (Hamel & Prahalad, 1989) of the CEO or corporate management, based on superior industry foresight (cf. Volberda, 1998). Our data shows that with respect to exploration activities indeed differences exist across hierarchical levels. However, not only top-, but also middle-level managers conduct significantly more exploration activities than front-line managers. This may correspond to other literatures in the field of strategy process research which suggest the importance of middle managers' exploration activities such as stimulating and conducting behavior and strategic initiatives which diverge from existing and official expectations and strategy (Bower, 1970; Burgelman, 1983a), experimenting with new approaches (Chakravarthy, 1982), and facilitating organizational adaptation (Floyd & Wooldridge, 1992).

Moreover, our data indicates that the separation of exploration activities across hierarchical levels is more present in units which focus on exploitation, such as in Rabobank's retail unit, Philips' production support unit, and Deloitte's audit and tax & legal divisions. These units operate in less dynamic environments. In units operating in more dynamic environments, such as in Philips' innovative products units and Deloitte's consulting and financial advisory divisions, top-, middle-, and frontline managers tend to engage to the same extent in relatively high levels of exploration activities. This may illustrate that, as for instance argued by Bartlett and Ghoshal (1993: 24), the traditional model as proposed by Chandler (1962) may not hold for firms or units operating in dynamic environments. Therefore, building on Bower's work (1970), studies on corporate entrepreneurship (e.g. Burgelman, 1983a) and strategic renewal (e.g. Floyd & Lane, 2000) suggest, in contrast to the administrative management perspective,

that perhaps the most effective process of exploring new capabilities is through originating, developing, and promoting strategic initiatives from front-line managers (Burgelman, 1983a; Kimberly, 1979; Quinn, 1985). Correspondingly, our study illustrates that bottom-up flows of knowledge are beneficial for exploration activities. Moreover, in line with these literatures, our study would suggests that top managers may stimulate lower level manager to explore by impacting upon structural contextual characteristics (Bower, 1970; Burgelman, 1991) or by challenging the status quo of the firm (Bartlett & Ghoshal, 1993); i.e. by impacting upon the organizational factors.

6.4 – Limitations and Future Research

This study has limitations, suggesting several issues for future research. First, the study involves cross-sectional data highlighting issues of causal reciprocity. To address the issue of causal reciprocity, future studies could explore organizational factors, knowledge flows and exploration and exploitation activities of managers with longitudinal data. Discussions with other researchers learned that uncertainty with respect to causal directions especially exists with respect to the relationships between knowledge *flows* and exploration and exploitation activities. That is, confusion may exist whether knowledge flows affect the types of activities someone works on, or that the choice of activities affects the type of knowledge flows to come about. We recognized this potential confusion and addressed this issue in the study by focusing on knowledge inflows only, and by indicating that both the knowledge donor and the knowledge recipient may be the initiator of such knowledge inflows. Further insight into the direction of causality between knowledge *flows* and exploration and exploitation activities could be created by examining knowledge *out*flows. That is with respect to our study, future research could examine how a manager's exploration and/ or exploitation activities impact upon the level and directionalities of knowledge outflows of this manager. At the organization unit, Schulz (2001), for instance, shows that a unit's exploration and/ or exploitation activities impact upon the extent and kind of knowledge outflows of this unit (Cf. Schulz, 2001). Summarizing, we would argue that a manager's knowledge inflows impact upon this manager's exploration and exploitation activities, whereas these activities may influence the manager's knowledge

*out*flows. Consequently, reciprocal causal relationships may exist between knowledge flows and this manager's exploration and exploitation activities.

Second, using single informant data highlights issues of common method bias. Regarding the issue of common method bias we performed Harman's one-factor test on items included in the regression models. If common method bias were a serious problem in the study, we would expect a single factor to emerge to account for most of the covariance in the dependent and independent variables (Podsakoff & Organ, 1986). We did not find such a single factor. The issue of common method bias could be addressed in future studies by measuring exploration, exploitation at the managerial level of analysis using objective measures.

Third, we limited this study's focus by examining the impact of organizational factors and managers' intra-organizational knowledge inflows on managers' exploration and exploitation activities. An interesting extension of our research would be investigating the impact of external knowledge inflows, i.e. knowledge a manager acquires, which resides out of the firm. At the firm and unit level, studies on innovation and absorptive capacity indicate the positive impact of the acquisition of new external knowledge on exploration related processes or outcomes such as, for instance, new product introductions (Katila & Ahuja, 2002), the creation of new knowledge through recombining the acquired knowledge with existing knowledge (Rosenkopf & Nerkar, 2001), new product development (Stock et al., 2001), and exploratory and exploitative innovations (Jansen et al., 2005b).

A *fourth* interesting line of research is that which examines the impact of managers' characteristics, such as personality traits and a manager's current knowledge and experience, on managers' exploration and exploitation activities, and knowledge acquisition activities. Current knowledge and experience, reflected in for instance education and job tenure, may not only affect a manager's ability to recognize the value of knowledge to be acquired, but also the ability to assimilate and apply it (cf. Cohen & Levinthal, 1990; Smith, 2005) in explorative and/ or exploitative ways. Personality traits such as risk aversion and conscientiousness on performance may increase a manager's preference for exploitation activities, whereas openness to experience may increase a manager's preference for exploration (Judge et al., 1999).

Fifth, this study indicates that a need for managers to conduct high levels of both exploration and exploitation activities leads to the question about how to

combine organizational factors that are conducive to managers' exploration activities with organizational factors that positively influence exploitation activities. Although some authors argue that such organization design elements may be combined (Rivkin & Siggelkow, 2003; Gibson & Birkinshaw, 2004), the most conventional view in studies on organization design seems to be that organizational design elements that stimulate exploration are incommensurable with those stimulating exploitation (Ghemawat & Ricart I Costa, 1993; Sheremata, 2000). Consequently, future studies may investigate combined or interaction effects of organizational factors on both exploration and exploitation, to further our conceptual and empirical insight into how combinations of organizational factors concurrently increase or decrease managers' exploration and exploitation activities (Gibson & Birkinshaw, 2004; Jansen et al., 2005a).

Sixth, several studies in management fields, such as organizational learning (Crossan et al., 1999; Vera & Crossan, 2004), strategy research (Burgelman, 1983b, 1991; Rajagopalan & Spreitzer, 1996; Rosenbloom, 2000; Trispsas & Gavetti, 2000) and technological innovation (Duncan, 1976; Subramaniam & Youndt, 2005; Tushman & O'Reilly, 1996) indicate that firm or unit level exploration and exploitation to a large extent originate in the exploration and exploitation activities of their managers. This made us assume that understanding how to influence managers' exploration and exploitation activities benefits our understanding about how to build exploration and exploitation within a business-unit or firm. However, the relevance of this study's findings could be further increased by examine the impact of managers' exploration and exploitation activities and the ratio between these two on, for instance, unit- or organization-level performance, on incremental and radical innovations or on strategic renewal (Lyles & Easterby-Smith, 2003).

Finally, although a contribution of this study is the development of scales which assess a manager's level of exploration and exploitation activities, and validity and reliability analyses indicated that the scales were appropriately constructed, linking objective exploration and exploitation measures to the scales as used in this study could increase insight into the scales' validity.

6.5 - Conclusion

In this chapter we discussed the findings, implications, limitations and directions for future research emanating from our inquiry into how organizational factors and intra-organizational knowledge inflows of managers influence managers' exploration activities and exploitation activities. This investigation delivers interesting insights for both the literature and management practice and indicates some valuable roads for future research. The study furthers understanding of managers' exploration and exploitation activities and into how these activities may be influenced. This benefits the understanding about how to build both exploration and exploitation within a firm, which will contribute to the firm's competitive advantage.

