

JUSTIN JANSEN

Ambidextrous Organizations

A Multiple-level Study of Absorptive Capacity, Exploratory and Exploitative Innovation, and Performance



PHD THESIS

AMBIDEXTROUS ORGANIZATIONS

**A MULTIPLE-LEVEL STUDY OF ABSORPTIVE CAPACITY,
EXPLORATORY AND EXPLOITATIVE INNOVATION AND
PERFORMANCE**

Ambidextrous Organizations
**A Multiple-Level Study of Absorptive Capacity,
Exploratory and Exploitative Innovation and Performance**

**Ambidexter organisaties: een multi-level studie van absorptievermogen,
exploratieve en exploitatieve innovatie en prestatie**

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
vrijdag 29 april 2005 om 13.30 uur

door

Justin John Peter Jansen
geboren te Numansdorp

Promotiecommissie

Promotoren:

Prof.dr.ing. F.A.J. Van den Bosch

Prof.dr. H.W. Volberda

Overige leden:

Prof.dr. M.A. Lyles

Prof.dr. G. George

Dr. J.S. Sidhu

Erasmus Research Institute of Management (ERIM)

Erasmus University Rotterdam

Internet: <http://www.irim.eur.nl>

ERIM Ph.D. Series Research in Management 55

ISBN 90 – 5892 – 081 – X

© 2005, Justin J.P. Jansen

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system, without permission in writing from the author.

PREFACE

The dissertation in front of you is the result of hard work, fun, and curiosity. Starting with an academic position was not so obvious for me. In fact, becoming an ‘AIO’ had never come to my mind until I received my master’s. From that moment, I have been able to experience the difficulty and excitement of translating initial research ideas into theoretical sound and practical relevant research.

This book and related research could not have been realized without the assistance and support of many people. I would like to thank Prof.Dr. Frans van den Bosch and Prof.Dr. Henk Volberda for their critical suggestions, for putting things in perspective, and for curbing my (over)enthusiasm when I - again - came up with new ideas for doing additional research. In addition, I would like to acknowledge the invaluable research assistance of Eric Tas and Susan de Grijp. Thanks also to my colleagues of the department Strategy and Business Environment of the RSM Erasmus University. I enjoyed working closely with Raymond van Wijk. We had countless discussions over various issues concerning absorptive capacity and worked together on several papers. In addition, I want to mention my closest colleague Tom Mom in particular. From the moment we both followed courses in Copenhagen and Barcelona, we have shared many ideas about doing research, but maybe even more enjoyable, about life in general.

Special acknowledgements belong also to many people at the Rabobank Group. I want to thank several executive directors and managers of local branches for making it possible to present and discuss ideas about managing exploration and exploitation. In particular, a special thank you to Ad Druijts for being the driving force behind this research project within the Rabobank Group. Without his persistent enthusiasm, this multiple year project could not have been as extensive both in depth and breadth as it has been. Ad Druijts not only convinced many of

his colleagues at the Rabobank Group to participate in this research project, but also has stimulated me to translate the research findings into relevant managerial implications.

I want to thank my family and friends for supporting me during the previous years. My work has been a challenging endeavour and it would not have been possible without your limitless patience, humour, support, and understanding. Although most of you were quite surprised when I started as a PhD student, you hopefully have noticed that doing research means a lot more than discussing theoretical insights and conducting statistical analyses. Finally, I wish to express my gratitude to a special person. Linda, thank you for hearing me out whenever I came home, for keeping me motivated, and for being my fellow traveler. I hope we will share many more experiences and journeys.

Rotterdam, March 2, 2005

Justin J.P. Jansen

TABLE OF CONTENTS

PREFACE	v
TABLE OF CONTENTS	vii
CHAPTER ONE INTRODUCTION	1
Introduction	1
Research Aim and Questions	3
Research Contributions	8
Research Approach	10
Overview of PhD Research	13
CHAPTER TWO EXPLORATION, EXPLOITATION, AND THE AMBIDEXTROUS ORGANIZATION: A REVIEW AND MODEL	15
Introduction	15
Exploration and Exploitation in Organization Life	17
<i>Exploration and Exploitation: Insights from related literatures</i>	19
<i>Balancing Exploration and Exploitation: Recent Developments</i>	24
The Ambidextrous Organization: An Overview	27
Organizational Ambidexterity and Financial Performance	33
Coping with the Paradox of Exploration and Exploitation	36
<i>Accept the paradox by compromising or outsourcing</i>	37
<i>Resolve the paradox by spatial separation</i>	38
<i>Resolve the paradox by temporal separation</i>	39
<i>Solve the paradox by balancing</i>	41
Firm Ambidexterity and Exploratory/Exploitative Innovations in Organizational Units	42
Conclusion	48
CHAPTER THREE EXPLORATION, EXPLOITATION, AND ABSORPTIVE CAPACITY: A REVIEW AND MODEL	50
Introduction	50
Absorptive Capacity: Origins, Antecedents, and Outcomes	52
<i>Absorptive Capacity and Organizational Antecedents</i>	54
<i>Absorptive Capacity and Outcomes</i>	61
Absorptive Capacity: A Multidimensional Construct	65
Organizational Antecedents of Absorptive Capacity: Hypotheses	68
<i>Organizational Mechanisms Associated with Coordination Capabilities</i>	71

<i>Organizational Mechanisms Associated with Systems Capabilities</i>	74
<i>Organizational Mechanisms Associated with Socialization Capabilities</i>	76
Consequences of Absorptive Capacity: Exploratory and Exploitative Innovations	78
Conclusion	82
CHAPTER FOUR RESEARCH METHODOLOGY AND RESULTS	84
Introduction	84
Research Methods	85
Research Setting: The Rabobank Group	85
<i>The Rabobank group: a historical overview</i>	86
<i>The Rabobank group: ten years in figures</i>	88
Sample and Data Collection: Study I	89
Measurement and Validation of Constructs: Study I	90
<i>Firm financial performance</i>	91
<i>Firm-level ambidexterity</i>	91
<i>Heterogeneity among organizational units</i>	92
<i>Control variables</i>	93
Analysis and Results: Study I	96
Sample and Data Collection: Study II	103
Measurement and Validation of Constructs: Study II	104
<i>Exploratory and exploitative innovation</i>	105
<i>Potential and realized absorptive capacity</i>	105
<i>Organizational mechanisms associated with combinative capabilities</i>	107
<i>Control variables</i>	108
Analysis and Results: Study II – Organizational antecedents	113
Comparison of Relative Effects	118
Analysis and Results: Study II – Absorptive Capacity and Outcomes	119
Conclusion	124
CHAPTER FIVE DISCUSSION, LIMITATIONS, AND CONCLUSION	127
Introduction	127
Theoretical Implications	128
<i>Ambidextrous organizations and firm performance</i>	128
<i>Absorptive Capacity: Organizational Antecedents</i>	130
<i>Absorptive capacity: innovative outcomes</i>	136
Managerial Implications	139
Limitations	141
Future Research Directions	142
<i>Firm ambidexterity and financial performance</i>	142
<i>Absorptive capacity: organizational antecedents and consequences</i>	144
Conclusion	145

REFERENCES	146
NEDERLANDSE SAMENVATTING (DUTCH SUMMARY)	168
CURRICULUM VITAE	178

CHAPTER ONE

INTRODUCTION

INTRODUCTION

The competitive arena in business environments has changed in many ways. The globalization of markets, rapid technological change, shortening of product life cycles and the increasing aggressiveness of competitors, require firms to respond flexibly and rapidly (Grant, 1996a; Volberda, 1996). Not just fast-moving, high-tech industries have been facing these changes; even industries that were supposed to be stable are heating up (D'Aveni, 1994). As competition intensifies and the pace of change accelerates, firms are increasingly confronted with a tension between exploiting existing competencies and exploring new ones (Floyd & Lane, 2000; Levinthal & March, 1993; March, 1991). Firms seek to adapt to environmental changes, explore new ideas or processes, and develop new products and services for emerging markets. In addition, they need stability to leverage current competences and exploit existing products and services (Benner & Tushman, 2003).

Introduction

Firms, however, seem to have a preference for short-term exploitation efforts. The returns to exploitation are ordinarily more certain, closer in time and closer in space than are the returns to exploration (Levinthal & March, 1993: 106; March, 1991). Furthermore, past exploitation in a knowledge domain makes future exploitation in the same domain even more efficient (Lant & Mezias, 1992; Rosenkopf & Nerkar, 2001). As a result, firms increasingly maintain the status quo, exhibit convergence, and develop highly specialised competences that may become core rigidities (Leonard-Barton, 1992). Although the preponderance for exploitation may enhance short-term performance, it can result in a competence trap (Ahuja & Lampert, 2001; Levinthal & March, 1993) since firms may not be able to respond adequately to environmental changes (Henderson & Clark, 1990; Jansen, Van den Bosch, & Volberda, 2005; Sorenson & Stuart, 2000; Tushman & Anderson, 1986). Focusing on exploration can also have dysfunctional effects. Excessive exploration may enhance a firm's ability to continually renew their knowledge stock, but can trap organizations in an endless cycle of search and failure and unrewarding change (Levinthal & March, 1993: 106). These firms escalate resources and time to exploration and become over sensitive to short-term variations and local errors (Volberda & Lewin, 2003) without gaining benefits from exploitation. Accordingly, too much emphasis on exploration can result in a failure trap (Levinthal & March, 1993).

Long-term survival of organizations, therefore, depends on firms' ability to refrain from competence and failure traps and "engage in enough exploitation to ensure the organization's current viability and engage in enough exploration to ensure future viability (Levinthal & March, 1993: 105). Correspondingly, previous literatures have argued that successful firms are *ambidextrous* – aligned and efficient in managing today's demands, while also being adaptable to changes in the environment (Duncan 1976; Gibson & Birkinshaw, 2004; He & Wong, 2004; Tushman & O'Reilly, 1996). Organizational ambidexterity refers to an organization's ability to perform two different things at the same time (Gibson & Birkinshaw, 2004). Duncan (1976), who introduced the term 'ambidextrous organization', focused on the ability of organizations to design dual structures that facilitate the initiating stage and implementation stage of the innovation process. More recently, Tushman and O'Reilly (1996: 24) defined ambidexterity as the "ability to simultaneously pursue both incremental and discontinuous innovation

and change”. Ambidextrous organizations¹ generate rents through revolutionary *and* evolutionary change (Tushman & O’Reilly, 1996), creating *and* sustaining advantages (Grant, 1996a), responsiveness *and* efficiency (Hanssen-Bauer & Snow, 1996), change *and* preservation (Volberda, 1996), or exploratory *and* exploitative innovations (Benner & Tushman, 2003; Levinthal & March, 1993; March, 1991)². They reconcile conflicting demands from task environments and synchronize and balance concurrent exploration of new opportunities and exploitation of existing capabilities (Volberda & Lewin, 2003). For instance, Bradach (1997) described how chain organizations, such as KFC, Pizza Hut, and Hardee’s, have been able to achieve both innovation and control in one organization. Moreover, Tushman and O’Reilly (1996) argue that large corporations, such as Hewlett-Packard, Johnson & Johnson, and Asea Brown Boveri (ABB), have been able to compete in mature market segments through incremental innovation and in emerging market segments through discontinuous innovation. Although these three organizations operate in different industries, each of them has been able to renew itself through exploiting existing competencies as well as exploring new ones simultaneously.

RESEARCH AIM AND QUESTIONS

Strategic management literatures, organizational change, and organizational learning literatures have increasingly discussed the need for firms to achieve a balance between exploration and exploitation activities (Burgelman, 1996; Eisenhardt & Martin, 2000; Levinthal & March, 1993; Teece, Pisano, & Shuen, 1997). In this sense, Benner and Tushman (2003) argue that ambidextrous organizations pursue both exploratory and exploitative innovations

¹ Throughout this dissertation, ‘ambidextrous organization’ is used to refer to the ability of firms to perform exploratory and exploitative innovations simultaneously (cf. Benner & Tushman, 2003).

² The studies listed are representative rather than exhaustive. Other literatures have affirmed the underlying assumption that firms need to facilitate both contradictory elements simultaneously (e.g. Adler, Goldoftas, & Levine, 1999; Bradach, 1997; Wilson, 1966). Various theoretical perspectives have discussed this critical challenge for organizations, including theories of technological innovation (Anderson & Tushman, 1986; Dewar & Dutton, 1986; Ettlie, Bridges, & O’Keefe, 1984; Tushman & Romanelli, 1985; Tushman & Anderson, 1986; Tushman, Newman, & Romanelli, 1986), and organizational change (Mezias & Glynn, 1993).

Introduction

simultaneously. *Exploratory innovations* require new knowledge or departure from existing knowledge and are designed for emerging customers or markets. *Exploitative innovations* build upon existing knowledge and meet the needs of existing customers (Benner & Tushman, 2003: 243). The underlying assumption of theories on ambidextrous organizations is the importance of balancing and synchronizing exploratory and exploitative innovations, yet the difficulty of achieving both types of innovations in any singly organization has often been noted in the literatures (Burns & Stalker, 1961; Duncan, 1976; Tushman & O'Reilly, 1996; Volberda, 1998). Burns and Stalker (1961), for instance, have argued that two sharply different organizational designs, a mechanistic and organic structure, are appropriate for either exploitative innovations or exploratory innovations. While there is little empirical evidence how ambidextrous organizations are able to simultaneously pursue exploratory and exploitative innovations (cf. Benner & Tushman, 2003; Gibson & Birkinshaw, 2004; Tushman & O'Reilly, 1996), this is precisely the challenge facing numerous organizations (Brown & Eisenhardt, 1997; Bradarch, 1997). Researchers have yet to determine how ambidextrous organizations can be organic as well as mechanistic (Nord & Tucker, 1987) and pursue both types of innovations simultaneously. This PhD research, therefore, aims at

“enhancing our understanding of how ambidextrous organizations successfully cope with exploratory and exploitative innovations across organizational units”

Figure 1: Research aim

To adequately fulfill this research aim, various research questions have been formulated at multiple-levels of analysis. As shown in Figure two, this PhD research develops a multilevel framework that addresses organizational ambidexterity, exploratory and exploitative innovations, absorptive capacity, and financial performance. The overall framework of this PhD research can be divided into two parts.

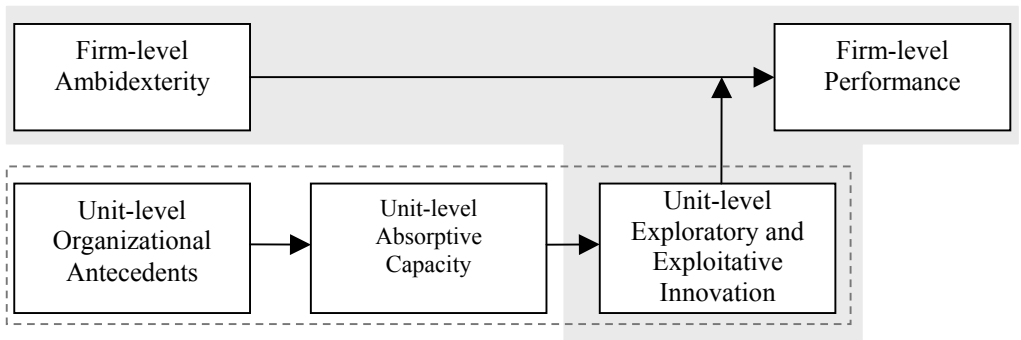


Figure 2: Overall framework of PhD research

The first part of this dissertation, captured by the shaded area in the figure above, addresses performance implications of organizational ambidexterity. To investigate the benefits of organizational ambidexterity, this PhD research examines the relationship between firm-level ambidexterity (i.e. pursuing exploratory and exploitative innovations simultaneously) and firm-level performance. Moreover, it also tests whether the most successful ambidextrous organizations *separate* or *combine* exploratory and exploitative innovations in organizational units. Although the importance of balancing and synchronizing exploratory and exploitative innovations has often been stressed, multiple views have been brought forward how ambidextrous firms may actually strike this balance³. On the one hand, scholars have suggested *separating* exploratory and exploitative innovations in organizational units (Benner & Tushman, 2003; Hill & Rothaermel, 2003; Tushman & O'Reilly, 1996). Duncan (1976) for example, argued that ambidextrous organizations develop dual organization structures for managing the innovation process. In this sense, organizational units shift their configuration of organizational structure to facilitate the initiation and the implementation phase of the innovation process. Such ambidextrous organizations

³ In addition to combining contradictory elements of exploratory and exploitative innovations within ambidextrous organizations, firms may also act ambidextrously by externalizing either exploratory or exploitative innovations (Baden-Fuller & Volberda, 1997; Volberda, 1998). In this regard, these firms outsource potential problems associated with the tension between both types of innovations and use external networks to complement their activities. In this dissertation, I focus on balancing and synchronizing exploratory and exploitative innovations *within* ambidextrous organizations.