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NEDERLANDSE SAMENVATING (DUTCH SUMMARY)

Introductie

Om succesvol te zijn en te blijven worden ondernemingen in een dynamische omgeving geconfronteerd met de uitdaging om zowel te innoveren, veranderen, en flexibel te zijn (exploreren), als voort te bouwen op bestaande zekerheden en efficiëntie te verhogen (exploiteren) (March, 1991). Onderzoekers en managers worstelen echter met de vraag hoe te exploreren, hoe te exploiteren, en vooral hoe deze twee te combineren binnen een bedrijf (Levinthal & March, 1993). Studies geven dan ook aan dat de bestaande managementliteratuur en de managementpraktijk baat hebben bij een beter begrip, dat zowel conceptueel als empirisch onderbouwd is, van hoe diverse organisatie-elementen exploratie, exploitatie, en de relatie tussen deze twee, beïnvloeden (Adler et al., 1999; Benner & Tushman, 2003; Gibson & Birkinshaw, 2004; Tushman & O'Reilly, 1996; Sheremata, 2000). Om een bijdrage te leveren aan een beter begrip hiervan, stelt dit onderzoek zich als doel om inzicht te verschaffen, ten eerste, in exploratie en exploitatie activiteiten van managers van grote ondernemingen die in een dynamische omgeving opereren, en, ten tweede, in hoe organisatie-elementen deze activiteiten beïnvloeden. Hiertoe conceptualiseren en operationaliseren we managers' exploratie en exploitatie activiteiten en onderzoeken we de invloed op managers' exploratie en exploitatie activiteiten van (1) organisatiefactoren en van (2) de acquisitie van kennis door managers, die zich in de organisatie bevindt.

Veranderingen op het gebied van technologieën, concurrentie, regulering, en klantbehoeften dwingen managers van ondernemingen die onderzocht zijn in deze studie om exploratie activiteiten te verrichten. De essentie van deze *exploratie activiteiten* is het creëren van variëteit in ervaringen (Bontis et al., 2002; Holmqvist, 2004; Levinthal & March, 1993; McGrath, 2001) dat gerelateerd is aan verbreding van de bestaande kennis van een manager (Cf. Katila & Ahuja, 2002; Levinthal & March, 1993; Sidhu et al., 2004). Voorbeelden van exploratie activiteiten van deze managers zijn zoeken naar nieuwe kansen in bestaande, nieuwe, of opkomende markten, experimenteren met bijvoorbeeld nieuwe technologieën, distributiekanalen of organisatievormen, het ontwikkelen van nieuwe processen, producten, of productcombinaties, en het herzien van bestaande opvattingen, beslissingen, en strategieën (Banker et al., 2005; Flier et al., 2001; Greenwood et al., 2005; Henisz & Macher, 2004; Sarvay, 1999). Andere ontwikkelingen in de omgeving van onderzochte ondernemingen, zoals het toenemende belang van efficiëntie en schaalgrootte, voortdurende kostenreductie, en forsere concurrentie gericht op de korte

termijn, dwingen managers om exploitatie activiteiten te verrichten. De essentie van deze *exploitatie activiteiten* is het vergoten van de betrouwbaarheid in bestaande ervaringen (Bontis et al., 2002; Holmqvist, 2004; Levinthal and March, 1993) dat gerelateerd is aan verdieping van de bestaande kennis van een manager (Cf. Katila & Ahuja, 2002; Levinthal & March, 1993). Voorbeelden van exploitatie activiteiten van managers zijn het bedienen van bestaande (interne) klanten met bestaande diensten of producten, het uitbreiden, consolideren, of afstoten van bestaande activiteiten, het nastreven van geformuleerde korte termijn doelstellingen, zich specialiseren in, bijvoorbeeld, specifieke technologieën, productgroepen, of marktsegmenten, en het verbeteren en standaardiseren van bedrijfsprocessen.

Onderzoeksaanpak

In deze studie worden een kwalitatieve en kwantitatieve onderzoeksaanpak gecombineerd (Creswell, 1994). De nadruk ligt op het verzamelen en analyseren van kwantitatieve data middels een vragenlijst omdat we voornamelijk geïnteresseerd zijn in welke en hoe factoren een uitkomst beïnvloeden en omdat we willen generaliseren naar een populatie, namelijk managers van grote ondernemingen die in een dynamische omgeving opereren (Creswell, 2003; Hussey & Hussey, 1997; Jankowicz, 1995). De kwalitatieve data, verzameld aan de hand van diepte interviews en bedrijfsdocumenten, dient ter ondersteuning. De kwalitatieve data is in het begin van de studie gebruikt om beter inzicht te krijgen in de centrale begrippen van de studie (Miles & Huberman, 1994), hun onderlinge relaties (Eisenhardt, 1989), en diende ter ondersteuning van het ontwikkelen van de managers' exploratie en exploitatie activiteiten schalen (Jick, 1979). Vervolgens is kwantitatieve data verzameld en geanalyseerd om de hypothesen te testen en bij te dragen aan de generaliseerbaarheid van de resultaten (Creswell, 1994). Ten slotte is kwalitatieve data gebruikt als hulp om de kwantitatieve resultaten te interpreteren (Miles & Huberman, 1994).

De volgende *onderzoeksactiviteiten* zijn verricht: ten eerste verrichten we literatuuronderzoek (zie onder 'theorie'). Aan de hand van de literatuurstudie zijn het onderzoeksprobleem, de doelstelling, en de onderzoeksvragen geformuleerd, als ook het conceptuele onderzoeksmodel dat de centrale variabelen van de studie weergeeft. Tevens diende de literatuurstudie ertoe om inzicht te krijgen in de belangrijkste relaties tussen de variabelen. Ten tweede zijn bedrijfsdocumenten bestudeerd en diepte-interviews gehouden met managers van verschillende hiërarchische lagen, functies, en organisatie-eenheden binnen Rabobank, Philips, en Deloitte (zie onder 'empirie'). Het doel hiervan was om vanuit de praktijk de relevantie van het onderzoeksprobleem, doelstelling, en onderzoeksvragen vast te stellen, om accurater

de centrale begrippen van de studie te kunnen beschrijven, en om vanuit het perspectief van managers de relevantie te bepalen van het wel of juist niet meenemen van bepaalde variabelen in deze studie. Ten derde werden, op basis van de literatuur, de hypothesen ontwikkeld. De gehouden interviews dienden ook om beter inzicht te krijgen in de causale relaties tussen de variabelen. Ten vierde, nadat de hypothesen ontwikkeld waren, werd de vragenlijst gemaakt. Hiertoe werden relevante bestaande schalen uit de literatuur gebruikt. Omdat deze nog niet bestonden, ontwikkelden we zelf meetschalen voor managers' exploratie en exploitatie activiteiten aan de hand van conceptualisaties in de literatuur. Interviews werden gehouden om de betrouwbaarheid en validiteit van deze twee schalen te vergoten. De items van de schalen werden verder verbeterd aan de hand van data verkregen door een pilot vragenlijst. Dit resulteerde in de uiteindelijke versie van de vragenlijst. Ten vijfde verzamelden we binnen elk van de drie bedrijven kwantitatieve data aan de hand van deze vragenlijst en werd deze data vervolgens geanalyseerd. Ten slotte hebben we de kwantitatieve bevindingen geëvalueerd aan de hand van de literatuur en feedbacksessies met managers. In ieder van de bedrijven waar onderzoek is verricht zijn feedbacksessies gehouden met managers om de empirische bevindingen van het onderzoek beter te kunnen begrijpen, en om meer inzicht te krijgen in de implicaties voor de praktijk.

Theorie

Het doel van het literatuuronderzoek is deze studie te relateren aan reeds bestaand verwant onderzoek. Dienovereenkomstig wordt in het theoretische gedeelte de studie gepositioneerd. De centrale variabelen van de studie worden geconceptualiseerd en voor ieder van de variabelen wordt het belang aangetoond om deze te bestuderen. Ten slotte wordt een conceptueel onderzoeksmodel ontwikkeld met bijbehorende hypothesen die de causale relaties tussen de variabelen weergeven. Het literatuuronderzoek richt zich op managementstudies waarin, op verschillende maar gerelateerde wijzen, sprake is van exploratie en exploitatie; namelijk studies op het gebied van leren in organisaties (bijvoorbeeld Crossan & Berdrow, 2003; Holmqvist, 2004; Levinthal & March, 1993; March, 1991), innovatie (bijvoorbeeld Benner & Tushman, 2002; 2003; Duncan, 1976; Subramaniam & Youndt, 2005), strategie (bijvoorbeeld Burgelman, 1991; 2002; Floyd & Lane, 2000; McGrath, 2001), organisatieontwerp (bijvoorbeeld Adler et al., 1999; Jansen et al., 2005b; Rivkin & Siggelkow, 2003; Sheremata, 2000), en kennis en dynamische vaardigheden (bijvoorbeeld Eisenhardt & Martin, 2000; Gupta & Govindarajan, 2000; Jansen et al., 2005b; Kogut & Zander, 1992; Grant, 1996).

Het literatuuronderzoek toont aan dat, hoewel de meeste studies aangeven dat het belangrijk is om te begrijpen hoe exploratie en exploitatie gestimuleerd kunnen worden binnen bedrijven, systematisch onderzoek hierover, theorie ontwikkeling, en vooral empirisch onderzoek achterblijft (Sihdu et al., 2004). Specifieker, de huidige literatuur is gediend bij onderzoek dat conceptueel verantwoord aangeeft hoe organisatie-elementen van invloed zijn op exploratie en exploitatie activiteiten binnen bedrijven en op de relatie tussen deze twee, en dat vervolgens ook empirische validatie geeft (Cf. Benner & Tushman, 2003; Gibson & Birkinshaw, 2004; Tushman & O'Reilly, 1996). Tevens blijkt uit het literatuuronderzoek dat studies die exploratie en exploitatie activiteiten op het analyseniveau van managers onderzoeken nagenoeg afwezig zijn. Dit is tamelijk verbazingwekkend omdat studies op het gebied van leren binnen organisaties (Crossan et al., 1999; Vera & Crossan, 2004), strategie (Burgelman, 1983a; 1991; Floyd & Lane, 2000; Rajagopalan & Spreitzer, 1996; Rosenbloom, 2000; Trispsas & Gavetti, 2000), en innovatie (Duncan, 1976; Subramaniam & Youndt, 2005; Tushman & O'Reilly, 1996), aangeven dat exploratie en exploitatie op het niveau van bedrijven of bedrijfseenheden grotendeels ontstaan uit exploratie en exploitatie activiteiten van managers. De hoofdrede dat deze studie zich richt op exploratie en exploitatie activiteiten van managers is dan ook de aanname, gebaseerd op de huidige literatuur, dat het gebrek aan inzicht met betrekking tot exploratie en exploitatie op het niveau van bedrijfseenheden of bedrijven verminderd kan worden door te begrijpen hoe managers' exploratie en exploitatie activiteiten beïnvloed kunnen worden

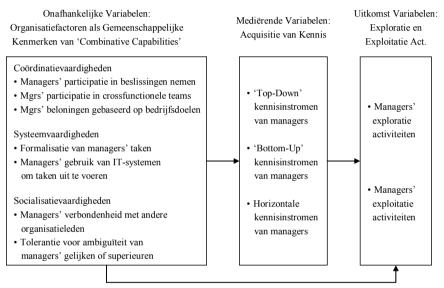
Om meer inzicht te creëren, onderzoekt deze studie hoe de acquisitie van kennis, die zich binnen de organisatie bevindt, door een manager van invloed is op de exploratie en exploitatie activiteiten van deze manager. Studies, vooral die op het gebied van innovatie, tonen aan dat de acquisitie van kennis door bedrijven of bedrijfseenheden een belangrijke verklarende variabele is voor exploratie en exploitatie activiteiten binnen het bedrijf of de bedrijfseenheid (Benner & Tushman, 2002; Katila & Ahuja, 2002; Nerkar, 2003; Rosenkopf & Nerkar, 2001). Met betrekking tot managers illustreren voornamelijk conceptuele studies en casestudies studies de relevantie om de acquisitie van kennis in de organisatie door managers, als een belangrijke determinant te beschouwen voor hun exploratie en/ of exploitatie activiteiten (bijvoorbeeld Burgelman, 1983b; 1991; Floyd & Lane, 2000; Grant, 1996; Ghemawat & Ricart I Costa, 1993; Kogut & Zander, 1992; Rivkin & Siggelkow, 2003; Sanchez et al., 1996). De aanname dat kennisacquisitie exploratie en exploitatie beïnvloedt is echter veelal impliciet in deze studies; theoretische en empirische onderbouwing met betrekking tot de relatie tussen managers' intra-organisationele

kennisacquisitie en exploratie en exploitatie activiteiten ontbreken dan ook. Op basis van Gupta en Govindarajan (2000), Schulz (2001) en Tsai (2001) wordt in deze studie de acquisitie van kennis door een manager geconceptualiseerd en geoperationaliseerd in termen van kennisinstromen van een manager. Aan de hand van Schulz' en Gupta en Govindarajans definitie van kennisinstromen definiëren we kennisinstromen van een manager als het 'totale volume' (Schulz, 2001: 662) van impliciete en expliciete kennis met betrekking tot verschillende gebieden zoals technologieën, producten, processen, strategieën, en markten, dat een manager vergaart of ontvangt per tijdseenheid, van andere personen of bedrijfseenheden in dezelfde organisatie. Deze brede notie van kennisinstromen maakt het mogelijk om managers te bestuderen die behoren tot verschillende hiërarchische lagen, functies, en bedrijfseenheden. Het is niet onze bedoeling om in het onderzoek de acquisitie van operationele of financiële data mee te nemen, noch het ontvangen van orders. Conceptuele studies en casestudies op het gebied van strategie processen illustreren dat exploratie en exploitatie activiteiten van managers beïnvloed worden door verticale kennisinstromen (Burgelman, 1983b; 1991; Floyd & Lane, 2000; Van Cauwenberg & Cool, 1982). Hierbij maken we in navolging van deze studies een onderscheid tussen 'top-down' kennis instromen', dat is kennis die een manager ontvangt van personen of bedrijfseenheden van hogere hiërarchische lagen, en 'bottom-up' kennis instromen, dat is kennis die een manager ontvangt van personen of bedrijfseenheden behorende tot lagere hiërarchische lagen. Ander studies wijzen op het belang van horizontale kennisstromen binnen een organisatie (bijvoorbeeld Gupta & Govindarajan, 1991; Nonaka, 1994; Schulz, 2001; 2003; Tsai, 2001). Horizontale kennisinstromen van een manager volgen niet de traditionele lijnen van de hiërarchie, ze worden geassocieerd met kennis die komt van mensen of bedrijfseenheden die zich op hetzelfde hiërarchische niveau bevinden als de kennisontvanger. In deze studie bekijken we conceptueel en empirisch de invloed van 'top-down', 'bottom-up' en horizontale kennisinstromen van managers op hun exploratie en exploitatie activiteiten.

Naast de rol van kennisinstromen van een manager onderzoekt deze studie wat de rol is van *organisatiefactoren*, zodat meer inzicht verkregen wordt in hoe managers' exploratie en exploitatie activiteiten gemanaged kunnen worden (Cf. Duncan, 1976; Gibson & Birkinshaw, Rivkin & Siggelkow, 2003). De literatuur, vooral studies op het gebied van organisatieontwerp, draagt in dit kader een breed scala van factoren aan. Om theoretisch gefundeerd te bepalen welke factoren in deze studie mee te nemen, onderzoekt deze studie, op basis van Jansen et al. (2005b) en Van Den Bosch et al., (1999), de invloed van organisatiefactoren die gemeenschappelijke kenmerken vormen van de 'combinative capabilities' van een

bedrijf. 'Combinative capabilities' refereren naar de vaardigheden van een bedrijf om nieuwe kansen te exploreren en bestaande zekerheden te exploiteren terwijl ze de integratie (Grant, 1996), uitwisseling (Jansen et al., 2005b), of transfer (Kogut & Zander, 1992) van kennis binnen een bedrijf benadrukken. Er wordt aan de hand van een drietal van zulke vaardigheden; coördinatie, systeem, en socialisatievaardigheden (Jansen et al., 2005b; Van Den Bosch et al., 1999), een aantal organisatiefactoren geïdentificeerd in de literatuur die op het analyseniveau van de manager bestudeerd kunnen worden. Links in figuur 1 zijn de onderzochte organisatiefactoren weergegeven.