Introduction

separate exploration and exploitation over time and consist of organizational units that alternate between both types of innovations (Brown & Eisenhardt, 1998; Johnston, 1976). Others have argued for separating exploration from exploitation by location and creating multiple organizational units that are inconsistent with each other (Tushman & O'Reilly, 1996; Benner & Tushman, 2003). Such ambidextrous organizations rely on horizontally differentiated exploratory and exploitative organizational units. On the other hand, scholars have increasingly recognized the importance of *combining* seemingly contradictory tensions from exploration and exploitation in organizational units (Gibson & Birkinshaw, 2004). In this way, ambidextrous firms create organizational units that pursue exploratory and exploitative innovations simultaneously. These organizational units combine contradictory organic and mechanistic features (Adler & Borys, 1996), centrifugal and centripetal forces (Sheremata, 2000), or develop a collective organizational context (Gibson & Birkinshaw, 2004). They need to integrate organizational characteristics in such a way that they act complementarily, reinforce each other (Sheremata, 2000), and support individuals to engage in both exploration-oriented actions and exploitation-oriented actions (Gibson & Birkinshaw, 2004). Proponents of this view argue that understanding the complex process of designing ambidextrous organizations requires conceptual and empirical research that is sensitive to the ability of organizational units to combine multiple contradictory elements simultaneously (McDonough & Leifer, 1983). Literatures from both sides have contributed to valuable insights, however, empirical research that has examined performance implications of both ways to cope with simultaneously pursuing exploratory and exploitative innovations is still lacking. To address these limitations, this PhD research has formulated the following research questions at the firm-level and unit-level of analysis.

1. *How can firm-level ambidexterity be defined and measured?*
2. *How does firm-level ambidexterity affect firm-level financial performance?*
3. *How does separation of exploratory and exploitative innovations in different organizational units moderate the relationship between firm-level ambidexterity and firm-level performance?*

Figure 3. Firm-level ambidexterity and performance: research questions

The second part of this dissertation, captured by the dotted line in Figure two, examines how organizational units develop exploratory and exploitative innovations. As outside knowledge sources are central to a unit's innovation process, the ability to recognize new external knowledge, assimilate it, and apply it to commercial ends (Cohen & Levinthal, 1990) becomes critical to a unit's exploratory and exploitative innovations (Van den Bosch, Volberda, & De Boer, 1999). Tsai (2001) confirmed the arguments of Cohen and Levinthal (1990) and provided empirical evidence that a unit's absorptive capacity increases its innovative performance. Despite the importance of a unit's absorptive capacity to its innovative outcomes, empirical examinations how absorptive capacity differentially influences exploratory and exploitative innovations are still largely lacking⁴. Zahra and George (2002), for instance, distinguished between acquisition and assimilation of new external knowledge (i.e. potential absorptive capacity) and transformation and exploitation (i.e. realized absorptive capacity) and argued that both components of absorptive capacity fulfill a necessary but insufficient condition to improve new product development. They argued that units need to manage their levels of potential and realized absorptive capacity to successfully convert knowledge into new products and services. Hence, examining differential effects of organizational antecedents on potential and realized absorptive capacity would not only clarify how dimensions of absorptive capacity may be managed, but also reveal why organizational units have difficulties in developing exploratory and exploitative innovations successfully. Since potential and realized absorptive capacity may have different implications for innovative outcomes (e.g. Zahra & George, 2002), this PhD research investigates differential effects of organizational antecedents on potential and realized absorptive capacity, and subsequently, the effect of both components of absorptive capacity on exploratory and exploitative innovations. To examine these

⁴ A notable exception is the study of Van Wijk, Van den Bosch, and Volberda (2001). They distinguished between the depth (i.e. specialist knowledge that allows a firm to learn complex matters) and breadth (i.e. generalist prior knowledge across a range of subject areas) dimension of absorptive capacity. Interestingly, they found that whereas the depth dimension of absorptive capacity decreases the ratio of exploration over exploitation, the breadth dimension of absorptive capacity increases the ratio of exploration over exploitation. However, how both dimensions of absorptive capacity directly influence exploration and exploitation remains rather unclear.

Introduction

issues at the organizational unit-level of analysis, the following research questions have been formulated:

4. *How can absorptive capacity be defined and measured?*
5. *How do organizational antecedents affect absorptive capacity?*
6. *How does absorptive capacity affect exploratory and exploitative innovations?*

Figure 4. Unit-level absorptive capacity and innovation: research questions

RESEARCH CONTRIBUTIONS

By developing and testing a multi-level framework on managing the tension between exploratory and exploitative innovations, this PhD research contributes to existing literatures in several ways. First, previous literatures on organizational ambidexterity have highlighted the challenge for today's management to balance and synchronize exploratory and exploitative innovations. Very few studies, however, have actually tested the ambidexterity hypothesis and examined whether ambidextrous organizations obtain higher levels of financial performance. Recent studies (Gibson & Birkinshaw, 2004; He & Wong, 2004) have found that organizational ambidexterity is associated with higher levels of financial performance, yet they relied on either subjective or self-reported data on financial performance. This study tests the 'ambidexterity' hypothesis with objective performance data regarding a firm's profitability as well as return-on-investment that are collected through internal corporate records. Second, empirical research has only begun exploring the ambidexterity hypothesis by including alignment and adaptability (Gibson & Birkinshaw, 2004) and exploration and exploitation innovation strategies (He & Wong, 2004). This study contributes to these studies by including complementary measures for a firm's ambidexterity – pursuing exploratory and exploitative innovations concurrently - and thereby providing additional insights into performance implications of pursuing contradictory forces simultaneously. Third, empirical research on ambidextrous organization has been focused on either the firm-level (He & Wong, 2004) or business unit-level (Gibson & Birkinshaw, 2004). In this way, organizational ambidexterity has been found to result in higher levels of financial performance; however, no insights have been

gained how ambidextrous organizations strike the balance between contradictory demands successfully. As previously indicated, various ways of coping with contradictory demands have been brought forward. This PhD study develops a multilevel framework and generates new insights about managing the tension between exploratory and exploitative innovations. It provides the first empirical study that examines organizational implications of balancing and synchronizing exploratory and exploitative innovations at both the firm-level as well as the unit-level of analysis. Fourth, this study contributes to and empirically validates the conceptual distinction between potential and realized absorptive capacity (Zahra & George, 2002) as well as exploratory and exploitative innovations (Benner & Tushman, 2003). To date, reliable and valid measures for these constructs are still lacking. Extant literature would clearly benefit from reliable and valid scales for these key constructs in strategic management, organizational learning, and organization theory literatures. This PhD research takes several steps both in the design and testing phases to develop reliable and valid measures for each construct. Moreover, it measures organizational ambidexterity by capturing a firm's ability to pursue exploratory and exploitative innovations simultaneously. Fifth, this study contributes to research regarding the link between combinative capabilities and absorptive capacity (Kogut & Zander, 1992; Teece, Pisano, & Shuen, 1997; Van den Bosch et al., 1999). We conceptually identify and empirically examine how common features of combinative capabilities affect dimensions of absorptive capacity (Jansen et al., 2005). Previous research has argued that common features of combinative capabilities involve organizational mechanisms that each influences absorptive capacity in specific ways (e.g. Eisenhardt & Martin, 2000; Henderson & Cockburn, 1994; Van den Bosch et al., 1999). No insights, however, have been gained into how these organizational mechanisms affect acquisition and assimilation (i.e. potential absorptive capacity), and transformation and exploitation (i.e. realized absorptive capacity) of new external knowledge. Hence, we reveal how organizational antecedents matter and examine the linkage between specific organizational mechanisms as common features of combinative capabilities and dimensions of absorptive capacity. Sixth, this study investigates how potential and realized absorptive capacity influence exploratory and exploitative innovations. Although previous literatures highlighted that dimensions of absorptive capacity differentially influence outcomes (Zahra & George, 2002), very few empirical studies have examined these hypothesized relationships. Accordingly, this study reveals how organizational units are able to

Introduction

invest in certain organizational mechanisms underlying combinative capabilities, change levels of potential and realized absorptive capacity and develop exploratory and exploitative innovations.

RESEARCH APPROACH

This PhD research follows a combined research approach to obtain answers to the formulated research questions (Jick, 1979). Combining qualitative and quantitative research designs, described as triangulation (Denzin, 1978), is advantageous to better understand concepts being explored and tested (Creswell, 1994). Such triangulation is aimed at reducing any bias inherent in particular data sources and methods by using them in conjuncture with other data sources and methods (Creswell, 1994). It provides stronger substantiation of constructs and hypotheses (Eisenhardt, 1989) and allows researchers to be more confident in their results (Jick, 1979). In this research endeavor, qualitative data were obtained to generate a rich and comprehensive picture of the constructs and to further enhance the rationale of hypothesized relationships. Moreover, qualitative data have been used to provide anecdotal data that may contribute to the validation of results and to the interpretation and understanding of statistical relationships found (Jick, 1979; Sieber, 1973). Quantitative data were obtained to examine the patterns of relationship between the constructs (Bryman, 1989) and to contribute to greater generalizability of the results (Jick, 1979).

The research approach of this PhD research can be broadly divided into three parts. During the first part, we provide an overview of the literature. We build upon strategic management, organizational learning, and change literatures (March & Olsen, 1975; Levinthal & March, 1981; Lant & Mezias, 1992) since balancing exploratory and exploitative innovations has been a consistent theme both in conceptual (Benner & Tushman, 2003; Levinthal & March, 1993; Tushman & Nadler, 1986; Zahra & George, 2002) as well as in empirical research (Henderson & Clark, 1990; March, 1991; Tushman & Romanelli, 1985; Van den Bosch et al., 1999). Insights from the literature review and qualitative data obtained through in-depth interviews were combined and used to specify the theoretical domains of the constructs and to develop a multilevel framework that hypothesizes relationships between the constructs. The qualitative data were obtained from various managers at branches and subsidiaries of the Dutch Rabobank Group. The Rabobank Group

is a large European multi-unit financial services firm. It has total assets of more than \$ 440 billion and ranks within the top 30 on the Fortune Global 500 in terms of total revenue in the banking industry. It is a broad-based financial service provider having branches in various countries. In the Netherlands, the Rabobank Group consists of 328 branches that are geographically distinct entities with their own clientele (annual report Rabobank Group, 2003). These branches have been the focal research context of this PhD research. The products and services of these branches cover asset management, insurance, leasing, equity participation, corporate banking, and investment banking⁵. The qualitative data obtained during the first part of the empirical research not only enhanced the rationale underlying the hypotheses, but also generated initial ideas on how to design and obtain quantitative data that would enable testing of the hypothesized relationships.

The second part of the empirical research entailed the design of quantitative data collection, the development of suitable scales and questionnaires, the collection of quantitative data, and the analysis of the obtained data. As shown in Figures five and six below, quantitative data were collected through two empirical studies that were administered to multiple levels at branches of the Rabobank Group. The first study was used to explore performance implications of organizational ambidexterity. In addition to examining the relationship between organizational ambidexterity and financial performance, study I was aimed at uncovering how successful ambidextrous organizations cope with potentially conflicting pressures from exploratory and exploitative innovations among organizational units. Accordingly, as shown in Figure five, study I incorporated multiple levels of analysis, i.e. the firm-level and unit-level of analysis. Survey packages, each containing a copy of executive-director questionnaires and copies of organizational unit manager questionnaires (equal to the number of organizational units in each branch) were developed and administrated to autonomous branches of the Rabobank Group in the Netherlands.

⁵ Chapter four provides a comprehensive description of the Rabobank Group and its branches.

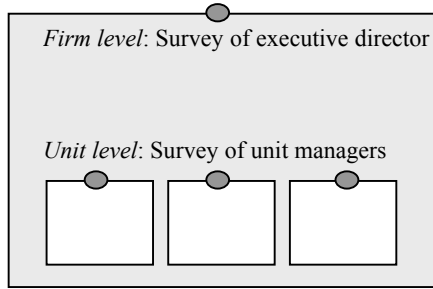


Figure 5. Study I: Firm-level and Unit-level questionnaires

Study II was aimed at the second set of research questions regarding absorptive capacity and was used to examine interrelationships between organizational antecedents, potential and realized absorptive capacity, and exploratory and exploitative innovations. As shown in Figure six, the second study was focused on the organizational unit-level of analysis. Survey packages, each containing copies of organizational unit manager questionnaires (equal to the number of organizational units in each branch) were developed and administrated to autonomous branches of the Rabobank Group in the Netherlands.

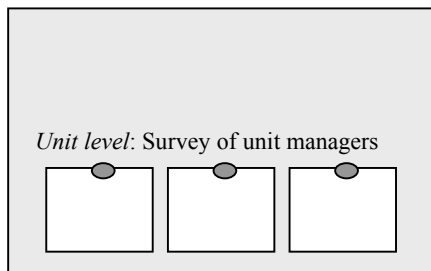


Figure 6. Study II: Unit-level questionnaires

To enable understanding and interpretation of the results, the third part of the research approach consists of several feedback sessions that were held for organizational unit managers and executive directors of branches. These sessions were organized at both the Rabobank Group and the Erasmus University Rotterdam and were used to discuss interpretations as well as managerial implications of the empirical findings.

OVERVIEW OF PHD RESEARCH

Table one provides an overview of the dissertation structure and corresponding research activities. After this introductory chapter, chapter two provides a literature review pertaining to balancing and synchronizing exploratory and exploitative innovations. Next, chapter two discusses research on ambidextrous organizations and draws upon literatures that distinguish between various ways through which ambidextrous organizations may cope with potentially conflicting pressures from exploratory and exploitative innovations. By introducing a multiple level framework, chapter two results in a number of hypotheses explaining (1) performance implications of firm-level ambidexterity (i.e. pursuing exploratory and exploitative innovations simultaneously), and (2) how ambidextrous organizations may successfully cope with both types of innovations among organizational units. Based on an extensive literature review and in-depth interviews that have been conducted at various branches of the Rabobank Group, chapter two questions whether effective ambidextrous organizations separate or combine exploratory and exploitative innovations in organizational units.

Dissertation Structure	Research Activities
Chapter One: Introduction	
Chapter Two: Exploration, Exploitation, and the Ambidextrous Organization: A Review and Model	Literature Review In-depth Interviews
Chapter Three: Exploration, Exploitation, and Absorptive Capacity: A Review and Model	
Chapter Four: Research Methodology, Data Collection, and Results	In-depth Interviews Questionnaire Development Data Collection and Analysis
Chapter Five: Discussion, Limitations, and Future Research	Feedback sessions

Table 1: Dissertation structure and research activities

Introduction

The third chapter of this dissertation focuses on the unit-level of analysis and discusses the interrelationship between organizational antecedents, dimensions of absorptive capacity, and exploratory and exploitative innovations. Based on Jansen et al. (2005), chapter three discerns important organizational mechanisms as common features of combinative capabilities and explains how these organizational mechanisms differentially influence a unit's potential and realized absorptive capacity. In addition, to enhance our understanding how organizational units develop exploratory and exploitative innovations, hypotheses are proposed that explain how potential and realized absorptive capacity influence both types of innovations.

Chapter four explains the research methodology applied in this PhD study and reports the results of the empirical study. Chapter four starts with a description of the research setting and discusses the research sample of the empirical study. As indicated, this PhD research has conducted two surveys at multiple levels of analysis to fulfill the research aim. Chapter four describes the procedures for data collection of both surveys and explains how new scales for the constructs are developed and validated. Subsequently, regression analyses are conducted to test the hypotheses as proposed in chapter two and three.

Finally, chapter five presents the overall discussion of this dissertation and provides an overview of the theoretical implications for research on organizational ambidexterity as well as absorptive capacity. To enable the interpretation of the results and insights into managerial implications of findings, several feedback sessions have been organized at branches of the Rabobank Group as well as at the Erasmus University Rotterdam. Chapter five concludes with limitations of the current empirical research that provide meaningful pathways for future research.