Figuur 1 – Conceptueel Onderzoeksmodel



Uit de literatuurstudie blijkt dat het niet alleen relevant is om te onderzoeken wat de directe invloed is van organisatiefactoren op managers' exploratie en exploitatie activiteiten, maar wat de indirecte invloed is. Dat is, het is relevant om te onderzoeken hoe, en in welke mate, managers' kennisinstromen de relatie tussen organisatiefactoren en exploratie en exploitatie activiteiten mediëren. Niet alleen studies op het gebied van 'combinative capabilities' (Grant, 1996; Kogut & Zander, 1992) onderschrijven deze gedachte, ook studies op het gebied van kennisstromen of kennisuitwisseling binnen bedrijven geven aan dat kennisstromen niet exogeen zijn, maar gestimuleerd of gehinderd worden door organisatiefactoren (Gupta & Govindarajan, 2000; Szulanski, 1996). Deze studie ontwikkelt en test dan ook

hypothesen met betrekking tot (1) de directe invloed van organisatiefactoren op managers' exploratie en exploitatie activiteiten, (2) de invloed van organisatiefactoren op kennisinstromen van managers, en (3) de invloed van kennisinstromen van managers op hun exploratie en exploitatie activiteiten. Figuur 1 toont de variabelen van deze studie en de bovengenoemde relaties.

Empirie en belangrijkste bevindingen

Het empirisch onderzoek van de studie vond plaats in drie 'multi-unit' ondernemingen die opereren in een dynamische omgeving; vijf lokale banken van de Rabobank Groep, actief in de financiële sector; Philips' semi-conductor divisie, actief in de semiconductor industrie; en Deloitte Nederland, actief in de accountancy & advies sector. Zoals aangegeven in de introductie van deze samenvatting maken verschillende ontwikkelingen in de omgeving van deze bedrijven dat ze een geschikte context vormen om managers' exploratie en exploitatie activiteiten te onderzoeken. Binnen ieder bedrijf is data verzameld aan de hand van diepte-interviews, bedrijfsdocumenten en dezelfde vragenlijst. De vragenlijst is binnen ieder bedrijf voorgelegd aan een sample van managers van verschillende hiërarchische lagen, functies, en organisatieeenheden; 237 managers binnen Rabobank, 255 binnen Philips, en 653 binnen Deloitte. Dit resulteerde in respectievelijk 177, 118, en 224 bruikbare ingevulde vragenlijsten. Om te testen of er sprake is van non-response bias in de datasets zijn de respondenten vergeleken met de niet-respondenten. De verdeling van de respondenten in ieder bedrijf over de hiërarchische lagen, functies, en bedrijfseenheden komt overeen met de werkelijke verdeling van alle managers binnen het desbetreffende bedrijf. Verder vergeleken we in iedere dataset vroege en late respondenten in termen van modelvariabelen; ook hierin bleken geen significante verschillen te zitten. Hieruit concluderen we dat non-response bias geen probleem is. Uitgebreide betrouwbaarheid en validiteit analyses van de items en schalen van de vragenlijst tonen aan dat ze betrouwbaarheid zijn, uni-dimensioneel, en goede convergerende en discriminerende validiteit bezitten.

Nadat de data per bedrijf geanalyseerd waren, bleek dat de bevindingen per bedrijf sterk overeenkomen. Daarom hebben we de drie datasets geïntegreerd en vervolgens geanalyseerd aan de hand van regressieanalyses. *De resultaten* tonen aan dat, controlerend voor hiërarchisch niveau, functie, bedrijf, en bedrijfseenheid, 'bottom-up' en horizontale kennisinstromen van managers positief gerelateerd zijn aan hun exploratie activiteiten, terwijl 'top-down' kennisinstromen positief gerelateerd zijn aan exploitatie activiteiten. Verder blijkt dat 'bottom-up' en horizontale kennisinstromen voornamelijk de relatie tussen organisatiefactoren die geassocieerd

ziin met coördinatievaardigheden en managers' exploratie activiteiten gedeeltelijk mediëren. 'Top-down' kennisinstromen mediëren gedeeltelijk de relatie tussen organisatiefactoren die geassocieerd zijn met systeemvaardigheden en managers' exploitatie activiteiten. Structural equation modelling bevestigt dat het model waarin de kennisinstromen een gedeeltelijk mediërende rol vervullen een goede fit met de data heeft die bovendien beter is dan het model waarin de kennisinstromen geen mediërende rol vervullen en het model waarin ze een volledig mediërende rol vervullen. Met betrekking tot de organisatiefactoren illustreren de resultaten dat organisatiefactoren die geassocieerd zijn met coördinatievaardigheden (zie figuur 1) een direct en indirect (via 'bottom-up' en horizontale kennisinstromen) positief effect op exploratie activiteiten hebben. Twee van deze factoren, namelijk managers' participatie in beslissingen nemen en managers' beloningen gebaseerd op bedrijfsdoelen hebben ook een (klein) direct negatief effect op managers' exploitatie activiteiten. Organisatiefactoren die geassocieerd zijn met systeemvaardigheden (zie figuur 1) hebben een direct negatief effect op managers' exploratie activiteiten en een direct en indirect (via 'top-down' kennisinstromen) positief effect op exploitatie activiteiten. Ten slotte. van de organisatiefactoren geassocieerd socialisatievaardigheden blijkt managers' verbondenheid met andere organisatieleden geen enkel effect te hebben op exploratie of exploitatie activiteiten. De andere factor, tolerantie voor ambiguïteit van een manager's omgeving heeft een direct en indirect (door de positieve relatie met 'bottom-up' en horizontale kennisinstromen) positief effect op exploratie activiteiten en een indirect positief effect (door de positieve relatie met 'top-down' kennisinstromen) op exploitatie activiteiten. Hiermee bevestigt de data ongeveer tweederde van de hypothesen. Met betrekking tot de meeste andere hypothesen zijn de veronderstelde relaties wel aanwezig in de data, maar niet significant.

De effecten van de controle variabelen blijken grotendeels als verwacht. Managers in R&D gerelateerde functies richten zich meer op exploratie activiteiten dan ander managers, terwijl managers in productie gerelateerde functies zich meer op exploitatie activiteiten richten. Managers in bedrijfseenheden waar meer veranderingen in de omgeving plaats vinden verrichten meer exploratie activiteiten en minder exploitatie activiteiten dan managers van bedrijfseenheden die in een stabielere omgeving opereren. Verder toont de data dat zowel top- als midden managers meer exploratie en exploitatie activiteiten verrichten dan 'front-line' managers. Verder blijkt dat het vooral 'front-line' managers zijn die zich binnen bedrijfseenheden specialiseren in exploratie of exploitatie activiteiten afhankelijk van de gerichtheid van

de bedrijfseenheid, terwijl top- en midden managers meer consistente niveaus van exploratie en exploitatie hebben over de verschillende bedrijfseenheden heen.

Bijdragen

Uit de literatuur en managementpraktijk blijkt dat er een gebrek is aan inzicht in hoe organisatie-elementen managers' exploratie en exploitatie activiteiten beïnvloeden. Dit onderzoek levert een conceptuele en empirische bijdrage aan de literatuur en de managementpraktijk.

March (1991) stelt dat een afweging bestaat tussen exploratie en exploitatie op verschillende analyse niveaus. Recent hebben studies aangetoond dat deze twee elkaar niet wederzijds uitsluiten op bedrijfsniveau (He & Wong, 2004) of bedrijfseenheid niveau (Gibson & Birkinshaw; Jansen et al., 2005a). De resultaten van deze studie tonen aan dat exploratie en exploitatie elkaar ook niet wederzijds uitsluiten op het analyse niveau van de manager. Top- en midden managers hebben bijvoorbeeld een relatief hoge mate van zowel exploratie en exploitatie. De correlatie coëfficiënt tussen exploratie en exploitatie van top- en midden managers is dan ook niet negatief. De resultaten van de exploratieve en confirmatieve factoranalyses tonen ook empirisch aan dat exploratie en exploitatie twee verschillende dimensies zijn en niet de extremen van één en hetzelfde continuüm.

Het onderzoek levert ook een bijdrage aan studies die zich bezighouden met de vraag welke en hoe organisatiefactoren van invloed zijn op exploratie en exploitatie (bijvoorbeeld Adler et al. 1999; Benner & Tushman, 2003; Gibson & Birkinshaw, 2004; Rivkin & Siggelkow, 2003; Sheremata, 2000). Deze studie levert een bijdrage door vanuit de kennis en dynamische vaardigheden literatuur een theoretisch gefundeerd argument aan te voeren met betrekking tot welke organisatiefactoren te bestuderen. Bovendien levert de studie een bijdrage door conceptueel en empirisch het effect van de factoren op zowel exploratie als op exploitatie te bestuderen; zie onder 'empirie en belangrijkste bevindingen' welke en hoe organisatiefactoren van invloed ziin op exploratie en op exploitatie. Bovendien toont de studie, naast de rol van organisatiefactoren, het belang en effect aan van kennisstromen binnen een bedrijf op managers' exploratie en exploitatie activiteiten. Hierdoor schept deze studie een integraler beeld dan afzonderlijke studies tot nu toe doen. Sommige van de bestaande studies richten zich immers slechts op enkele of één specifieke organisatiefactor (Benner & Tushman, 2003; McGrath, 2001; March, 1991), andere richten zich slechts op exploratie (McGrath, 2001; Sidhu et al., 2004) of op exploitatie (Hansen et al., 2002) aspecten, of zijn conceptueel van aard (Adler et al. 1999; Rivkin & Siggelkow, 2003; Sheremata, 2000).

Het onderzoek levert een bijdrage aan studies op het gebied van 'combinative capabilities' en studies op het gebied van kennis uitwisselen binnen organisaties. Een belangrijk argument in conceptuele studies zoals die van Kogut en Zander (1992) en Grant (1996) is, dat de centrale rol van een bedrijf het transfereren van kennis binnen de organisatiecontext is, teneinde exploratieve en exploitatieve aanpassingen te bewerkstelligen. Het conceptueel model en de empirische bevindingen van deze studie onderstrepen dit argument; de studie toont de centrale rol van kennisstromen binnen een bedrijf voor managers' exploratie en exploitatie activiteiten en toont de rol van de organisatiecontext. Managers' intra-organisationele kennisinstromen belangrijke determinanten te zijn van hun exploratie en exploitatie activiteiten. Ze mediëren echter niet geheel maar gedeeltelijk de invloed van organisatiefactoren. De organisatiefactoren beïnvloeden dus niet alleen managers' exploratie en exploitatie activiteiten indirect door hun invloed op managers' kennisinstromen, maar ook direct. Verder; bestaande studies op het gebied van kennisstromen binnen een bedrijf richten zich vooral op de vraag welke en hoe factoren van invloed zijn op zulke kennisstromen (bijvoorbeeld Gupta & Govindarajan, 2000; Szulanski, 1996). Deze studie levert een bijdrage door ook de invloed, of uitkomst van zulke kennisstromen aan te tonen.

Ten slotte levert dit onderzoek een bijdrage aan de vraag van zowel wetenschappers (Duncan, 1976; Levinthal & Mach, 1993) en managers hoe een bedrijf exploratie en exploitatie kan combineren door aan te geven hoe de configuratie van organisatiefactoren en kennisstromen managers in staat stelt te beantwoorden aan de manieren waarop een bedrijf exploratie en exploitatie kan combineren. Aan de hand van Jansen (2005) en Volberda (1998) onderscheidden we in de literatuur drie hoofdmanieren waarop een bedrijf om kan gaan met spanningen tussen exploratie en exploitatie; scheiden qua locatie, scheiden in tijd, en combineren op dezelfde plaats en tijd. Scheiden qua locatie heeft als gevolg dat managers, behorende tot een bepaalde hiërarchische laag (Burgelman, 1983a; 1983b; Floyd & Lane, 2000), functie (De Leede et al., 2002), of organisatie-eenheid (Benner & Tushman, 2003; O'Reilly & Tushman, 2004) zich of moeten richten op exploratie activiteiten, of op exploitatie activiteiten, afhankelijk van de gerichtheid van de desbetreffende hiërarchische laag, functie, of organisatie-eenheid. Scheiden in tijd heeft als gevolg dat managers, naarmate de tijd verstrijkt, hun aandacht moeten verleggen van het verrichten van exploratie activiteiten naar het verrichten van exploitatie activiteiten of omgekeerd (Cheng & Van de Ven, 1996; Duncan, 1976; Garcia et al., 2003; Nooteboom, 2000; Winter & Szulanski, 2001). Deze studie toont aan dat managers op plaatsen binnen organisaties of in tijdsperioden, gericht op exploratie, gebaat zijn bij 'bottom-up' en/of horizontale kennisinstromen, participatie in beslissingen nemen, participatie in crossfunctionele teams, beloningen gebaseerd op bedrijfsdoelen, en tolerantie voor ambiguïteit. Ze zijn niet gebaat bij formalisatie van taken en gebruik van IT-systemen. Echter, managers op plaatsen binnen organisaties, of tijdsperioden, gericht op exploitatie zijn gebaat bij 'top-down' kennisinstromen, formalisatie van taken en gebruik maken van ICT-systemen om hun taken te verrichten. Ze zijn niet gebaat bij participatie in beslissingen nemen en beloningen gebaseerd op bedrijfsdoelen.

Het combineren van exploratie en exploitatie op dezelfde plaats en dezelfde tijd, de derde manier waarop bedrijven om kunnen gaan met de noodzaak om zowel te exploreren als te exploiteren, houdt in dat managers van alle hiërarchische lagen, functies en organisatie-eenheden zich zowel moeten richten op exploratie activiteiten als op exploitatie activiteiten. Dit kan bereikt worden volgens sommige onderzoekers door (schijnbaar) 'tegenstrijdige' organisatie-elementen te combineren (Adler et al., 1999; Gibson & Birkinshaw, 2004; Nonaka & Toyama, 2002; Sheremata, 2000). Met betrekking tot kennisstromen suggereert deze studie dat voor managers binnen een bedrijf dat streeft naar het gelijktijdig en op dezelfde plaats combineren van exploratie en exploitatie, een combinatie van 'top-down' en 'bottom-up', of een combinatie van 'top-down' en horizontale kennisinstromen van waarde is. Deze drie soorten kennisinstromen, lijken niet 'tegenstrijdig' te zijn; elk van de drie is positief, maar niet negatief, gerelateerd aan exploratie of exploitatie. Bovendien geeft de data aan dat de drie soorten kennisinstromen elkaar niet uitsluiten op het analyse niveau van de manager; volgens de correlatiematrix zijn ze alle drie positief en significant aan elkaar gerelateerd. Hetzelfde geldt voor de organisatiefactoren; factoren die exploratie bevorderen zijn niet significant negatief gerelateerd aan factoren die exploitatie bevorderen. De bevindingen tonen zelfs aan dat combinaties van organisatiefactoren die exploratie bevorderen met factoren die exploitatie bevorderen, positief gerelateerd zijn aan managers' combinatie van exploratie en exploitatie vaardigheden.