CHAPTER TWO

EXPLORATION, EXPLOITATION, AND THE AMBIDEXTROUS ORGANIZATION: A REVIEW AND MODEL

Introduction

Research on topics of organizational learning and change has enjoyed an extended and prosperous history (cf. Cyert & March, 1963; Lant & Mezias, 1992; Levinthal & March, 1993; March, 1991; March & Olsen, 1975). It attempts to understand the processes that lead to changes in organizational knowledge and subsequent changes in organizational behaviour and outcomes. Literatures on organizational learning and change have long argued that organizations capable of pursuing exploration and exploitation simultaneously obtain superior performance and enhance their long term survival. Correspondingly, they have argued that successful firms are *ambidextrous* – aligned and efficient in managing today’s demands, while also being adaptable to changes in the environment (Duncan 1976; Gibson & Birkinshaw, 2004; Tushman & O’Reilly, 1996).

This chapter reviews various literatures on exploration, exploitation, and the ambidextrous organization.

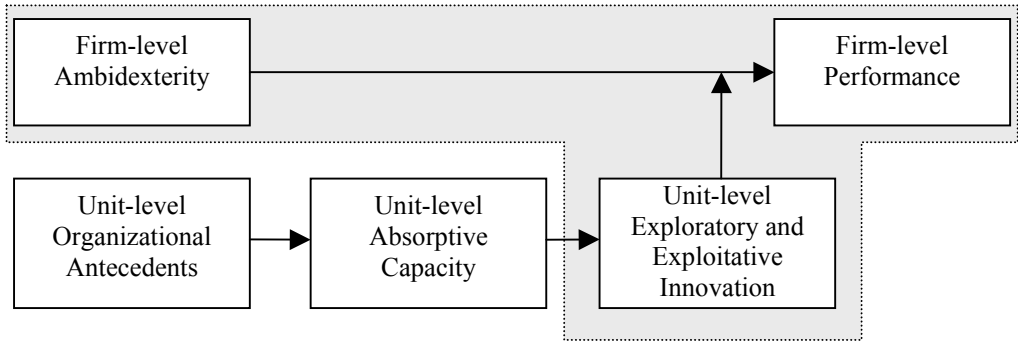


Figure 7. Firm-level ambidexterity and performance: the role of unit-level exploratory and exploitative innovation

Based on the distinction between exploration and exploitation (March, 1991), the next paragraphs discuss recent conceptual studies (e.g. Benner & Tushman, 2003; O'Reilly & Tushman, 2004) and define exploratory and exploitative innovations as two distinct types of innovations. Since researchers working in closely related streams have converged to related distinctions between exploration and exploitation, a brief overview is given on literatures ranging from technological change and innovation to organization theory. Next, the sections dealing with exploration and exploitation are concluded by a discussion on recent literatures on balancing exploration and exploitation. Subsequently, research on organizational ambidexterity in general and on dealing with paradoxes in organizations such as pursuing exploratory and exploitative innovations is discussed. This chapter develops a multilevel framework and not only examines whether ambidextrous organizations obtain higher levels of financial performance, but also investigates how these organizations cope with potentially conflicting pressures from exploratory and exploitative innovations. In other words, do successful ambidextrous organizations separate or combine both types of innovations in organizational units? Finally, in the discussion we will provide an overview of the main issues provided in this chapter.

Exploration and Exploitation in Organization Life

Previous literatures have emphasized the crucial role of organizational learning and knowledge in obtaining a competitive advantage. Although organizations need to learn through experience and refine their existing capabilities, they also need to create variety in experience through experimenting, innovating, and risk taking. This trade-off between exploitation and exploration has been explicated in detail (Levinthal & March, 1993; Lewin & Volberda, 1999; March, 1991). Organizations face a dilemma of allocating resources to the exploitation of existing practices or to the exploration of new alternatives. *Exploitation* captures activities such as efficiency, production, selection, and execution (March, 1991: 71). Through exploitation, organizations learn to refine their capabilities, apply current knowledge, and focus on current activities in existing domains (Holmqvist, 2003: 99). Exploitation creates reliability in experience through refinement and routinization of knowledge (Holmqvist, 2004). While organizations that engage in exploitation utilize and improve existing competencies, organizations may also engage in exploration and pursue new competencies that are distinctly different from existing competences. *Exploration* implies activities characterized by variation, experimentation, flexibility, risk-taking, and innovation. Accordingly, exploration involves the search for new organizational routines and the discovery of new approaches to technologies, businesses, processes, and products (McGrath, 2001). As succinctly summarized by March (1991), the distinction between exploration and exploitation captures a number of fundamental differences in firm behavior that have significant consequences on a firm's performance.

To examine how ambidextrous organizations cope with potentially conflicting demands from exploration and exploitation, this PhD research follows recent conceptual studies and refers to exploratory and exploitative innovations as two distinct innovative outcomes of learning. Both types of innovations can be classified along two domains: (1) the proximity to existing products and services and (2) the proximity to existing customer/market segments (Abernathy & Clark, 1985; Benner & Tushman, 2003; Danneels, 2002). *Exploratory innovations* are radical innovations and are designed to meet the needs of emerging customers and markets (Benner & Tushman, 2003: 243; Danneels, 2002). They offer new designs, create new markets, and develop new channels of distribution (Abernathy & Clark, 1985). Accordingly, exploratory innovations result from the search for

new organizational routines and the discovery of new approaches to technologies, businesses, processes, and products (McGrath, 2001). Exploratory innovations require new knowledge or departure from existing knowledge (Levinthal & March, 1993; McGrath, 2001) and are characterized by search, variation, experimentation, flexibility, and risk-taking (March, 1991). Conversely, *exploitative innovations* are incremental innovations and are designed to meet the needs of existing customers or markets (Benner & Tushman, 2003: 243; Danneels, 2002). They broaden existing knowledge and skills, improve established designs, expand existing products and services, and increase the efficiency of existing distribution channels (Abernathy & Clark, 1985: 5). Organizations that pursue exploitative innovations refine their capabilities, apply current knowledge, and focus on current activities in existing domains (Holmqvist, 2003: 99). Hence, exploitative innovations build on existing knowledge and reinforce existing skills, processes, and structures (Abernathy & Clark, 1985; Holmqvist, 2004; Levinthal & March, 1993; Lewin et al., 1999). They result from activities focusing on refinement, production, efficiency, and execution (March, 1991). Our analysis considers exploratory and exploitative innovations as having both administrative and technical aspects (Mezias & Eisner, 1997; Van de Ven, 1986)⁶. Thus, when referring to both types of innovations, we explicitly incorporate non-technical aspects such as changes in knowledge and skills underlying products, services, and technologies (e.g. see Table two; Volberda & Van den Bosch, 2004; 2005).

⁶ Most studies have focused on technological innovation or change (e.g. Ahuja & Lampert, 2001; Anderson & Tushman, 1986; Danneels, 2002; Henderson & Clark, 1990). Rosenkopf and Nerkar (2001) for example, analysed the impact generated by different types of exploration on subsequent technological evolution. In addition, Rothaermel and Deeds (2004) examined new product development paths in biotechnology firms. They argued that firms change their types of alliances during new product development from exploration alliances to exploitation alliances.

	Exploratory Innovation	Exploitative Innovation
Definition	are radical innovations and are designed to meet the needs of emerging customers or markets	are incremental innovations and are designed to meet the needs of existing customers or markets
Outcomes	new designs, new markets, and new distribution channels	existing designs, current markets, and existing distribution channels
Knowledge base	require new knowledge and departure from existing knowledge	build and broaden existing knowledge and skills
Result from	search, variation, flexibility, experimentation, and risk-taking	refinement, production, efficiency, and execution
Performance implications	distant in time	short-term benefits

Table 2: Exploratory and Exploitative Innovations

Exploration and Exploitation: Insights from related literatures

Researchers working in closely related streams have converged to related distinctions between exploration and exploitation. One of the central notions in literatures on *technological innovation*, for instance, is the distinction between refining and improving an existing design and introducing a new concept that departs in a significant way from past practice (Abernathy & Clark, 1988; Dewar & Dutton, 1986). Incremental innovation introduces relatively minor changes to the existing product and reinforces established designs, practices, and structures. Radical innovation, in contrast, is based on a different set of principles and often opens up whole markets and potential applications (Benner & Tushman, 2003; Dewar & Dutton, 1986; Ettlie, Bridge, & Keefe, 1984; Nord & Tucker, 1987). Because radical innovations are incompatible with existing products, services, and processes, they produce fundamental changes in activities and represent a large departure from existing organizational practices (Moch & Morse, 1977). Accordingly, previous research has found that properties of innovations such as radicality influence the rate of innovation diffusion (Lee, Smith, & Grimm, 2003; Rogers, 1995). Moreover, studies have argued that radical innovations require other structural arrangements to become successfully adopted (Ettlie et al., 1984). Based on Abernathy and Clark (1985), Benner and Tushman (2003) distinguished

between incremental innovations that are designed to meet the needs of existing customers or markets (exploitative innovations) and radical innovations that are designed to meet the needs of emerging customer and markets (exploratory innovations). They argued that organizational units pursuing exploratory innovations are supposed be smaller and more decentralized with loose cultures, while organizational units pursuing exploitative innovations are generally larger and more centralized with strong cultures (Benner & Tushman, 2003). Accordingly, literatures on innovation have applied the distinction between exploration and exploitation and have distinguished between radical and incremental innovations. These literatures have discussed the implications of both types of innovations for a firm's financial performance, innovation adoption, organizational structure, and practices.

Literatures on *technological change* have suggested that technology is a central force in shaping environmental conditions (Anderson & Tushman, 1990; Tushman & Anderson, 1986). Studies across a range of industries have suggested that technological progress constitutes an evolutionary system punctuated by discontinuous change. Major discontinuous technological breakthroughs are rare. Therefore, during long periods of incremental change, numerous incremental innovations improve existing dominant designs, enhance and extend the underlying technology, and increase scale or efficiency. Periods of incremental change, however, are punctuated by discontinuous change when new technologies represent a significant advance that older technologies are not competitive anymore (Tushman & Anderson, 1986). Firms, thus, need to be able to compete in eras of incremental change through pursuing incremental innovations while competing in eras of ferment through pursuing radical innovations. Although older firms in industries have the advantage over younger firms in terms of number of innovations (Stinchcomb, 1965), Sorensen and Stuart (2000) have shown that older firms generate less relevant innovations because they rely on improved but older routines. Thus, firms that are able to gradually improve existing dominant design as well as to initiate major technological breakthroughs gain major advantages over rivals.

Stream of research	Related distinction between exploitation and exploration	Example of literatures
Organizational learning	Exploitation and exploration Refinement search and innovative search Local search and long jump	Levinthal (1997); Levinthal & March (1981, 1993); March (1991)
Technological innovation	Incremental and radical Innovation Exploitative and exploratory Innovation	Abernathy & Clark (1985); Benner & Tushman (2003); Dewar & Dutton (1986); Ettlie, Bridge, & Keefe (1984); Nord & Tucker (1987);
Technological change	Incremental change and technological breakthrough Competence enhancing and competence destroying	Anderson & Tushman (1990); Tushman & Anderson (1986)
Organizational change	Convergence and reorientation Momentum and revolution Evolutionary and revolutionary change	Lant, Milliken, & Batra (1992); Miller & Friesen (1980, 1984); Tushman & Romanelli (1985); Tushman & O'Reilly (1996)
Strategic management	Static efficiency and dynamic efficiency Induced and autonomous strategic process Competence leveraging and competence building Leverage and stretch	Burgelman (1991); Ghemawat & Ricart I Costa (1993); Hamel & Prahalad (1993); Sanchez et al. (1996); Schuler & Jackson (1987)
Organization theory	Certainty and flexibility Operating and innovating Change and preservation	Burns & Stalker (1961); Galbraith (1982); Thompson (1967); Volberda (1996)

Table 3: Exploitation and Exploration: Insights from related literatures

A similar distinction between exploration and exploitation is a thematic hallmark of research on *organizational change*. In their model of organizational evolution, Tushman and Romanelli (1985) suggested that organizations experience long periods of convergence punctuated by short periods in which major discontinuous changes occur. During convergence periods, organizations aim at establishing consistency or alignment between internal activities and conditions of the external environment to achieve high performance. Miller and Friesen (1980) argued that interdependencies among organizational and environmental variables

tend to manifest gestalts that are common configurations of mutually reinforcing elements of strategy, structure, and environment. Various studies have found that elements of organizations and environments are closely interdependent (e.g. Burns & Stalker, 1961; Lawrence & Lorsch, 1967; Miles & Snow, 1978; Miller & Friesen, 1977; 1978; Mintzberg, 1973; Thompson, 1967). Burns and Stalker (1961), for instance, crystallized similar considerations into two organizational types, mechanistic and organic, that are suited to stable and changing environments. Moreover, Mintzberg (1973) distinguished between three modes of strategy-making that each exhibit consistency among characteristics but differ from each other in terms of motives, goals, vision of direction, and decision horizon. Based on a longitudinal study on 21 US pharmaceutical firms, Bierly and Chakrabarti (1996) identified four groups with generic knowledge strategies: explorers, exploiters, loners, and innovators. Miles and Snow (1978) proposed a strategic typology classifying business units into four groups: prospectors, analyzers, defenders, and reactors. Miller and Friesen (1980; 1984) have shown that momentum is a pervasive force and incremental change appears to be biased in the direction that firms generally extrapolate past trends. However, despite inertial properties of convergence periods, organizations need to undergo discontinuous shifts in strategic orientation, core structure, and nature of control systems (Tushman & Romanelli, 1985). Momentum may lead to low performance when inconsistencies arise in terms of organizational variables and environmental or major changes in the economic, technological, social and legal conditions of the environment make an existing strategic orientation obsolete. Accordingly, Tushman and Romanelli (1985) suggested that successful organizations have developed the correct balance of stability and change; these organizations will reorient when environmental conditions warrant such a change. Although persistence frequently improves an organization's efficiency, it can also lead to failure when there are major shifts in an organization's environmental context. Accordingly, Miller and Friesen (1982) found that successful organizations exhibited a pattern of organizational change that is both dramatic and quick. In other words, successful organizations are not only able to change structural variables in a more radical way, but also increase or decrease structural variables quickly. Achieving long-term success requires the ability to emphasize efficiency during periods of evolutionary change and pursuing quick discontinuous transformations in strategic orientation in periods of revolutionary change (Tushman & O' Reilly, 1996).

Literatures on *strategic management* have emphasized the tension between exploitation and exploration in terms of static and dynamic efficiency (Ghemawat & Ricart i Costa, 1993), induced and autonomous strategic processes (Burgelman, 1991), leverage and stretch (Hamel & Prahalad, 1993), and leveraging and building competences (Sanchez et al., 1996). In their paper that analyses the trade-off between static and dynamic efficiency, Ghemawat and Ricart I Costa (1993) showed that organizations have the tendency towards extreme forms of pursuing efficiency. On the one hand, static efficiency involves continuous search for improvements of existing products, processes, and capabilities within a fixed set of initial conditions. Organizations that pursue dynamic efficiency, on the other hand, continuously reconsider initial conditions and develop new products, processes, and capabilities (Ghemawat & Ricart I Costa, 1993: 59). Because of sunk costs, opportunity costs of the path not taken, different sets of socially complex resources, and inertial tendencies, organizations have difficulty in changing between the two efficiency orientations. A similar distinction has been made between induced and autonomous strategic processes (Burgelman, 1991). Induced strategic processes are based on retrospective sense making and attempt to capture organizational learning based on past success. They preserve the coupling of operational-level strategic initiatives with the organizational-level strategy, maintain the organization context, and lead to incremental and peripheral adaptation. Autonomous strategic processes expand a firm's domain and result into activities that are outside the scope of the current strategy (Burgelman, 1991). In this sense, induced strategic processes serve as a variation-reduction mechanism, while autonomous strategic processes allow firms to move to a new curve of adaptation and renewal. Hamel and Prahalad (1993) argued that most thinking on the topic of 'strategic fit' is static; focusing on the fit between existing resources and opportunities. A firm's capacity to leverage its resources is a key to creating a competitive advantage through using capabilities across organizational units, improving them through cooperation with others, and employing them where the returns are highest. However, firms also need stretch, a purposely created misfit between the firm and its environment by means of "a chasm between ambition and resources" (Hamel & Prahalad, 1993: 84). Accordingly, a key management task in competence-based competition is to imagine new competences that will be the basis for sustainable competitive advantage in the coming years and build these competencies incrementally (Sanchez & Heene,

1997). To remain viable in the long run, organizations should effectively manage the effectiveness of competence building and leveraging processes (Sanchez et al., 1996: 10). Competence building refers to the acquisition and development of qualitative different assets and capabilities. A firm engages in competences leveraging when applying its existing competences to market opportunities in ways that do not require qualitative changes in the firm's assets or capabilities. Competence leveraging, in effect, “is the exercise of one or more of a firm's existing options for action created by its prior competence building” (Sanchez et al., 1996: 8). Heterogeneity among firms in changing industries arises from path-dependent developmental paths of competences and differences in the capacity of maintaining a mix of competence building and competence leveraging activities. These differences are determined by each firm's set of goals, by its strategic logic for achieving goals, and by the way in which each firm coordinates the deployment of resources in pursuit of established goals (Sanchez & Heene, 1997).