Dit onderzoek toont enkele interessante resultaten, zowel voor de literatuur en management praktijk, maar kent ook beperkingen die kansen voor toekomstig onderzoek bieden. Deze studie geeft inzicht in managers' exploratie en exploitatie activiteiten en in hoe deze activiteiten beïnvloed kunnen worden. Dit bevordert inzicht in de vraag hoe een bedrijf zowel kan exploreren als exploiteren, dat een positieve bijdrage zal leveren aan het concurrentievoordeel van een bedrijf.

CURRICULUM VITAE

Tom J.M. Mom (Stein, Netherlands, February 2, 1977) obtained a Master's degree in Strategic Management (Cum Laude) from the Rotterdam School of Management (RSM), Erasmus University Rotterdam, The Netherlands, and a Master's Degree in International Management from the Community of European Management Schools (CEMS) preceded by an exchange to the Universität St. Gallen, Switzerland. Before starting his Master's studies, Tom followed a oneyear study program on philosophy and theology at EIFE, Paray, France. He received the CGEY Strategy-Award for the best Dutch Master Thesis in Management in 2001. Tom is currently an assistant professor in the department of Strategy and Business Environment of the RSM Erasmus University Rotterdam. His research interests include strategic renewal, exploration and exploitation activities of managers, intra-organizational knowledge exchange, and ICT knowledge management tools. Tom's research output appeared in journal publications and a book and he has presented his research at major international conferences such as the Academy of Management, the Strategic Management Society, and EGOS. Tom taught several courses in Strategy to students of the Bachelor of Science in International Business Administration program, as well as courses in Strategy and Methodology to students of the Bachelor and students of the Master of Science in Business Administration programs.

APPENDIX A - Illustrative Studies on Organizational Learning, Organization Design, Strategic Management, and Innovation: Distinctions and Relations between Exploration and Exploitation

		*	*	
Reference	Level, Research	Related Distinctions between Exploration &	View on Relation between and Combing	Influential
(field)	Method, Industry	Exploitation	Exploration & Exploitation	(Organizational) Factors
Adler et al.	- Firm	Non-routine and routine tasks	Combinatorial. Concurrently achieving	Four mechanisms: meta-
(Org. design)	- Car manuf.	Efficiency and flexibility	efficiency and flexibility in manufacturing by combing 'organizational mechanism' and 'organizational contextual factors'	routines, Job-enrichment, switching, and partitioning. Three organizational contextual factors: trust, training, and leadership
Benner & Tushman (2002) (Innovation)	- Firm - Quantitative - Photogr. & paint	Exploratory innovations (i.e. shift to different technological trajectories and distant search for new knowledge) and exploitative innovations (i.e. building on existing technological trajectory and local search for knowledge)	Trade-off. Routinization triggered by process management techniques stimulates local search and inhibits distant search	Process management techniques
Benner & Tushman (2003) (Innovation)	- Firm - Conceptual	Exploratory innovations (i.e. architectural and radical innovations, and innovations for new and emerging customer set) and exploitative innovations (i.e. incremental innovations, and innovations for current customer set)	Trade-off. Combining the two by spatial separation by unit and level; highly differentiated subunits which are weakly integrated at the senior team level	Process management techniques and organization design
Boynton & Victor (1991) (Strategic mm.)	- Firm - Conceptual	Revolutionary and evolutionary product and process change	Combinatorial. Synthesizing the two by combining vertical and horizontal information systems	Information technology systems
Brown & Eisenhardt (1997) (Innovation)	- Firm - Case studies - Computer	Stressing that organizations engage in continuous change	Continuous change rather than oscillating, triggered by semi-structures, links in time, and sequenced steps	Implementing structures and processes which allow for continues change

Reference (field)	Reference Level, Research (field) Method, Industry	Related Distinctions between Exploration & Exploitation	View on Relation between and Combing Exploration & Exploitation	Influential (Organizational) Factors
Burgelman (1983a; b) (Strategic mm.)	- Firm & managers' activities - Case study - Semicond.	Autonomous strategic activities (i.e. within the scope of the current strategy, building on existing organizational learning), and induced strategic activities (i.e. emerge outside of current strategy, providing potential for new organizational learning)	Trade-off. Autonomous activities take place out of established strategic and structural context. Difficult for autonomous initiatives to come about and get re-assimilated into established context. Combining through interlocking activities of managers at different levels	Strategic and structural context characteristics
Cheng & Van De Ven (1996) (Innovation)	- Process - Conceptual & simulations	Learning in chaotic conditions (an expanding and diverging process of discovery) and learning during stable conditions (a narrowing and converging process of testing)	Oscillating. Learning in chaotic conditions followed by learning during stable conditions. Combining the two by temporal separation	Decisions on the timing of transitions
Christensen & Bower (1996) (Innovation)	- Firm - Case study - Disk drive	Innovations for remote or emerging markets and innovations for existing markets	Trade-off. Both types of innovations internally compete for resources. Combining the two by spatial separation; development of emerging technologies should take place out of the mainstreams organizational and strategic context of the organization	Resource allocation processes driven by a firm's attention for current customers' and remote or emerging customers' needs
Danneels (2002) (Strategic mm.)	- Firm - Conceptual & case evidence - High-tech	Building competences (i.e. establishing new linkages among both technology and customer competences which are new to the firm) and leveraging competences (i.e. establishing new linkages among a firm's existing technology and customer competences)	Oscillating. Leveraging competences contributes to building competences	Linking and de-linking (knowledge) resource processes

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Reference	Level, Research	Related Distinctions between Exploration &	View on Relation between and Combing	Influential
(field)	Method, Industry	Exploitation	Exploration & Exploitation	(Organizational) Factors
De Leede et al. (2002) (Org. design)	- Firm - Case studies - Manufactur.	Innovation versus improvement & operation activities	Oscillating. Aligning over time operation and innovation activities	Cross-functional interfaces such as cross-functional teams and job-rotation
Duncan (1976) (Innovation/ Org. learning)	- Firm & unit - Conceptual	Initiation versus implementation stage of innovation process	Trade-off. Dimensions of structural characteristics facilitating exploration are inconsistent with those facilitating exploitation, hence combining the two by either spatial or temporal separation	Structural characteristics: complexity, formalization, and centralization
Floyd & Lane (2000) (Strategic mm.)	- Unit & individual	Competence definition (experimentation with new skills and exploration of new market opportunities) and competence deployment (deploying resources to venture into new product market arenas or to reinforce an existing product market position)	Trade-off/ combinatorial; reducing managers' role conflicts within the competence definition, modification, and deployment processes	Managers' role conflicts within strategic renewal processes
Garcia et al. (2003) (Innovation)	- Firm - Conceptual & simulation	Search for long-run breakthrough technologies versus development of products of processes for immediate payback	Oscillating. Exploration and exploitation depend on changing -over time- external competitive pressures and firm performance. Also Trade-off. Explorative and exploitative technological innovations compete for resources.	Resource allocation decisions
Ghemawat & Costa (1993) (Strategic mm.)	- Firm - Conceptual & simulation	Dynamic efficiency (continuous reconsideration of initial conditions) and static efficiency (continuous search for improvements within a fixed set of initial conditions)	Trade-off. Static and dynamic efficiency require inconsistent organizational arrangements. Tendency towards extremes, however, dynamic efficiency should generally deserve more attention in firms	(De)centralization/ decision chain, controls, standards, rewards

Appendix Reference (field)	Appendix A – Cont. Reference Level, Research (field) Method, Industry	Related Distinctions between Exploration & Exploitation	View on Relation between and Combing Exploration & Exploitation	Influential (Organizational) Factors
Gibson & Birkinshaw (2004) (Org. design)	- Unit - Quantitative - Mixture	Adaptability (the capacity to reconfigure activities in the business unit quickly to meet changing demands in the task environment) and alignment (refers to coherence among all the patterns of activities in the business unit)	Combinatorial. Adaptability and alignment each constitute a separate, but interrelated non substitutable element. Combining the two by synthesis	Hard (performance management; discipline and stretch) and soft (social context; support and trust) factors
He & Wong, (2004) (Innovation)	- Firm - Quantitative - Manufactur.	Explorative innovation strategy (technological innovation activities aimed at entering new product-market domains) and Exploitative innovation strategy (technological innovation activities aimed at improving existing product-market positions)	Relation between exploratory and exploitative innovation strategies not explicitly addressed. Disapproval of temporal separation	Mention that exploration and exploitation require different structures, processes, and capabilities, without specifying
Holmqvist (2004) (Org. learning)	- (Inter-)Firm - Conceptual & case evidence - software	Creating variety in experience through search, discovery, novelty, innovation, and experimentation and creating reliability in experience through refinement, routinization, production, and implementation of knowledge	Oscillating. Learning creating variety and stability in experience follow each other. Importance of opening-up or closing through dissatisfaction with ongoing behavior	Incentive systems and targets.
Iansiti (1993) (Innovation)	- Multiple - Conceptual & case evidence - Ceramic and chip	Research and manufacturing	Combinatorial. Integrating R&D and manufacturing	Teams with a T-shaped combination of skills and knowledge
Jansen et al., (2005a) (Org. design)	- Unit - Quantitative - Financial	Exploratory and exploitative innovations	Trade-off. Creating structural ambidexterity.	Decentralization, formalization, connectedness

Appendix	Appendix A – Cont.			
Keterence (field)	Level, Research Method, Industry	Kelated Distinctions between Exploration & Exploitation	View on Kelation between and Combing Exploration & Exploitation	Influential (Organizational) Factors
Lunnan & Barth (2003) (Org. learning)		Explorative and exploitative learning	Oscillating. Separating exploratory and exploitative learning in time	Teams working with an external partner
Luo (2002) (Strategic mm.)	- Unit - Quantitative - Various Chinese	Capability building (building new capabilities through learning from other organizations, creating new skills, or revitalizing existing skills in new situations) and capability exploitation (exploiting rent-generating resources that are firm specific, difficult to imitate, and able to generate abnormal returns)	Unclear about relation between capability building and exploitation	Entry mode and market orientation
March (1991) (Org. learning)	- Nested - Conceptual & simulations	Exploration (i.e. experimentation with new alternatives; developing knowledge) and exploitation (i.e. refining and extending existing competences; using knowledge)	Trade-off, need however to 'balance' the two	Socialization practices and employee turn-over
McGrath (2001) (Org. learning/ Strategic mm.)	- Project team - Quantitative - Various	Focus on various levels of exploratory learning; i.e. variance seeking	Trade-off. Incommensurability because of inconsistent organizational arrangements. Whether a firm should focus on more or less exploration is a function of: (1) environmental conditions, and (2) the firm's existing knowledge base.	Goal and supervision autonomy
McNamara & Baden-Fuller (1999) (Strategic mm.)	- Firm - Case study - Biotech.	Developing new versus using existing knowledge	Relation unspecified. Dynamics of accelerating exploitation; hence importance of overcoming over time the dominance of exploitation by increasing exploration	Overcoming inertia by creating crisis, new CEO, acquiring new knowledge

Factors	foster		oundary ow of cctedness, nt, cross-	nowledge ion apital) ly emental ions
Influential (Organizational) Factors	Article points at boundary- spanning search to foster exploration	Strategic goals	Decentralization, boundary spanning search, flow of information, connectedness, project management, crossfunctional teams, plans & schedules	The exchange of knowledge between organization members (social capital) appears to positively influence both incremental and radical innovations
View on Relation between and Combing Exploration & Exploitation	Trade-off between boundary-spanning versus local search. Tendency for firms towards local search.	Combinatorial. 'Virtuous circle' of competence building and leveraging within firms, demanding simultaneously different goal-seeking behaviors, and acquiring new and using existing resources	Combinatorial. Creative and collective action are not mutually exclusive, however the structures and processes they require do appear contradictory and difficult to combine	Trade-off. Incremental and radical innovations draw in fundamentally different ways on organizational knowledge.
Related Distinctions between Exploration & Exploitation	Second-order competence (the ability of a firm to create new knowledge through recombination of knowledge across boundaries) versus first order competence (the behavior of any firm or entity to search for solutions in the neighborhood of its current expertise of knowledge)	Competence building (associated with qualitative changes in the firm's existing stock of competences, and with changing the status quo by creating new strategic options for future action) and competence leveraging (associated with using or quantitatively changing existing competences, and exercising existing options for actions)	Creative action (requiring the generation of high- quality ideas and in-depth knowledge, as well as the retrieval of accurate and timely information) versus collective action (requiring pooling and integration of knowledge and information)	Radical innovative capability (i.e. generating innovations that significantly transform existing products and services which draws upon transformed prevailing knowledge) and incremental innovative capability (generating innovations that refine and reinforce existing products and services which draws upon reinforced prevailing knowledge)
A – Cont. Level, Research Method, Industry	- Firm - Quantitative - Optical disk	- Firm - Conceptual	- Firm, unit - Conceptual	- Firm - Quantitative - Various
Appendix A – Cont. Reference Level, Resea (field) Method, Ind	Rosenkopf & Nerkar (2001) (Innovation)	Sanchez et al. (1996) (Strategic mm.)	Sheremata (2000) (Org. design)	Subramaniam & Youndt (2005) (Imovation)

Appendix A – Cont.	A – Cont.			
Reference	Level, Research	Related Distinctions between Exploration &	View on Relation between and Combing	Influential
(field)	Method, Industry	Exploitation	Exploration & Exploitation	(Organizational) Factors
Tushman &	- Firm	Radical or discontinuous innovations or change	Trade-off. Radical and incremental	Decentralization, culture,
O'Reilly	- Conceptual &	versus incremental innovations or change	innovations require contradictory structures,	vision, senior management
(1996)	qualitative		processes, and cultures. Combining both	
(Innovation)	evidence		demands a decentralized structure, a	
			common culture and vision, and senior	
			managers combing both	
Van Den Bosch	ı - Firm	Exploration; related to scope and flexibility of	Trade-off. Focus of firm on exploration or	Organizational form
et al.	- Conceptual &	knowledge absorption, and exploitation; related to	exploitation depending on turbulence in	
(1999)	case evidence	efficiency of knowledge absorption	environment	
(Org. design)	- Multimedia			
Volberda	- Firm	Change and preservation	Combinatorial. Various ways of combing	Organizational form
(1996; 1998)	- Conceptual		change and preservation	
(Org. design)				
Winter &	- Firm	Discovering, developing, and refining a business	Oscillating. Discovering, developing,	Transfer of knowledge
Szulanski	- Conceptual &	model versus stabilizing and leveraging a business	stabilizing and leveraging a business model	between parent and
(2001)	case evidence	model	follow each other over time	subsidiary
(Strategic mm.) - Financial	- Financial			

APPENDIX B – Survey Items

Managers' exploration activities

To what extent did you, last year, engage in work related activities that can be characterized as follows:

- Searching for new possibilities with respect to products/ services, processes or markets
- Evaluating diverse options with respect to products/ services, processes or markets
- Focusing on strong renewal of products/ services or processes
- Activities of which the associated yields or costs are currently unclear
- Activities requiring much adaptability from your side
- Activities requiring you to learn new skills
- Activities that are not (yet) clearly existing company policy

Managers' exploitation activities

To what extent did you, last year, engage in work related activities that can be characterized as follows:

- Activities of which a lot of experience has been accumulated by yourself
- Activities which you carry out as if it were routine
- Activities which serve existing (internal) customers with existing services/ products
- Activities of which it is clear to you how to conduct them
- Activities primarily focused on achieving short-term goals
- Activities which you can properly conduct by using your present skills
- Activities which clearly fit into existing company policy