In *organization theory* research, scholars have distinguished between structures that are conducive to efficiency and structures that are conducive to innovation. Galbraith (1982), for instance, argued that operating and innovating are fundamentally opposing logics that require sharply different organizational structures. In addition, Thompson (1967) called attention to the paradox of administration, the dual search for certainty and flexibility, which to a large extent revolves around short-run and long-run perspective of administration. In their seminal work on innovation, Burns and Stalker (1961) distinguished between organizational structures that are conducive to stable conditions (i.e. mechanistic organizational structures) and organizational structures that are appropriate to changing conditions (i.e. organic organizational structures). Volberda (1996) referred to the paradoxical nature of flexibility and suggested that various organizational forms represent particular ways of addressing the flexibility paradox of change and preservation.

Balancing Exploration and Exploitation: Recent Developments

Although various studies on exploration and exploitation as well as related streams of research have argued that firms need to balance exploration and exploitation, few have empirically tested performance implications of organizational ambidexterity. Rather, previous research has applied the exploration-exploitation framework to contexts such as strategic management,

organizational change, and innovation, and has examined dynamics between exploration and exploitation over time through linking and de-linking technology and customer competences (Danneels, 2002), through establishing exploration and exploitation alliances (Holmqvist, 2004; Koza & Lewin, 1998; Rothaermel & Deeds, 2004) or through organization-environment coevolution (Lewin, Long, & Carroll, 1999; Lewin & Volberda, 1999; Van den Bosch et al., 1999).

Danneels (2002), for instance, examined how product development activities contribute to the renewal of firms. Based on the notion that new products are developed through linking technology competences and customer competences, he derived a typology that classifies new product development projects ranging from pure exploration to pure exploitation. To renew over time, firms need to link and de-link current and new technology and customer competences. Holmqvist (2004) revealed the dynamics of exploitation and exploitation over time. Based on a case study, he indicated how experiential learning processes of exploration and exploitation within organizations generate interorganizational exploration and exploitation. Qualitative data also suggested how exploration and exploitation between organizations generate within-organization exploration and exploitation. Based on the conceptual distinction between exploration and exploitation alliances (Koza & Lewin, 1998), Rothaermel and Deeds (2004) provided quantitative data on the alliance history of 350 biotechnology firms. They found that biotechnology firms have an integrated product development path in which their exploration alliances predict products in development, which in turn predict their exploitation alliances, and which, in turn, predict their products on the market. In addition, they found that firm size negatively influenced the above explained relationships. In other words, exploration and exploitation alliances become less relevant for the firm's new product development as the technology venture accrues more internal resources.

Studies on organizational learning and change have also generated a model of organizational adaptation that link firm-level exploration and exploitation to changes in the population of organizations (Lewin, Long, & Carroll, 1999; Van den Bosch et al., 1999). Lewin et al. (1999) outlined a model of organization-environment co-evolution that links firm-level exploration and exploitation to changes in the population of organizations. They considered organizations, their populations, and their environments as the interdependent outcome of managerial actions, institutional influences, and extra-institutional changes. Moreover, they argued that organizations increase, deplete, or enhance their legacy through the

cumulative effect of their exploration and exploitation activities as mediated by their absorptive capacity to assimilate new external knowledge. Van den Bosch et al. (1999) addressed this mediating role of absorptive capacity in organizational adaptation and argued that a firm's absorptive capacity influences expectation formation and the exploration/exploitation path of firms. They introduced three dimensions of absorptive capacity – efficiency, scope, and flexibility - and suggested that the flexibility and scope dimensions of absorptive capacity are related to exploration while the efficiency dimension of absorptive capacity is related to exploitation. Furthermore, they related absorptive capacity to micro- and macro- co-evolutionary effects and offer an explanation how knowledge environments co-evolve with the emergence of organizational forms and combinative capabilities that are suitable for efficiency, scope, and flexibility dimensions of absorptive capacity.

Only recently, empirical studies have examined whether organizational actors pursuing exploration and exploitation simultaneously obtain superior performance. Gibson and Birkinshaw (2004) and Birkinshaw and Gibson (2004), for instance, have argued that ambidextrous business units, i.e. business units that are simultaneously adaptive and aligned, obtain superior performance. They surveyed multiple respondents per business unit of large multinational firms and found that ambidexterity is significantly related to higher financial performance. He and Wong (2004) distinguished between exploration and exploitation innovation strategies. An explorative innovation strategy denotes technological innovation activities aimed at entering new product-market domains. An exploitative innovations strategy captures technological innovation activities aimed at improving existing product-market positions. Based on survey data from 206 firms from Singapore and Malaysia, they found a positive interaction between explorative and exploitative innovation strategies on firm performance. Moreover, a relative imbalance between explorative and exploitative innovation strategies in absolute values was negatively related to firm performance. Accordingly, He and Wong (2004) found a positive effect of ambidexterity in the context of technological innovation. Kyriakopoulos and Moorman (2004) have argued that a firm's market orientation allows the effective combination of exploitation and exploration marketing strategies. A firm's market orientation is a firm's capability to generate, disseminate, and responsiveness to intelligence pertaining to current and future customers (Kohli & Jaworski, 1990; Narver & Slater, 1990). It provides a unifying frame of reference focused on customer goals, facilitating market

information flows, and integrating exploitation and exploration by serving as a dynamic market linking capability (Kyriakopoulos & Moorman, 2004). Based on longitudinal data from the Dutch food processing industry, Kyriakopoulos and Moorman (2004) found that business units with a high level of market orientation that engage in high levels of both marketing exploitation and exploration marketing strategies have higher new product performance during the next two years. Interestingly, without the inclusion of market orientation in the models, pursuing exploration and exploitation marketing strategies was not significant. In other words, market orientation moderated the impact of pursuing both high levels of exploitation and exploration market strategies on new product performance.

The Ambidextrous Organization: An Overview

Organization theory has a long tradition of research that aims at explaining firm behavior and corresponding success. Ever since it became apparent in organizational literature that organizations face contradictory environmental demands, researchers have questioned which solution fits these circumstances best. Contingency theorists have emphasized that organizations respond to environmental changes by modifying their internal structure and maintain an isomorphic relationship with the environment. Burns and Stalker (1961), for instance, argued that two sharply different organizational designs, mechanistic and organic structures, are appropriate for routine and innovative tasks, respectively. While mechanistic structures are most suitable for stable conditions, organic structures are expected to be most appropriate for changing conditions. Lawrence and Lorsch (1967) argued that environmental heterogeneity must be matched by internal differentiation and integration. Literatures on organizational change have emphasized that interdependencies among organizational and environmental variables tend to manifest gestalts that are common configurations (Miller, 1980; Miller & Friesen, 1982). Organizations refine existing strategies and structures and normally depart from the status quo only under the duration of revolutionary change or crises. These findings inspired a stream of research aimed at mapping different possible states of organizational and environmental factors and the adequate organizational configurations and decisions best able to succeed in each state. Hence, organizations align to environmental demands by framing its poles (i.e. mechanistic vs. organic) as options that would fit different environmental and organizational states. Accordingly, the underlying assumption was that the choice

of organizational design depends on the challenges a firm faces, yet the difficulty of achieving both stability and change in any single organizational structure has often been noted in the literature. Consequently, conceptual and empirical studies were focused on making choices between conflicting demands and strategic alternatives.

As competition intensifies and the pace of change accelerates, however, firms are increasingly confronted with a continuous tension between exploiting existing competencies and exploring new ones (Floyd & Lane, 2000; Levinthal & March, 1993; March, 1991), operating in multiple time frames (Gavetti & Levinthal, 2000), creating and sustaining advantages (Grant, 1996a), and becoming capable of changing and preserving (Volberda, 1998). Organizations seek flexibility and pursue change to quickly adapt to environmental changes and to enhance their competitive positions. At the same time, they seek stability to reduce uncertainty, manage relationships, and reduce transaction costs (Leana & Barry, 2000). Many established firms face the challenge for exploring new, often uncertain opportunities while continuing operating their existing businesses simultaneously. Environments characterized by hyper-competition (D'Aveni, 1994), shortening of product life cycles (Bettis & Hitt, 1995), and ever shifting customer preferences, impose contradictory demands on organizational structures and strategies. In the personal computer industry, for instance, companies need to have a high rate of innovation while keeping costs at increasingly lower levels. Such contradictory environmental demands necessitate organizations to master the paradox bounded by the opposite poles of effectiveness and efficiency (Brown & Eisenhardt, 1997). Accordingly, when environmental changes increasingly impose conflicting constraints on the appropriateness of organizational structures, basic contingency theory that advocates 'one best way' approaches and suggest a close fit between structure and environment provides little guidance. Scholars therefore have suggested that the ability to engage in rapid and relentless continuous change is a crucial capability for survival (Brown & Eisenhardt, 1997; D'Aveni, 1994). In this way, organizations face multiple contradictory demands simultaneously and are confronted with multiple contingencies to fit conflicting demands rather than an overall contingency. For instance, to use Burns and Stalker's (1961) typology, whereas the need for exploration suggests an 'organic' structure, the simultaneous importance of exploitation suggests a 'mechanistic' structure, creating a dilemma

or paradox⁷ for today's management. As Child (1984: 228) argued "all organizations function within a context of multiple contingencies. To the extent that considerations of contingency have force, this poses a significant organization design dilemma because structural implications for each contingency are unlikely the same" Because both organic and mechanistic elements need to coexist as competitive rivalry increases, organizational scholars have begun to shift their focus from trade-off to paradoxical thinking (Bobko, 1985; Lewis, 2000; Poole & Van de Ven, 1989). Quinn and Cameron (1988) claimed that investigating paradoxes offers a powerful framework for examining implications of plurality and change and for increasing our understanding of divergent perspectives and contradictory elements in organizations. Accordingly, various studies have applied the concept of paradox and have examined its dynamics in groups and organizations (e.g. Koot, Sabiles, & Ybema, 1996; Murnighan & Conlon, 1991; Vince & Broussine, 1996). As Slaatte (1968: 4) defined, a paradox is "an idea involving two opposing thoughts or propositions which, however, contradictory, are equally necessary to convey a more imposing, illuminating, life-related or provocative insights into truth than either factor can muster in its own right. What the mind seemingly cannot think it must think; what reason is reluctant to express it must express" In a special topic forum on 'paradox, spirals, and ambivalence: The new language of Change and Pluralism', Eisenhardt (2000) acknowledged the movement towards paradoxical thinking in management research. She argued that paradox was one of the most prominent themes in the special topic form. Paradox is "the simultaneous existence of two inconsistent states, such as between innovation and efficiency, collaboration and competition, or new and old (Eisenhardt, 2000: 703). Rather than aiming at compromising between opposite poles where the organization chooses the right mix of opposites, Eisenhardt (2000: 703) posited that "vibrant organizations, groups, and individuals change by simultaneously holding the two states. This duality of coexisting tensions creates an edge of chaos, not a bland halfway point between one extreme and the other. The management of this duality hinges on exploring the tension in a creative way

⁷ Scholars often use paradox to refer to seemingly contradictory elements, conflicting demands, or illogical findings. A dilemma is "an either-or situation, for example, where one alternative must be selected over other attractive alternatives" (Cameron, 1986: 545). Paradoxes are different from other concepts often used as synonyms, such as dilemma or conflict. The key characteristic of a paradox is "the simultaneous presence of contradictory even mutually exclusive elements" (Quinn & Cameron, 1988: 2). A conflict is "the perpetuation of one alternative at the expense of others" (Cameron, 1986).

that captures both extremes, thereby capitalizing on the inherent pluralism within the duality”

Increasingly, therefore, researchers have recognized the importance of balancing and synchronizing seemingly contradictory tensions (e.g. Brown & Digid, 2001). Peters and Waterman (1982), for example, suggested that excellent firms possess a variety of paradoxical characteristics. As shown in Table four, various scholars have discussed the tension between exploration and exploitation in organizations. Wilson (1966) and Duncan (1976) speculated that organizations need both structures: organic for initiating innovations and mechanistic for implementing them. Duncan (1976), who first coined the term ‘ambidextrous organization’, suggested that organizations solve this paradox by becoming ‘ambidextrous’, switching between the two forms depending on where organizations are in the process of innovation. Duncan (1976) argued that organizations need to deal with the conflict arising from initiating as well as implementing innovating ideas. Johnston (1976), conversely, found that a consulting company exhibited a mechanistic formal design as well as a more organic design. In a similar vein, McDonough and Leifer (1983) suggested that work units use several structures simultaneously to deal with the variety of contingencies they face. They found various combinations of structural dimensions which suggest that the notion of a single, relatively fixed structure is inaccurate. In their study on the computer industry, Brown and Eisenhardt (1998) found similar complex combinations of structures which they referred to as semi-structures. Successful organizations engage in continuous change and have semi-structures that exhibit partial order, and lie between the extremes of very rigid and highly chaotic. Bradach (1997) used data from a field study of five large US restaurant chains to model how they use a plural form – simultaneous use of company and franchise units – to maintain uniformity and achieve system-wide adaptation to changing markets. The chain’s main challenge is to balance the amount of similarity and the amount of difference among units and the linkages between these units. Similarly, Sheremata (2000) argued that effective structures for high-performing organizations are neither simply organic nor purely mechanistic. Successful product development appears to require a “complex combination of structural elements and processes. Some appear organic, others mechanistic” (Sheremata, 2000: 389). Weick (1982) proposed that a key dilemma for organizations involves the trade-off between adaptation to exploit present

opportunities and adaptability to exploit future opportunities. Moreover, he argued that this trade-off between adaptation and adaptability is often described as a tension between stability and flexibility. Volberda (1996) argued that organizational flexibility requires a constructive tension between change and preservation. Volberda introduced certain types of flexibility and illustrated how organizations may develop organizational forms to address change and preservation in particular ways. Recently, Gilson, Mathieu, Shalley, and Ruddy (2005) indicated that the team work environment should foster both the adherence to established work standards and the use of creativity as circumstances warrant. They found that teams with more standardized as well as creative work environments have higher levels of team performance and customer satisfaction.

Ambidextrous organizations are complex organizational forms composed of multiple internally inconsistent architectures that are collectively capable of operating simultaneously for short-term efficiency as well as long-term innovation (Bradach, 1997; O'Reilly & Tushman, 2004; Tushman & O'Reilly, 1996). Like a juggler who needs to handle multiple balls at the same time, organizations need to compete on multiple markets simultaneously (Tushman & O'Reilly, 1996).

Reconciling Conflicting Demands: Examples from various literatures

Revolutionary and evolutionary change; discontinuous and incremental change	O'Reilly & Tushman, 2004; Tushman & O'Reilly, 1996
Exploration and exploitation; exploratory and exploitative innovation; explorative and exploitative innovation strategies	March, 1991; Levinthal & March, 1993; Benner & Tushman, 2003; He & Wong, 2004
Change and preservation	Volberda, 1996; 1998
Creating and sustaining advantages	Grant, 1996a
Alignment and adaptability	Birkinshaw & Gibson, 2004; Gibson & Birkinshaw, 2004
Responsiveness and efficiency	Hanssen-Bauer & Snow, 1996
Standardization and Creativity	Gilson et al., 2005

Table 4: Reconciling conflicting demands: examples from various literatures

Based on case studies of two organizations, USA Today and Ciba Vision, O'Reilly and Tushman (2004) suggested several organizational characteristics of ambidextrous organizations that enable them to pursue exploration and exploitation simultaneously without increasing costs of coordination extensively. They found that ambidextrous organizations have a clear and compelling vision that is relentlessly communicated by the senior team. Moreover, they implemented incentive systems with common bonus programs based on the overall performance as well as job-rotation of senior executives. In this way, ambidextrous organizations can renew itself through the creation of breakthrough products, services, and processes without destroying or hampering its traditional businesses (Gibson & Birkinshaw, 2004; Tushman & O'Reilly, 1996). Building an ambidextrous organization is by no means easy, however, given the paradoxical nature of balancing and synchronizing exploration and exploitation.

Organizational Ambidexterity and Financial Performance

Intensified competition and changing environments confront firms with a tension between exploiting existing competencies and exploring new ones (Floyd & Lane, 2000; Levinthal & March, 1993; March, 1991). Strategic management, organizational change, and organizational learning literatures have increasingly discussed the need for firms to achieve a balance between exploration and exploitation activities (Burgelman, 1996; Eisenhardt & Martin, 2000; Levinthal & March, 1993; Teece, Pisano, & Shuen, 1997). Firms, however, tend to accentuate existing competencies and to search for solutions in the neighborhood of existing expertise of knowledge (March & Simon, 1958; Nelson & Winter, 1982). Helfat (1994), for instance, has demonstrated that R&D investments of petroleum firms in various technologies varied little from year to year. Likewise, Stuart and Podolny (1996) indicated that large firms in the Japanese semiconductor sector tended to concentrate their patenting activity in domains related to prior patent activities. Martin and Mitchell (1998) have found that the incumbent firms introduce designs that are similar to designs incorporated in earlier products. Because cognitive maps become increasingly rigid and existing dominant paradigmatic solutions are applied to all problems, firms search for solutions in the neighborhood of existing capabilities (Leonard-Barton, 1992). Furthermore, past exploitation in a given domain makes future exploitation in the same or related domain even more efficient because of learning by doing. Such learning curves (Yelle, 1979) may lead firms to realize improvements of production and increase proficiency of individuals, improvements of scheduling, and better coordination. Firms also tend to extrapolate previous investments in knowledge and expertise because of the risk and sunk costs involved in the adoption of alternative directions. Because the returns to exploitation are ordinarily more certain, closer in time, and closer in space than are the returns to exploration (Levinthal & March, 1993; March, 1991), firms consider investments in exploration less attractive and potentially less rewarding (Ahuja & Lampert, 2001). As a result, firms increasingly maintain the status quo, exhibit convergence and develop highly specialised competences that may become core rigidities (Leonard-Barton, 1992). Because of implicit differences between exploration and exploitation, learning and adaptive processes typically improve exploitation more rapidly than exploration (March, 1991; Levinthal & March, 1993). Although the preponderance for exploitation may enhance short-term performance, it can result in a competence

trap (Ahuja & Lampert, 2001; Levinthal & March, 1993) since firms may not be able to respond adequately to environmental changes (Henderson & Clark, 1990; Jansen et al., 2005; Sorenson & Stuart, 2000; Tushman & Anderson, 1986). Organizational learning increases the reliability of organizations and increases average performance, however, competitive forces may make reliability a disadvantage. When organizations learn from experience, they create well-established beliefs about reality and attend to such increasingly biased interpretation of it (Weick, 1979). Eventually, they may become 'skillfully incompetent' (Argyris, 1993: 54) by focusing on existing knowledge and skills and by becoming removed from other sources of experience. If environmental changes impact organizational action, experiential learning may turn out to be self-destructive. In this way, organizations may find themselves 'drifting into a decaying backwater' (Hedberg et al., 1976: 48). Experiences become a hindrance to learning that aims at changing present conditions and confront organizations with disadvantages of experiential learning (Miller, 1994; Westenholtz, 1993). In this way, organizations may become trapped in learning that favors specialization and inhibit experimentation. They may suffer from forms of learning myopia that are manifested in the tendency to ignore the long run, the tendency to ignore the larger picture, and the tendency to overlook failures (Ahuja & Lampert, 2001; Levinthal & March, 1993). Levitt and March (1988) called attention to "competency traps". In a competency trap an organization obtains short-term gains from continuing to develop current competencies, but thereby loses out on the change to move to a new, substantially more useful competency.

Scholars, therefore, have emphasized the double-edged sword of incremental learning and the potential value of more radical learning. However, the right mix of exploration and exploitation is complex and hard to specify, because firms may also become trapped into dynamics of accelerating exploration. Excessive exploration may enhance a firm's ability to continually renew their knowledge stock, but can trap organizations in an endless cycle of search and failure and unrewarding change (Levinthal & March, 1993: 106). These firms escalate resources and time to exploration and become over sensitive to short-term variations and local errors (Volberda & Lewin, 2003) without gaining benefits from exploitation. Too much emphasis on exploration therefore can result in a failure or renewal trap (Levinthal & March, 1993). When exploration drives out exploitation, organizations may turn cycles of experimentation, change, and innovation that stem from failure (Levinthal & March, 1993). Organizational

failure or performance below aspiration levels may lead to search and change which, in turn, may lead to failure and so on. Levinthal and March (1993: 106) indicated that three main reasons underlie a downward cycle of over-exploration: most new ideas are bad, so most innovations are unrewarding; any particular innovation is likely to perform poorly until experience with the new innovation has been developed, and aspirations adjust downward more slowly than upward and exhibit an optimistic bias. These three reasons can trap firms into an endless cycle of exploration and unrewarding results. Accordingly, learning may not only drive organizations into dynamics of accelerating exploitation, but may also force organizations into accelerating exploration. In this way, learning may imbalance a firm's level of exploration compared to exploitation.

Previous research has increasingly argued that successful firms “engage in enough exploitation to ensure the organization's current viability and engage in enough exploration to ensure future viability (Levinthal & March, 1993: 105). Organizational renewal “requires that organizations explore and learn new ways while currently exploiting what they have already learned (Crossan et al., 1999). As March (1991: 71) indicated “adaptive systems that engage in exploration to the exclusion of exploitation are likely to find that they suffer the costs of experimentation without gaining many of its benefits. They exhibit too many undeveloped new ideas and too little distinctive competence. Conversely, systems that engage in exploitation to the exclusion of exploration are likely to find themselves trapped in suboptimal stable equilibria” For instance, Gibson and Birkinshaw (2004) found that a business unit's capacity to simultaneously achieve alignment and adaptability was significantly related to its performance. In addition, He and Wong (2004) found that organizations that combine exploitative and explorative innovation strategies obtain higher levels of sales growth. We hypothesize that ambidextrous firms pursuing both exploratory and exploitative innovations simultaneously increase their financial performance or in particular, their profitability and return on investment. Following He and Wong (2004) we examined the relationships between firm-level ambidexterity and firm financial performance in two ways. First, organizational ambidexterity can be regarded as firms having both high levels of exploratory and exploitative innovations simultaneously (e.g. Gibson & Birkinshaw, 2004). In this sense, the multiplicative interaction term between exploration and exploitation needs to be considered. Second, the impact of organizational ambidexterity on firm financial performance

may also be examined through the absolute difference between exploratory and exploitative innovations. In this sense, organizations with low levels for both exploratory and exploitative innovations are considered as ambidextrous as well. Accordingly, organizations are not only considered as ambidextrous when they have high levels of both exploratory and exploitative innovations (multiplicative interaction), but are also considered ambidextrous when they have both low levels of both types of innovations as long as they are balanced (absolute difference). As we measured the relative imbalance between exploratory and exploitative innovations, we predict a negative relationship between a firm's relative imbalance of exploratory and exploitative innovations and its financial performance. Accordingly,

Hypothesis 1a. Firm-level ambidexterity (i.e. multiplicative interaction between exploratory and exploitative innovations) will be positively related to firm performance

Hypothesis 1b. The relative imbalance (absolute difference) between firm-level exploratory and exploitative innovations will be negatively related to firm performance

Coping with the Paradox of Exploration and Exploitation

Although various literatures have stressed the importance of balancing and synchronizing exploration and exploitation simultaneously, much less debate has been devoted to the question how ambidextrous organizations may reconcile conflicting demands for exploration and exploitation. To be effective, organizations need to possess attributes that are simultaneously contradictory, even mutually exclusive (Cameron, 1986). Peters and Waterman (1982: 100), for instance, found that excellent companies have learned how to manage paradoxes, such as loose/tight, quality/cost, and autonomy/discipline. Research on paradoxes in management and organization theories, such as the tension between exploration and exploitation, has suggested various ways of dealing with paradoxes (Lewis, 2000; Poole & Van de Ven, 1989; Volberda, 1996; 1998; Weick, 1982). Poole and Van de Ven (1989) and Volberda (1998) have argued that organizations confronted with a paradox may:

- (1) **accept** the paradox of exploration and exploitation and learn to live with it,
- (2) **resolve** the paradox of exploration and exploitation by clarifying levels of reference and connections among them,
- (3) **resolve** the paradox of exploration and exploitation by taking into account the role of time and separate exploration and exploitation over time,
- (4) **solve** the paradox of exploration and exploitation by introducing new concepts or a new perspective.

Accept the paradox by compromising or outsourcing

Organizations may accept the paradox of pursuing exploration and exploitation simultaneously and reach a compromise between the two activities. Regarding theoretical development, accepting paradoxes reminds scholars of inconsistencies and enables them to study the dialectic between opposing levels and forces which are captured in different theories (Poole & Van de Ven, 1989: 566). Murnighan and Conlon (1991) found that members of successful string quartets were well aware of tensions and recognized paradoxes (e.g. between the desire for personal autonomy and strong leadership), however, they consciously avoided discussing them. Potentially divisive confrontations were put on hold and successful quartets did not resolve contradictions but rather they recognized and tolerated them, and handled them quietly, rarely raising paradoxical issues for debate. Instead, they played through the paradox by focusing on their intense tasks. Accordingly, accepting the paradox between exploration and exploitation may result from compromising (Vieira da Cunha, Clegg, & Pina e Cunha, 2000) during which organizations choose between a mix of opposites. In this way, organizations try to compromise and to accept that their organizational structure is less effective or efficient as choosing between opposites or (re)solving the paradox in a particular way. Alternatively, organizations may grasp the tension between exploration and exploitation as either/or and develop either a mechanistic or an organic organizational structures. Volberda (1998), for instance, argued that such organizations accept the tension between exploration and exploitation, however, believe that the opposition between both activities can not be resolved within the organization. Rather, these organizations may outsource one side of the paradox to

others (Baden-Fuller & Volberda, 1997) and purchase certain outcomes of either exploitation or exploitation from external parties.

Resolve the paradox by spatial separation

In contrast to accepting paradoxes, organizations can resolve the tension between exploration and exploitation by clarifying different levels of reference and connections among them (Poole & Van den Ven, 1986). In this way, organizations resolve the paradox within the firm by simultaneously pursuing exploration and exploitation in different parts of the organization. Such spatial separation may occur by level, function, and/or location (Volberda, 1998). The first type of spatial separation, separation by level, is characterized by differences in exploration and exploitation related to hierarchical positions. Floyd and Lane (2000), for instance, linked various strategic roles of managers to sub-processes of strategic renewal. The three sub-processes of strategic renewal, i.e. competence definition, competence modification, and competence deployment, are characterized by specific managerial roles. For example, during the competence definition process, managers at the operating levels experiment with novel solutions to emerging problems (exploration mode). Based on a more general understanding of the organization's strategic context, middle managers evaluate the long-term consequences of these exploration efforts and champion the most promising initiative. Subsequently, top management ratifies the most promising champion (exploitation mode) and leverages the expanding knowledge base (Floyd & Lane, 2000: 161). Conversely, Volberda, Baden-Fuller, and Van den Bosch (2001) suggested that top-management may also be active in pursuing exploration and exploitation simultaneously. In directed strategic renewal, a key role for top management is to provide the purpose of strategic intent in guiding journeys of renewal of multiunit firms. Top management sets goals, scans the environment, searches for alternatives, and explicitly manages the balance of exploration and exploitation by bringing in new competences to some units while using well-developed competences in others (Volberda et al., 2001: 165).

Ambidextrous organizations may also separate exploration and exploitation by function or location (Volberda, 1998). In either way, ambidextrous organizations separate exploration from exploitation through creating differentiated exploratory and exploitative organizational units that are inconsistent with each other (Tushman & O'Reilly, 1996; Benner & Tushman, 2003). While organizational units pursuing exploration are expected to be small and decentralized with loose

cultures and processes, organizational units that pursue exploitation are expected to be larger, more centralized, and with tight cultures and processes (Benner & Tushman, 2003: 247). Separation by function is commonly used in large organizations with multiple operations. Organizational production departments, for instance, usually exploit existing competences and skills and are aimed at efficiency and cost reduction. Other functions, such as marketing or R&D are more oriented towards exploration and aimed at experimentation, product development, and finding new markets and customers (Volberda, 1998).

Resolve the paradox by temporal separation

Organizations may also resolve paradoxes by taking into account the role of time (Poole & Van de Ven, 1989; Volberda, 1998; Weick, 1982). Such organizations temporally separate exploration and exploitation, thus pursuing exploration during one time period and pursuing exploitation during a different time period. Duncan (1976) for example, argued that ambidextrous organizations may develop dual organization structures that alternate between exploration and exploitation over time. He found that the same decision unit used a mechanistic structure for making routine decisions and then shifted to an organic structure for making nonroutine decisions. Such temporary fluctuations resulted in a better fit between the structure of the organization and the task and environmental demands. Studies on technological change have suggested that technological progress constitutes an evolutionary system punctuated by discontinuous change. Organizations adapt to environmental changes by incrementally changing existing products, services, and markets punctuated by radical transformation (Tushman & Anderson, 1986). Major discontinuous technological breakthroughs are rare. Therefore, during periods of incremental change, numerous incremental innovations improve existing dominant designs, enhance and extend the underlying technology, and increase scale or efficiency. Periods of incremental change, however, are punctuated by discontinuous change when new technologies represent such a significant advance that older technologies are not competitive anymore (Tushman & Anderson, 1986). Firms, thus, need to be able to compete in eras of incremental change through pursuing incremental innovations while competing in eras of ferment through pursuing radical innovations.

Paradox of Exploration and Exploitation	Mode of Balancing Exploration and Exploitation	Study	Characteristics
Accept	Compromise	Murnighan and Conlon (1991) Vieira da Cunha, Clegg, & Pina e Cunha (2000)	Organizations accept the tension between exploration and exploitation and compromise between opposites.
	Outsource	Baden-Fuller & Volberda (1997)	Organizations accept the tension between exploration and exploitation, however, believe that the opposition between both activities can not be resolved in the organization. Rather, these organizations outsource one side of the paradox
Resolve	Spatial separation by level	Floyd & Lane (2000); Volberda et al. (2001)	Types of strategic renewal represent distinct options for top, middle, and front-line managers that differ in capacity to cope with changing environments, time horizon, information requirements, and core values
	Spatial separation by function and location	Benner & Tushman (2003), Tushman & O'Reilly (1996)	Organizing incremental and discontinuous change in separate organizational units.
	Temporal Separation	Duncan (1976), Shepard (1967), Tushman & Anderson, (1986); Wilson (1966)	Creating periodicity through alternation between the generation and implementation phases of innovations, through groups working parallel, or the use of special task forces.
Solve	Balance	Adler & Borys (1996), Gibson & Birkinshaw (2004); Johnston (1976), McDonough & Leifer (1983)	Organizational or business units reconcile conflicting demands for exploration and exploitation by combining contradictory elements for both activities at the same level of analysis

Table 5: Coping with the Paradox of Exploration and Exploitation in Organizations

Solve the paradox by balancing

The fourth option identified to cope with paradoxes is to solve them (Poole & Van de Ven, 1989). Recently, scholars have recognized the ability of business units to simultaneously balance seemingly contradictory tensions (Gibson & Birkinshaw, 2004). In this way, ambidextrous firms may create organizational units that pursue exploration and exploitation simultaneously. These organizational units combine organic and mechanistic features (Adler & Borys, 1996), centrifugal and centripetal forces (Sheremata, 2000), or develop a collective organizational context (Gibson & Birkinshaw, 2004). Accordingly, they consist of various contradictory organizational elements and manage the tension between exploration and exploitation through complex organizational environments. McDonough and Leifer (1983), for instance, suggested that work units use several structures simultaneously to deal with the variety of contingencies they face. They found various combinations of structural dimensions which suggest that the notion of a single, relatively fixed structure is inaccurate.