Managers' top-down Knowledge Inflows (based on Gupta & Govindarajan, 2000; Schulz, 2001)

To what extent did you, last year, receive or gather knowledge from:

- your direct supervisor
- one more hierarchical level up than your direct supervisor
- two more hierarchical levels up than your direct supervisor

Managers' bottom-up Knowledge Inflows (based on Gupta & Govindarajan, 2000; Schulz, 2001)

To what extent did you, last year, receive or gather knowledge from:

your direct assistants

Managers' horizontal Knowledge Inflows (based on Gupta & Govindarajan, 2000; Schulz, 2001)

To what extent did you, last year, receive or gather knowledge from:

Rabobank

- peer managers within your business unit (for members of the board of directors refer to: 'other members of the board of directors')
- other business units
- other local banks of the Rabobank Group

Philips

- peer teams within your own organizational unit
- teams in other organizational units within your own division
- teams in other divisions' units

Deloitte

- peer managers within your department
- other departments within your division
- other divisions of Deloitte Nederland

Participation in decision making (Hage & Aiken, 1967; Dewar et al., 1980)

- I participate in decisions on implementing new processes or products/ services
- I participate in decisions on adopting new policies
- I participate in decisions on hiring new colleagues
- I participate in decisions on the promotion of colleagues

Participation in cross-functional interfaces (Nadler & Tushman, 1987; Gupta & Govindarajan, 2000)

- I coordinate work across organizational units
- I work in temporary cross-unit task forces
- I work in permanent cross-unit teams

Rewards based on overall firm performance (Lawler, 1986)

- Rewards I receive are strongly linked to the performance of the organization as a whole
- I receive rewards primarily on individual achievements as opposed to organization-wide accomplishments ®
- Rewards I receive are based on an organizational plan as opposed to an individual plan

Formalization of tasks (Desphande & Zaltman, 1982)

• Whatever situation arises, I have procedures to follow in dealing with it

- I have to follow strict operational procedures at all times
- Rules occupy a central place in my work related activities
- There is a written job description for going about my tasks

Use of IT-systems to conduct tasks (Davis, 1989; Sanders, 1984)

IT-systems here exclude email and web-based discussion forums

- I very frequently use IT-systems to get my job done
- IT-systems do not assist me at all in performing my job ®
- I have become very dependent on IT-systems in conducting my tasks

Connectedness to other organization members (Jaworski & Kohli, 1993)

- There are many opportunities for me to talk to individuals from all kinds of different organizational units
- I very frequently have contact with people, regardless of rank or position
- The personal network I have throughout the organization, can be called 'extensive'
- I feel very comfortable calling others, regardless of rank, position, or organizational unit, when the need arises

Tolerance for ambiguity of manager's peers and/ or superiors (Volberda, 1998)

- The attitude in my working environment is very negative when I have deviant opinions or new ideas ®
- My direct supervisors strongly encourage me to think 'out of the box'
- Differing opinions or new ideas I have, have a great chance to succeed in my working environment
- I am very careful about questioning existing assumptions we have here ®

All items are measured on a 7-point scale with 1 = 'to a very small extent', or 'strongly disagree', to 7 = 'to a very large extent', or 'strongly agree'

® means reversed coded item

APPENDIX C – Specification of Interviews

Company: Rabobank

Date of	Hier. Level	Function of	Local Bank	Unit
Interview	Respondent	Respondent		
15 11 2002	Тор	Back office	1	Operations
21 01 2003	Middle	Front office	1	Whole sale
21 01 2003	Front	Front office	1	Whole sale
21 01 2003	Front	Front office	1	Retail
23 01 2003	Тор	Back office	1	Operations
23 01 2003	Front	Back office	1	Operations
23 01 2003	Front	Front office	1	Retail
30 01 2003	Middle	Front office	1	Whole sale
30 01 2003	Middle	Front office	1	Whole sale
26 06 2003*	Top	Back office	1	Operations
	Front	Back office		Operations
27 02 2004	Top	Back office	2	Operations
27 02 2004	Front	Back office	2	Operations
27 02 2004	Front	Back office	2	Operations
06 05 2004*	Top	Back office	2	Operations
	Middle	Front office		Retail
	Middle	Front office		Retail
28 02 2004	Top	Back office	3	Operations
28 02 2004	Middle	Back office	3	Operations
28 02 2004	Front	Back office	3	Operations
06 05 2004*	Top	Back office	3	Operations
	Middle	Back office		Operations
14 07 2004	Top	Back office	4	Operations
14 07 2004	Middle	Back office	4	Retail
14 07 2004	Front	Front office	4	Retail
05 10 2004*	Middle	Back office	4	Retail
25 11 2004	Top	Front office	5	Whole sale
25 11 2004	Front	Front office	5	Whole sale
25 11 2004	Front	Front office	5	Whole sale
25 11 2004	Middle	Back office	5	Whole sale
13 09 2005*	Top	Front office	5	Whole sale
10 07 2002	Middle		Headquarters	E-Commerce
	Middle		Rabo Nederland	
10 05 2004*	Middle		Headquarters	E-Commerce
	Middle		Rabo Nederland	

Appendix C – Cont.

Company: Philips

Date of	Hier. Level of	Function of Respondent	Unit
Interview	Respondent		
31 03 2004	Тор	Head of Human Resources	Headquarters
21 04 2004	Тор	CEO Division	Headquarters
19 04 2004	Тор	Vice CEO Division and CEO	Automotive
		Automotive Unit	
22 04 2004	Middle	Innovation	Headquarters
15 04 2004	Middle	Quality assurance and Reliability	Automotive
13 04 2004	Middle	Supply Chain	Headquarters
20 04 2004	Front	Finance	Headquarters
22 04 2004	Front	Quality	Headquarters
15 04 2004	Middle	Design & Innovation	Automotive
09 04 2004	Middle	Market segment manager	Automotive
07 04 2004	Middle	Business Development and	Automotive
		Strategic Marketing	
12 10	Тор	CEO Division	Headquarters
2004*	Тор	Head of HRM	Headquarters

Company: Deloitte

	1 3			
	Date of	Hier. Level	Function of Respondent	Unit
	Interview	Respondent		
,	09 06 2004	Тор	CKO	Central & Support
	20 12 2004	Top	CKO	Central & Support
	30 12 2004	Middle	Manager Information Research	Consultancy
	30 12 2004	Front	Senior consultant	Accountancy
	30 12 2004	Front	Senior consultant	Consultancy
	27 09 2005*	Top	CKO	Central & Support

^{*} Interview refers to a feedback session. During a feedback session with managers, we presented, using a PowerPoint presentation, the empirical results of the study as conducted at their company. During this presentation, managers discussed with us the interpretation of the results and managerial implications.

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Managers' Exploration and Exploitation Activities The Influence of Organizational Factors and Knowledge Inflows

In order to be successful over time, firms in a dynamic environment are challenged to explore new possibilities to achieve congruence with the changing business environment, and to exploit old certainties to secure efficiency benefits. However, both researchers and managers struggle to understand how firms may manage and organize exploration and exploitation. This study delivers a contribution by investigating managers' exploration and exploitation activities, and by developing and testing hypotheses on the influence of organizational factors and managers' knowledge inflows on managers' exploration and exploitation activities. Results indicate that organizational factors not only directly influence managers' exploration and exploitation activities, but also indirectly through their influence on managers' knowledge inflows; i.e. knowledge inflows mediate the relationship between organizational factors and exploration and exploitation at the manager level. We contribute to current literature on exploration and exploitation and to management practice by focusing on the manager level of analysis. We add the importance of knowledge flow configurations to the literature on organizational factors' influence on exploration and exploitation. Furthermore, we illustrate which, and how, configurations of organizational factors enable or inhibit managers to explore, to exploit, or to combine both.

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