Examining how ambidextrous firms strike the balance between exploration and exploitation at the level of organizational units would enhance our understanding why ambidextrous organizations vary in their ability to create value from exploration and exploitation. Although previous research has suggested that organizational ambidexterity leads to higher performance levels, particular ways of dealing with the paradox of exploration and exploitation may influence subsequent outcomes in terms of financial performance. In other words, these multiple ways may moderate the relationship between organizational ambidexterity and subsequent financial performance. Accordingly, this PhD study examines performance implications of how ambidextrous organizations balance and synchronize exploration and exploitation in their boundaries. Our research focuses on two main ways to balance and synchronize exploration and exploitation in ambidextrous organizations: through developing structurally ambidextrous units or through developing contextually ambidextrous units (*cf.* Gibson & Birkinshaw, 2004). Gibson and Birkinshaw (2004) distinguished between two types of organizational ambidexterity: structurally ambidextrous and contextually ambidextrous. Structurally ambidextrous organizations exhibit ‘dual structures’ through separating exploration and exploitation in different organizational or business units. Contextual ambidexterity, on the other hand, is “the behavioural capacity to simultaneously demonstrate alignment and adaptability across an entire

business unit” (Gibson & Birkinshaw, 2004: 209). Accordingly, such ambidextrous organizations consist of organizational units that pursue exploratory and exploitative innovations simultaneously. Although both ways have been identified in previous studies, empirical studies have not yet examined whether ambidextrous organizations obtain higher financial performance by separating exploration and exploitation in different organizational units or by combining both types of activities in organizational units. Based on a literature review and in-depth interviews conducted at various branches of the Rabobank Group, the next paragraph argues that most effective ambidextrous organizations separate exploratory and exploitative innovations in organizational units.

Firm Ambidexterity and Exploratory/Exploitative Innovations in Organizational Units

In this PhD study, we contrast two ways through which ambidextrous organizations may cope with the paradox of exploration and exploitation: through creating structurally ambidextrous units or through creating contextually ambidextrous units (cf. Gibson & Birkinshaw, 2004).

On the one hand, scholars have suggested that organizations may become structurally ambidextrous (Gibson & Birkinshaw, 2004) by *separating* exploratory and exploitative innovations in different organizational units (Benner & Tushman, 2003; Tushman & O’Reilly, 1996). Based on the notion the separation of both activities at different locations within organizations would be the only viable option, researchers have increasingly stated that “a compromise response often accomplishes neither flexibility nor stability” (Weick, 1982: 387). Accordingly, effective ambidextrous organizations separate exploration and exploitation spatially by function or location and create multiple organizational units that are inconsistent with each other (Tushman & O’Reilly, 1996; Benner & Tushman, 2003). They consists of a heterogeneous mosaic of organizational units that either pursue experimentation, improvisation, and risk taking or exhibit efficiency, consistency, and reliability (Imai et al., 1985; Eisenhardt & Tabrizi, 1995; Tushman, Smith, Wood, Westerman, & O’Reilly, 2002). In his seminal work, Thompson (1967) already argued that organizations create hierarchical structures that enable dual searches for certainty and flexibility. Organizational units that directly relate to the central part of the organization, or technical core, are focused on certainty and need to be buffered from undue disturbances. Organizations,

therefore, develop specialized organizational units that attempt to monitor environmental changes and to influence external stakeholders. Accordingly, to solve the paradox of balancing exploratory and exploitative innovations, proponents of this view have suggested that ambidextrous organizations structurally divide both types of innovations in differentiated organizational units. At the same time, such structurally ambidextrous organizations (Gibson & Birkinshaw, 2004) need to maintain tight links across organizational units at the senior-executive level (O'Reilly & Tushman, 2004). Thus, such ambidextrous organizations not only consist of horizontally differentiated exploratory and exploitative organizational units, but also accomplish tight linkages across their organizational units at the senior-management level (O'Reilly & Tushman, 2004; Tushman & O'Reilly, 1996).

On the other hand, scholars have recognized that organizations may become contextually ambidextrous by *combining* seemingly contradictory tensions from exploratory and exploitative innovations in organizational units (Gibson & Birkinshaw, 2004). In this way, such ambidextrous organizations create organizational units that pursue exploratory and exploitative innovations simultaneously. These units combine contradictory organic and mechanistic features (Adler & Borys, 1996), and support individuals to engage in both exploration-oriented actions and exploitation-oriented actions (Gibson & Birkinshaw, 2004). However, integrating the required characteristics for both exploratory and exploitative innovations in one business unit is a demanding task, because they are elements of contradictory organizational architectures (Tushman & O'Reilly, 1996). The dual objective in ambidextrous organizational units, for example, requires management to integrate seemingly different organizational aspects, such as decentralization and formalization (Sheremata, 2000).

Because of possible difficulties that may arise from combining exploratory and exploitative innovations in one organizational unit, Weick (1982: 387), argued that organizations may only be viable through alternating between exploratory and exploitative innovations over time or through simultaneous expression of both types of activities in different portions of the organization. Hill and Rothaermel (2003: 267) generalize from this point and argue that the "simultaneous pursuit of different business models within the same organizational unit will lead to failure to execute one or perhaps both models". They suggest, therefore, separating exploratory and exploitative innovations and developing exploratory units that are

functionally self-contained and autonomous. In addition, the framework of design alternatives for corporate entrepreneurship (Burgelman, 1984, 1985) would suggest that the strategic importance of organizational units in ambidextrous organizations is relatively high while the operational relatedness across exploratory and exploitative organizational units is moderate to relatively low⁸. The relatively high level of strategic importance of each organizational unit requires ambidextrous organizations to remain control over the units and develop them in the existing structural context of the organizations (i.e. Burgelman, 1984, 1985). The moderate to low level of operational relatedness among the organizational units, however, implies that problems may occur concerning the efficiency by which both types of innovations may be combined in a contextually ambidextrous organizational unit. Accordingly, Burgelman's (1984, 1985) framework would suggest that ambidextrous organizations require a combination of strong administrative and medium-strong operational linkages. Both types of linkages are achieved by creating a separate department or unit around exploratory and exploitative innovations.

To provide further anecdotal data on balancing and synchronizing exploration and exploitation in ambidextrous organizations, qualitative data were collected at multiple branches of Rabobank Group. The aim of the qualitative data collection was to elaborate on existing theory and to contribute to important ideas on organizational ambidexterity. Thirty-six formal interviews were held with managers at different branches. In addition, various repeat interviews were carried out to enable managers to respond to conclusions drawn by the research team. Interviewees were selected using formal and snowball sampling methods. In each branch, we aimed at interviewing the executive director and various members of the management team. In addition, a snowball sampling technique was used to identify other interviewees, such as those whose names were suggested to the research team because, for example, they had been in the particular branch for a long time. In addition to these formal and snowball sampling strategies, we also

⁸ Operational relatedness refers to “the degree to which the entrepreneurial proposal requires capabilities and skills that are different from the core capabilities and skills of the corporation” (Burgelman, 1984: 159). When applied to exploratory and exploitative units, the framework would suggest that the capabilities and skills required for managing both types of organizational units would be quite different (e.g. Benner & Tushman, 2003). Accordingly, the operational relatedness among exploratory and exploitative organizational units can be regarded as relatively low.

interviewed any manager who expressed an interest. The interviews were semi-structured, and became increasingly focused over the course of the study. The domains covered in early interviews included the individual's organizational role, the main issues in which interviewees had been involved and their perceptions how exploration and exploitation can be successfully managed among organizational units. Later in the study, and particularly during repeat interviews with key informants (individuals who were involved in many of the issues), we modified the interview protocol to focus on organizational ambidexterity at the firm-level as well as unit-level of analysis. Subsequent interviews were mainly aimed at uncovering performance implications of separating or combining exploratory and exploitative innovations in organizational units. Interviews covered managerial aspects of managing exploratory innovation, managing exploitative innovations, and both simultaneously. We were mainly interested in viewpoints how to reconcile potential conflicting demands that would arise from combining both types of innovations in organizational units and the impact on the performance of the branch as a whole. In addition to the recorded and transcribed interviews, we also conducted a number of informal interviews throughout the study period. In addition, round-the-table discussions were organized at twelve branches to discuss preliminary conclusions from the interviews held.

During a six-month period, thirty-one formal interviews were held with organizational unit managers responsible for organizational units within branches. Five formal interviews were held with executive directors of branches. The interviews lasted from one to two hours and were recorded and transcribed. In accordance with previous literatures (e.g. Benner & Tushman, 2003; Hill & Rothaermel, 2003; Tushman & O'Reilly, 1996; Weick, 1982) Evidence from these interviews suggested that ambidextrous branches separating exploratory and exploitative innovations in different organizational units were able to manage both types of innovations more successfully. For instance, at various high-performing branches we found evidence that management explicitly separated exploration from exploitation. As two organizational unit managers at these branches argued:

“If you would combine exploitative activities in more exploratory units, then you will create all kinds of managerial problems. It simply becomes too complex to manage successfully. Therefore, you need to separate both activities.” (Interview, November 12, 2002)

“both types of organizational units work differently. That’s why combining is difficult and leads to sub-optimal results.” (Interview, December 3, 2002)

Additionally, one of the executive directors of a successful ambidextrous branch argued that

“we separate both activities [exploration and exploitation] to manage them successfully, absolutely. Exploration and exploitation are different elements. Although the combination of both activities in one organizational unit may be possible, it would require a lot of efforts from both unit managers and me.” (Interview, December 8, 2002)

Because both types of innovations require different managerial approaches, high-performing ambidextrous branches spatially separated exploratory and exploitative innovations in different organizational units. Moreover, as suggested by Benner and Tushman (2003), interviews revealed that exploratory organizational units in the branches were relatively small and were characterized by a high level of decentralization in terms of products and services initiated, programs developed, and financial responsibilities given to employees. Conversely, exploitative organizational units were relatively large and consisted of a low level of decentralization and (financial) responsibilities. Regarding the different managerial approaches, a unit managers at one of these branches commented:

“Employees in exploratory units for example need more span of control, whereas employees in more exploitative units need more direction and less span of control ... Exploitative units need to be optimised based on economies of scale and high quantities. Exploratory units need another management model that may conflict with the model used in the exploitative units.”
(Interview, March 15, 2003)

In accordance with previous literatures (Benner & Tushman, 2003; Hill & Rothaermel, 2003; Tushman & O’Reilly, 1996; Weick, 1982), interviews held with managers at various branches point at the difficulties arisen from combining exploratory and exploitative innovations in one organizational unit. Because of inconsistent organizational characteristics and the associated difficulties in managing both types of innovations in one organizational unit, we argue that successful ambidextrous organizations perform exploratory and exploitative innovations concurrently in different organizational units (Tushman et al., 2002). Such firms are composed of multiple integrated architectures that are themselves inconsistent with each other. Benner and Tushman (2003: 251), for example, argued “an ambidextrous organization design allows for uncoupling the variance-decreasing units and activities from those units where variation is critical”. In this way, ambidextrous organizations create loosely coupled organizational units that provide several advantageous performance implications. As Weick (1982) made clear, loose coupling of elements (i.e. loosely coupled exploratory and exploitative organizational units) enhances sensitivity to the environmental context. It allows for simultaneous adaptation at different organizational units to conflicting environmental demands. Ambidextrous organizations are able to successfully adapt to complex and varied environmental through enabling the adaptation of a specific organizational unit to local environmental demands while other organizational units are able to maintain stability in their operations. In this way, ambidextrous organizations are able to adapt to local environmental conditions without requiring the larger system to change. Structurally ambidextrous organizational designs that separate exploratory and exploitative innovations in different organizational units reduce overall coordination costs for the system as a whole (Scott, 1981: 248). Accordingly, we predict that ambidextrous firms that separate exploratory and exploitative innovations in different organizational units

obtain higher financial performance than when they combine both types of innovations in organizational units.

Hypothesis 2. Firm ambidexterity (multiplicative interaction between exploratory and exploitative innovation) will be more positively related to firm performance when exploratory and exploitative innovations are separated in different organizational units than when exploratory and exploitative innovations are combined in organizational units

Conclusion

This chapter has provided an overview of organizational ambidexterity and has argued that firm ambidexterity leads to higher levels of financial performance. In other words, organizations that are able to balance and synchronize exploratory and exploitative innovations obtain above-normal performance. Building on literatures from strategic management, organizational learning, and organization theory, we have argued that research has been shifted from either/or thinking towards paradoxical thinking. Initially, conceptual and empirical studies were focused on making choices between conflicting demands and strategic alternatives, such as mechanistic or organic (Burns & Stalker, 1961) and differentiation or low cost (Porter, 1996). More recently, however, research has been more and more focused on firms' ability to operate in multiple time-frames (Gavetti & Levinthal, 2000), to create and sustain advantages (Grant, 1996), and to become capable of changing and preserving (Volberda, 1996). Hence, recent research has increasingly argued that successful organizations in dynamic environments are *ambidextrous* – they are able to implement both evolutionary and revolutionary change (O'Reilly & Tushman, 2004; Tushman & O'Reilly, 1996). Ambidextrous organizations reconcile conflicting demands from their environment and synchronize and balance concurrent exploration of new opportunities and exploitation of existing ones (Benner & Tushman, 2003; Bradach, 1997; Gibson & Birkinshaw, 2004; O'Reilly & Tushman, 2004; Tushman & O'Reilly, 1996).

Although various conceptual studies have increasingly argued that ambidextrous organizations obtain superior performance, few have tested the

‘ambidexterity-performance hypothesis’. Katila and Ahuja (2002) examined search scope and search depth as proxies for exploration and exploitation. They found a positive interaction between search scope and search depth on new product development. They did not test whether the interaction between exploration and exploitation results in higher levels of financial performance. Only recently, Gibson and Birkinshaw (2004) as well as He and Wong (2004) provided empirical evidence that confirmed the importance of organizations to become ambidextrous and pursue exploration and exploitation simultaneously. This PhD research has not only proposed that firm ambidexterity will be positively related to firm financial performance (e.g. profitability and return on investment), but has also discussed multiple ways how ambidextrous organizations may reconcile contradictory demands for exploratory and exploitative innovations among organizational units. On the one hand, scholars have argued that exploration and exploitation need to be separated in organizational units to enable effective development. In this sense, ambidextrous organizations consist of multiple consistent units that are inconsistent with each other (cf. Benner & Tushman, 2003; Tushman & O’Reilly, 1996). On the other hand, Gibson and Birkinshaw (2004) argued that even at lower levels in the organizations, such as business units or organizational units, management may be well able to effectively manage and pursue exploration and exploitation simultaneously. Such contextually ambidextrous organizational units need to combine contradictory organizational elements and support individuals to explore and exploit.

Based on previous literatures (Benner & Tushman, 2003; Tushman & O’Reilly, 1996; Weick, 1982) and qualitative data collected at multiple branches, we hypothesized that separation of exploratory and exploitative innovations in different organizational units positively moderates the relationship between firm-level ambidexterity and firm-level financial performance. In other words, we argue that firms may act ambidextrously at the firm-level by separating exploratory and exploitative innovations at the unit-level.

CHAPTER THREE

EXPLORATION, EXPLOITATION, AND ABSORPTIVE CAPACITY: A REVIEW AND MODEL

Introduction

The previous chapter has discussed the relationship between firm-level ambidexterity and firm-level performance. In addition, it has proposed that effective ambidextrous organizations pursue exploratory and exploitative innovations simultaneously; however, they separate both types of innovations in different organizational units. This chapter focuses on the organizational unit-level and investigates how organizational units develop exploratory and exploitative innovations. Since absorptive capacity is crucial to a unit's innovations, this chapter examines the interrelationships between organizational antecedents, absorptive capacity, and exploratory and exploitative innovation (see Figure 8).

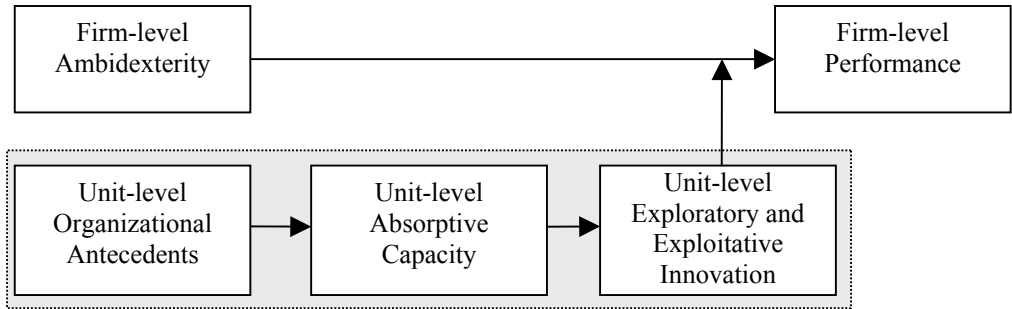


Figure 8. Unit-level absorptive capacity: antecedents and innovative outcomes

The next paragraph provides an overview of research on absorptive capacity. It not only discusses the origins of absorptive capacity research, but also focuses on organizational antecedents and outcomes. To survive selection pressures, organizational units need to recognize new external knowledge, assimilate it, and apply it to commercial ends. This ability, referred to as absorptive capacity (Cohen and Levinthal, 1990), has emerged as an underlying theme in strategy and organization research. Recent research has focused on the role of absorptive capacity in innovation (Tsai, 2001), business performance (Lane, Salk, & Lyles, 2001; Tsai, 2001), intra-organizational transfer of knowledge (Gupta & Govindarajan, 2000; Szulanski, 1996), interorganizational learning (Lane & Lubatkin, 1998; Lane et al., 2001), and expectation formation (Van den Bosch et al., 1999).

Despite the growing interest in absorptive capacity, few have captured the richness and multidimensionality of the concept. Moreover, while most studies have focused on the competitive benefits of absorptive capacity, organizational antecedents have been largely ignored (Lane, Koka, & Pathak, 2002). The lack of research regarding this link is surprising, especially since Cohen and Levinthal (1990) emphasized the importance of organizational mechanisms and suggested considering what aspects of absorptive capacity are distinctly organizational. Even when organizational antecedents have been considered (e.g. Lane et al., 2001; Van den Bosch, Volberda, & De Boer, 1999), their relationships with different dimensions of absorptive capacity have not been tested empirically. Although the ability to absorb new external knowledge can generate significant benefits

(Cockburn, Henderson, & Stern, 2000; Zollo & Winter, 2002), organizational antecedents may have differential effects on dimensions of absorptive capacity, and subsequently lead to different outcomes. Zahra and George (2002), for instance, distinguished between four dimensions of absorptive capacity that constitute potential and realized absorptive capacity. They argued that firms need to manage these dimensions of absorptive capacity successfully to obtain superior performance. Firms focusing on acquisition and assimilation of new external knowledge (i.e. potential absorptive capacity) are able to continually renew their knowledge stock, but may suffer from the costs of acquisition without gaining benefits from exploitation. Conversely, firms focusing on transformation and exploitation (i.e. realized absorptive capacity) may achieve short-term profits through exploitation, but may fall into a competence trap (Ahuja & Lampert, 2001) and may not be able to respond to environmental changes. Examining differential effects of organizational antecedents on potential and realized absorptive capacity would not only clarify how absorptive capacity may be developed, but also reveal why firms have difficulties in managing dimensions of absorptive capacity successfully. Based on previous literatures, this chapter discerns important organizational mechanisms and explains their relationships with two components of absorptive capacity, i.e. potential and realized absorptive capacity (Zahra & George, 2002).

Although various studies have related absorptive capacity to important outcomes, such as knowledge transfer, innovation, and financial performance, insights how dimensions of absorptive capacity influence different types of innovations are still lacking. Tsai (2001), for instance, revealed that a unit's absorptive capacity increases its innovative performance. However, potential and realized absorptive capacity may have differential effects on a firm's exploratory and exploitative innovations and subsequently lead to different performance implications. Accordingly, this PhD research proposes hypotheses regarding the relationship between potential and realized absorptive capacity on the one hand, and exploratory and exploitative innovations on the other hand.

Absorptive Capacity: Origins, Antecedents, and Outcomes

As originally introduced by Cohen and Levinthal (1989, 1990), absorptive capacity has emerged as a prominent underlying theme in strategic management and organizational learning literatures. Lane et al. (2002), for instance, revealed

that the concept of absorptive capacity has appeared in approximately 200 manuscripts published in 18 peer-reviewed journals. In their seminal paper, Cohen and Levinthal (1990: 128) defined absorptive capacity as:

“a firm’s ability to recognize the value of new information, assimilate it, and apply it to commercial ends”

Cohen and Levinthal (1989, 1990) argued that a firm’s ability to learn from its external environment depends on prior related knowledge. Therefore, as also indicated by several authors on R&D efforts, firms investing in R&D enhance their absorptive capacity and facilitate the assimilation of new external knowledge that is related to their R&D activities. As Mowery (1983) and Allen (1984) made clear, in-house R&D has long-term implications to the ability of firms to keep abreast of the latest development in various industries. Accordingly, studies have used a firm’s or business unit’s R&D intensity (R&D expenditures divided by sales) as a proxy for absorptive capacity. Tsai (2001), for instance, found that business units with higher levels of R&D intensity obtained a higher level of innovative and financial performance. Meeus, Oerlemans, and Hage (2001) proposed various alternative hypotheses regarding an innovator’s internal knowledge resources and its ability to obtain a high level of interactive learning with buyers and suppliers. Using R&D intensity as a proxy for an innovator’s internal knowledge resources, they found however neither a positive nor a negative relationship between internal knowledge resources and interactive learning with suppliers and buyers. Rather, they obtained marginal support for an inverted U-shaped relationship between internal knowledge resources and interactive learning with suppliers. Other scholars have used proxies such as size (Mowery et al. 1996) and age (Stuart & Sorensen, 2000) to capture the extent to which firms have accumulated knowledge. Hence, many literatures on absorptive capacity have related the ability of firms to acquire, assimilate, and apply new external knowledge to existing knowledge resources or, more specifically, to the extent to which firms have developed prior related knowledge resources in the same or complementary area compared to new external knowledge (Zahra & George, 2002). Pennings and Harianto (1992), for instance, empirically examined the relationship between prior related knowledge within commercial banks and their ability to adopt technological innovations. Based on a sample of 152 of the largest commercial banks in the United States, their results confirmed the

hypothesis that firms with high levels of capital investments in systems and equipment are more likely to engage in video banking service. As high levels of capital investment reflect accumulated experience, these investments should increase the readiness to expand investment programs into new generations of equipment. In addition, Shenkar and Li (1999) extended the absorptive capacity argument to the context of international cooperative ventures and examined knowledge-seeking behavior of prospective partners. They found support for the importance of prior related knowledge and the complementary perspective of absorptive capacity. Their results, however, indicated that firms seek knowledge in an area complementing their own knowledge base rather than solely searching for knowledge that is identical to the existing knowledge base.

Absorptive Capacity and Organizational Antecedents

Although Cohen and Levinthal (1989, 1990) and others have revealed the crucial role of a firm's prior related knowledge in enhancing a firm's absorptive capacity, exposure to external knowledge is not sufficient to acquire, assimilate, and apply it successfully. A firm's absorptive capacity, thus, also depends on internal mechanisms or organizational antecedents. Interestingly, Lane and Lubatkin's (1998) study on relative absorptive capacity pointed out that organizational mechanisms explained more variance than R&D expense. Based on 31 complete responses from a population of R&D alliances between pharmaceutical and biotechnology companies, they argued that organizational aspects of absorptive capacity are relatively more important to explaining interorganizational learning and to understanding how organizations are able to successfully absorb new external knowledge. Moreover, according to Lane and Lubatkin (1998), their results also called into question the usefulness of R&D spending as an absolute measure for absorptive capacity. Their study revealed limitations of using proxies to accurately capture complex phenomena such as a firm's absorptive capacity. In previous research, arguments have been made to consider organizational aspects of absorptive capacity that go beyond prior related knowledge and individual absorptive capacities of organizational members. As Cohen and Levinthal (1990: 113) suggested:

“a firm's absorptive capacity is not, however, simply the sum of the absorptive capacities of its employees, and it is therefore useful to consider what aspects of absorptive capacity is

distinctly organizational. ..[.].. an organization's absorptive capacity does not simply depend on the organization's interface with the external environment. It also depends on transfers of knowledge across and within subunits that may be quite removed from the original point of entry"

Although previous research has acknowledged that research should go beyond examining prior related knowledge, studies that consider other organizational determinants of absorptive capacity remain sparse. At the intraorganizational level of analysis, Gupta and Govindarajan (2000) examined why organizations differ in their ability to increase knowledge flows across business units. In addition to prior related knowledge, they proposed that the extent of inter-unit homophily of the receiving unit vis-à-vis the sending unit determines knowledge flows across units. Organizational members across different organizational units, thus, need to be similar in certain attributes, such as beliefs, education, shared common meanings, and a mutual subcultural language (Gupta & Govindarajan, 2000: 476). These characteristics refer to the background knowledge required by the group as a whole for effective communication. As Cohen and Levinthal (1990) argued, the most basic level of relevant knowledge that permits effective communication among subunits consists of shared language and symbols. Moreover, they hinted at a trade-off in the efficiency of internal communication against the ability of subunits to assimilate and exploit information originating from other subunits. Accordingly, although effective knowledge sharing across units requires shared language, symbols, or coding schemes, organizational units that share the same language and that are characterized by highly overlapping knowledge resources may not be able to tap into new external knowledge sources. Therefore, Cohen and Levinthal (1990) acknowledged the importance of interactions among individuals who have diverse knowledge structures.

Building on the premise that interaction among individuals is important for developing their knowledge stocks (Dierickx & Cool, 1989), Van Wijk et al. (2001) argued that knowledge inflows into organizational units increase units' depth and breadth of knowledge stocks, thereby increasing their absorptive capacity. They distinguished between two dimensions of absorptive capacity, depth and breadth, and revealed that a unit's knowledge flow configuration impacts both dimensions of absorptive capacity. However, whereas vertical

knowledge inflows were related to the depth dimension of absorptive capacity, horizontal inflows into organizational units were related to the breadth dimension of absorptive capacity. Accordingly, their study indicated that the distinction between vertical and horizontal knowledge flows and between the depth and breadth dimension of absorptive capacity proved valuable to understanding absorptive capacity in internal networks of organizations. Tsai (2001) also investigated the role of internal networks within organizations and a unit's absorptive capacity. Although he did not directly examine organizational mechanisms that increase a unit's absorptive capacity, his study indicated that the interaction between a business unit's network position and its absorptive capacity is critical to its effectiveness. In other words, centrally located organizational units with high levels of absorptive capacity obtained higher levels of innovative performance as well as financial performance. In another study, Tsai (2002) revealed that the degree of decentralization of organizational units as well as social interaction among organizational units help units to gain access to new knowledge or new information. In addition, Hansen (1999) distinguished between strong and weak interunit linkages and argued that both types of linkages have different implications for search benefits on the one hand and transfer benefits on the other hand. His findings indicated that strong linkages among units are most important when knowledge is highly complex, whereas weak interunit linkages have the strongest effect when knowledge is not complex. In a similar vein, future studies may further examine the role of interunit linkages, or in particular, dimensions of interunit linkages, in developing a unit's absorptive capacity.

Level of Analysis	Examples of Antecedents	Illustrative References
Intrafirm-level	<ul style="list-style-type: none"> • A unit's R&D intensity • knowledge flow configuration (horizontal versus vertical) • prior knowledge and similarity of certain attributes (e.g. sharing similar common meaning, a mutual subcultural language) • decentralization and social interaction • HRM practices; knowledge management tools (e.g. communities of practice) 	<p>Tsai (2001)</p> <p>Van Wijk et al. (2001)</p> <p>Gupta & Govindarajan (2000)</p> <p>Tsai (2002)</p> <p>Minbaeva et al. (2003); Mahnke et al. (2005)</p>
Firm-level	<ul style="list-style-type: none"> • prior related knowledge and internal mechanisms • crisis construction • prior related knowledge, organizational form, combinative capabilities • diversity and degree of overlap of external knowledge sources and experience • external linkages • internal information provision 	<p>Cohen & Levinthal (1990)</p> <p>Kim (1998)</p> <p>Van den Bosch et al. (1999)</p> <p>Zahra & George (2002)</p> <p>Pennings & Harianto (1992); Yli-Renko, Autio, Sapienza (2001)</p> <p>Lenox & King (2004)</p>
Interfirm-level	<ul style="list-style-type: none"> • similarity of knowledge resources, compensation practices and organizational structures; familiarity with organizational problems • interorganizational trust 	<p>Lane & Lubatkin (1998); Lane, Salk, & Lyles (2001); Parkhe (1991); Mowery et al. (1996)</p> <p>Lane, Salk, & Lyles (2001)</p>

Table 6: Antecedents of absorptive capacity, based on Van den Bosch et al. (2003)

Research on knowledge flows within multinational corporations has considered the impact of absorptive capacity on knowledge inflows into units. Minbaeva, Pederson, Bjorkman, Fey, and Park (2003), for instance, found that a subsidiary's absorptive capacity – the interaction between ability and motivation to transfer

knowledge – is positively related to the transfer of knowledge across business units. Moreover, results revealed that various human resources practices, such as training, performance-based compensation, and internal communication increase the ability and motivation of employees to transfer knowledge, thereby enhancing a subsidiary's absorptive capacity. Building on the findings of Minbaeva et al. (2003), Manhke, Pedersen, and Venzin (2005) further elaborated on the influence of HRM and knowledge management practices on the development of a unit's absorptive capacity. They found that three knowledge management practices, group-benchmark report, communities of practice, and corporate university are significantly related to a unit's absorptive capacity⁹.

In addition to the unit-level of analysis, studies have identified and examined various organizational determinants of a firm's absorptive capacity. As explained above, Cohen and Levinthal (1990) indicated that interaction across individual with diverse knowledge structures is crucial for a firm's absorptive capacity. To stimulate such interactions, they provided various examples of organizational mechanisms, such as the structure of communication, the character and distribution of expertise, gatekeeping or boundary-spanning roles, cross-functional interfaces, and job-rotation (Cohen & Levinthal, 1990: 131-135). Job-rotation, for instance, not only creates knowledge overlap, but also increases the diversity of backgrounds of organizational members. However, as Cohen and Levinthal (1990) make clear, rotated members need to be involved in functions for several years as some intensity of experience in complementary knowledge domains is necessary to develop diverse knowledge structures that are not superficial. Other internal mechanisms, such as liaison personnel and cross-functional teams affect a firm's absorptive capacity through facilitating interaction among individuals based on some amount of redundancy. Few studies have been conducted that examine the impact of organizational determinants on firm-level absorptive capacity. The qualitative study of Van den Bosch et al. (1999) provides one of the few studies that differentiated between various organizational determinants and illustrated how these determinants influence a firm's absorptive capacity. They proposed that organizational form and combinative capabilities may enable or restrict a firm's

⁹ Minbaeva et al. (2003) and Mahnke et al. (2005) captured a subsidiary's absorptive capacity through employee's ability and employee's motivation to transfer knowledge among subsidiaries within MNCs. In fact, they found that the interaction between motivation and ability is positively related to inter-subsidiary knowledge transfer

absorptive capacity. Van den Bosch et al. (1999), for instance, argued that an organization's efficiency, scope, and flexibility dimensions of absorptive capacity varied depending on the particular organizational form the particular firm adopted. Their framework showed how organizational form and combinative capabilities influence certain dimensions of absorptive capacity and, subsequently, a firm's absorptive capacity. Moreover, they derived various ways in which firms may change their organizational form as well as combinative capabilities in order to increase their absorptive capacity. Kim (1998) provided an interesting case study how Hyundai Motor Company has transformed itself from a mere assembler of Ford models to a designer and exporter of its own cars and engines in less than three decades. Unlike externally evoked crises, Hyundai used proactively constructed internal crises to present a clear performance gap, to shift learning orientation from imitation to innovation, and to increase the intensity of effort underlying a firm's absorptive capacity. Lyles and Salk (1996) as well as Lane, Salk, and Lyles (2001) found that international joint ventures need a flexible and creative organization to facilitate assimilation of knowledge from foreign parents. Such non-hierarchical and non-bureaucratic organizational structures increase a joint venture's absorptive capacity by "encouraging greater receptivity of organization members to new stimuli from the outside, by promoting collaboration and exchange of information within the organization and by granting members greater latitude in altering activity patterns and ways of doing things to adapt to perceived changing needs and conditions" (Lyles & Salk, 1996). In addition, Lyles and Salk (1996) found support for their hypothesis that articulated goals also increases a firm's absorptive capacity by focusing members upon the same vision or mission. Similarly, Inkpen and Crossan (1995) found that a rigid set of management beliefs associated with and unwillingness to unlearn previous experiences severely limit the ability of firms to learn from their partners. They suggested, therefore, that a key factor for a firm's ability to absorb new skills from partners is a sufficiently complex managerial belief system with which to notice and appreciate firm differences. Lenox and King (2004) argued that existing literatures on absorptive capacity underemphasized the role of managers in administering information to organizational units with unique knowledge stocks. Using data on the adoption of pollution prevention practices in 311 firms, they found that managers directly affect their firm's absorptive capacity (in terms of the adoption of pollution prevention practices) by providing information to potential adopters in the organization. Moreover, they also showed that this effect is

moderated by the degree to which the potential adopters have little information that directly relates to the new practice. Although the implicit assumption of the absorptive capacity construct is the acquisition and assimilation of new external knowledge, the role of external network ties in enabling a firm's absorptive capacity is relatively unclear. Through interactions with others, firms get access to external knowledge and can combine it with existing knowledge. Although previous research has found that interfirm linkages in certain technological areas, with key customers (Yli-Renko, Autio, & Sapienza, 2001), and with bridging institutions increases the likelihood of innovations adoption (Pennings & Harianto, 1992), knowledge acquisition (Yli-Renko, Autio, & Sapienza, 2001) or interactive learning (Meeus, Oerlemans, & Hage, 2001), empirical studies that examine the influence of certain dimensions of external ties on a firm's absorptive capacity remain sparse.

Various studies at the inter-firm level of analysis have argued that a firm's absorptive capacity is not absolute but rather varies with the learning context. Parkhe (1991) argued that highly dissimilar partners in a global strategic alliance would need greater efforts and resources toward learning. Accordingly to Hamel (1991), partner firms vary in transparency, i.e. the openness and willingness of the partner firm to share its embedded knowledge, which influences the extent of interpartner learning. Lane and Lubatkin (1998), therefore, argued that absorptive capacity should be assessed at the dyad-level of analysis and coined the term 'relative absorptive capacity'. In this sense, a firm's absorptive capacity is argued to depend on the similarity of a firm's knowledge bases, organizational structure and compensation practices, and dominant logics. They found that similarity in lower management formalization and similarity in compensation practices increases the relative absorptive capacity and subsequently interorganizational learning. In a similar vein, Mowery et al. (1996) examined the role of absorptive capacity in the firm's ability to acquire its partner's capabilities. Based on a sample of strategic alliances, they found that experience in an area related to the alliance partner's increased the likelihood of inter-firm transfer of knowledge. Lane, Salk, and Lyles (2001) also found that the relatedness of businesses between the international joint venture and parent firms that centers on the similarity of business objectives and strategic resources is positively related to learning from parents. Accordingly, much research on interorganizational learning has centered on the similarity between joint ventures and their parents regarding knowledge

resources (Inkpen, 2000; Mowery, et al. 1996), structures (Lane & Lubatkin, 1998), and businesses (Lane, Salk, & Lyles, 2001). In addition to the similarity or relatedness hypothesis, other studies have argued that trust between partners determines interorganizational learning (Inkpen, 2000; Lane, Salk, & Lyles, 2001). Trust “reflects the belief that a partner’s word or promise is reliable and that a partner will fulfill its obligations in the relationship” (Inkpen, 2000: 1027). Interorganizational trust increases relative absorptive capacity since it increases the free exchange of knowledge between partners (Inkpen, 2000) and results in committed parent firms helping student firms to understand new external knowledge (Lane, Salk, & Lyles, 2001). Trust between partners increases both the extent of knowledge transfer (Inkpen, 2000) as well as the efficiency by which knowledge is transferred between the partners (Parkhe, 1991). However, as Yli-Renko, Autio, and Sapienza (2001) indicated, a high level of trust may also inhibit exchange and combination processes of new external knowledge because of collective blindness (Nahapiet & Ghoshal, 1998). Lane, Salk, and Lyles (2001), for instance, unexpectedly found that trust between parents is associated with IJV-performance rather than learning.

Absorptive Capacity and Outcomes

Research on absorptive capacity has been dominated by studies that examine various competitive benefits of absorptive capacity. First, in their seminal paper, Cohen and Levinthal (1990) argued that a firm’s absorptive capacity is critical to its innovative performance. Accumulating absorptive capacity not only permits more efficient accumulation of related knowledge but also permits the firm to better understand and evaluate the nature and commercial potential of technological advances (Cohen & Levinthal, 1990: 136). Gambardella (1992), for instance, revealed that US pharmaceutical firms with better in-house scientific research programs are not only able to make use of internal science more efficiently, but are also able to exploit external science more effectively and increase their innovative performance. Correspondingly, Henderson and Cockburn (1998) indicated that a firm’s development in its absorptive capacity through in-house basic research as well as the active collaboration with external researchers increases private research productivity of pharmaceutical company scientists. Tsai (2001) also confirmed the arguments of Cohen and Levinthal (1990) and provided empirical evidence that a unit’s absorptive capacity increases its innovative performance. Other scholars, such as Stock, Greis, and Fisher (2001) indicated that

the relationship between absorptive capacity and new product development performance is nonlinear. Based on data from the computer modem industry, they found an inverted U-shaped relationship between R&D intensity (proxy of absorptive capacity) and subsequent technical performance of new products. Building on the distinction between exploration and exploitation (Levinthal & March, 1993; March, 1991), Van Wijk et al. (2001) argued that the depth and breadth dimensions of absorptive capacity¹⁰ differentially influence exploration and exploitation as outcomes of absorptive capacity. They found that the breadth dimension of absorptive capacity increases a firm's degree of exploration over exploitation.

Second, other scholars have argued that absorptive capacity would lead to higher levels of financial performance or wealth creation. Lewin et al. (1999), for instance, argued that a firm's ability to absorb new external knowledge mediated the impact of exploration and exploitation on wealth creation. Zahra and George (2002) related absorptive capacity to the creation of a competitive advantage through innovation and product development as well as greater strategic flexibility in the timely reconfiguration of resources. Deeds (2001) directly examined performance implications of absorptive capacity and found that absorptive capacity is positively related to entrepreneurial wealth creation. In addition, Tsai (2001) not only indicated that a unit's absorptive capacity increases its innovative performance; it also results in higher financial performance. Accordingly, the ability of organizational units or firms to acquire, assimilate, and apply new external knowledge enhances their innovative performance as well as their financial performance. In their study on international joint ventures, Lane, Salk, and Lyles (2001) found that the amount of learning from foreign parents, which results from acquisition and assimilation of new external knowledge, is positively associated with IJV-performance.

Third, most studies on absorptive capacity have treated the concept as predictor for knowledge transfer within and between firms. Szulanski (1996), for instance, found that the lack of a recipient's absorptive capacity is one of the most important origins of stickiness. Others, such as Gupta and Govindarajan (2000), Minbaeva et al. (2003), and Mahnke et al. (2005) have shown that a unit's absorptive capacity plays a crucial role in increasing knowledge inflows into the particular unit.

¹⁰ The depth dimension is associated with specialist knowledge that allows a firm to learn complex matters. The breadth dimension of absorptive capacity is related to generalist prior knowledge across a range of subject areas (Van Wijk et al., 2001).

Absorptive capacity not only increases knowledge transfers within organizations, but also increases inter-organizational learning. In this way, a firm's absorptive capacity contributes to the amount of knowledge learned from partner firms which (Lane & Lubatkin, 1998; Lane, Salk, and Lyles, 2001; Lyles & Salk, 1996), in turn, leads to higher levels of performance.

Fourth, Cohen and Levinthal (1990) related absorptive capacity to expectation formation. Through increasing a firm's expectation formation, absorptive capacity permits "firms to predict more accurately the nature and commercial potential of technological advances" (Cohen and Levinthal, 1990: 136). Firms with higher levels of absorptive capacity are more sensitive to emerging market opportunities and exhibit more proactiveness to exploiting opportunities in the environment. Various other scholars have recognized the importance of proactive behavior in turbulent environments (Van den Bosch et al., 1999). Volberda (1998), for instance, emphasized that higher levels of absorptive capacity increases a firm's industry foresight (cf. Hamel & Prahalad, 1994).

Examples of Organizational Outcomes	Illustrative References
Innovation; exploration and exploitation; new product development; research productivity	Cohen & Levinthal (1990); Gambardella (1992); Tsai (2001); Van Wijk et al. (2001); Stock et al. (2001); Henderson & Cockburn (1998)
New wealth creation; entrepreneurial wealth; competitive advantage; financial performance	Lewin et al. (1999); Deeds (2001); Zahra & George (2002); Tsai (2001)
Transfer of best practice; knowledge flows across organizational units within firms	Szulanski (1996); Gupta & Govindarajan (2000); Minbaeva et al. (2003); Mahnke et al. (2005)
Knowledge acquisition from parents, Knowledge transfers between firms; interorganizational learning	Chen (2004); Kim (1998); Koza & Lewin (1998); Lane & Lubatkin (1998); Lyles & Salk (1996); Makhija & Ganesh (1997); Mowery et al. (1996)
Expectation formation; industry foresight	Cohen & Levinthal (1990); Volberda (1998); Van den Bosch et al. (1999)
Organizational adaptation; responsiveness	Lewin & Volberda (1999); Liao, Welsch, & Stoica (2003)

Table 7: Outcomes of Absorptive Capacity, based on Van den Bosch et al. (2003)

Finally, another stream of research has related a firm's absorptive capacity to organizational adaptation and organizational responsiveness. Liao, Welsch, and Stoica (2003) examined the relationship between a firm's absorptive capacity and organizational responsiveness (i.e. the speed and coordination with which actions are implemented and periodically reviewed) in the context of growth-oriented small and medium-sized enterprises. They differentiated between two dimensions

of absorptive capacity, external knowledge acquisition and intrafirm knowledge dissemination, and found that both are significantly related to a firm's responsiveness. Moreover, they revealed that environmental turbulence positively moderates these relationships. Thus, a firm's absorptive capacity becomes even more important to its responsiveness in more turbulent environments. In their discussion on research on strategy and new organizational forms, Lewin and Volberda (1999) pointed to the crucial role of a firm's absorptive capacity in developing organizational knowledge that, in turn, enables a firm's adaptation.

Absorptive Capacity: A Multidimensional Construct

Although most studies have examined absorptive capacity as a one-dimensional construct through R&D intensity, others have suggested that absorptive capacity needs to be examined as a multidimensional construct (see table 8). Cohen and Levinthal (1990) already explicitly argued that a firm's absorptive capacity captures not only the ability to acquire and assimilate new external knowledge, but also the ability to exploit newly acquired external knowledge successfully.

Dimensions of Absorptive Capacity	Illustrative References
Ability to recognize and value new external knowledge	Cohen & Levinthal (1990); Lane &
Ability to assimilate new external knowledge	Lubatkin (1998); Lane, Salk, & Lyles
Ability to apply new external knowledge	(2001)
Efficiency	Van den Bosch et al. (1999)
Scope	
Flexibility	
Depth	Van Wijk et al. (2001)
Breadth	
Acquisition	Zahra & George (2002)
Assimilation	
Transformation	
Exploitation	
External knowledge acquisition	Liao, Welsch, & Stoica (2003)
Internal knowledge dissemination	
Employee ability	Minbaeva et al. (2003); Mahnke et al.
Employee motivation	(2005)

Table 8: Dimensions of Absorptive Capacity

Building on Cohen and Levinthal's definition, Lane and Lubatkin (1998) and Lane, Salk, and Lyles (2001) have distinguished between three dimensions of absorptive capacity and have related several organizational mechanisms to these three dimensions. For instance, Lane and Lubatkin (1998) argued that a firm's prior knowledge is related to its ability to recognize and value new external knowledge. Moreover, the similarity in organizational structure and compensation systems is related to a firm's ability to assimilate new external knowledge. Finally, the ability to commercialize new external knowledge is depended on the proportion of the organizational problem solving set that is shared with the partner.

Based on Grant's (1996a) distinction between three dimensions of knowledge integration, Van den Bosch et al. (1999) distinguished between corresponding dimensions of absorptive capacity: efficiency, scope, and flexibility. Whereas the efficiency dimension of absorptive capacity refers to the cost and economies scale perspective, the scope dimensions refers to the breadth of component knowledge, and the flexibility dimension refers to the extent to which firms can access additional and reconfigure existing component knowledge. Van Wijk et al. (2001) focused on a firm's prior related knowledge to differentiate between dimensions of absorptive capacity. The depth dimension is associated with specialist knowledge that allows a firm to learn complex matters. The breadth dimension of absorptive capacity is related to generalist prior knowledge across a range of subject areas. Accordingly, firms with a breadth knowledge base are better able to absorb various components of new external knowledge.

Building upon the dynamic capabilities view of the firm (e.g. Eisenhardt & Martin, 2000), Zahra and George (2002) reviewed, reconceptualized, and extended the absorptive capacity construct by distinguishing between potential and realized absorptive capacity. Potential absorptive capacity, which includes knowledge acquisition and assimilation, captures efforts expended in identifying and acquiring new external knowledge and in assimilating knowledge obtained from external sources (Zahra & George, 2002: 189). Realized absorptive capacity, which includes knowledge transformation and exploitation, encompasses deriving new insights and consequences from the combination of existing and newly acquired knowledge, and incorporating transformed knowledge into operations (Zahra & George, 2002: 190). Based on Zahra and George (2002), Liao, Welsch, and Stoica (2003) posited that a firm's absorptive capacity consists of two major components: external knowledge acquisition and intrafirm knowledge dissemination. External knowledge acquisition refers to a firm's ability to identify and acquire new external knowledge that is critical to a firm's operations. Intrafirm knowledge dissemination involves the communication of the newly acquired knowledge to all relevant departments and individuals.

Addressing the critique that the majority of studies focus on the ability rather than the motivation of employees to absorb new external knowledge, Minbaeva et al. (2003) as well as Mahnke et al. (2005) identified employees' ability and motivation as key dimensions of a subsidiary's absorptive capacity. If employees

within a subsidiary are both motivated and able to absorb new external knowledge, these studies assume that the corresponding level of absorptive capacity is high. Accordingly, they found that the interaction between motivation and ability was related with higher levels of knowledge transfer within multinational corporations.

Despite the growing interest in absorptive capacity, few have captured the richness and multidimensionality of the concept. Moreover, previous literatures still lack an overall framework of absorptive capacity that integrates organizational antecedents, dimensions of absorptive capacity, and outcomes. The objective of the next paragraphs is to address this issue and to examine the interrelationships between organizational antecedents, absorptive capacity, and outcomes.

Organizational Antecedents of Absorptive Capacity: Hypotheses

The ability of units to absorb new external knowledge depends on the level of prior related knowledge (Cohen & Levinthal, 1990). However, mere exposure to related external knowledge is not sufficient to internalize it successfully (Pennings & Harianto, 1992). In addition to deepening prior knowledge resources (e.g. Verona, 1999), units need to develop organizational capabilities that enable units to “synthesize and acquire knowledge resources, and generate new applications from these knowledge resources” (Eisenhardt & Martin, 2000: 1107). These organizational capabilities, defined as combinative capabilities (Kogut & Zander, 1992), influence absorption of new knowledge from external sources (Van den Bosch et al., 1999; Verona, 1999: 134). For instance, Henderson and Cockburn (1994) proposed that combinative capabilities may be an important source of enduring competitive advantage by influencing the ability to access new external knowledge and the ability to integrate knowledge flexibly. Moreover, Verona (1999) pointed out that combinative capabilities influence acquisition as well as use of new external knowledge. We draw on preceding literatures and empirically test how combinative capabilities influence potential and realized absorptive capacity. Combinative capabilities have been associated with integrative structures and processes (Matusik, 2002; Verona, 1999), control systems, and culture or dominant values of organizations (Henderson & Cockburn, 1994: 66). Van den Bosch et al. (1999: 556) classified these organizational mechanisms along three types of combinative capabilities, i.e. coordination, systems, and socialization capabilities, and suggested that each influences a unit’s absorptive capacity in

specific ways. As depicted by Figure 9, we relate organizational mechanisms associated with these three types of combinative capabilities to acquisition and assimilation (i.e. potential absorptive capacity), and transformation and exploitation (i.e. realized absorptive capacity) of new external knowledge.

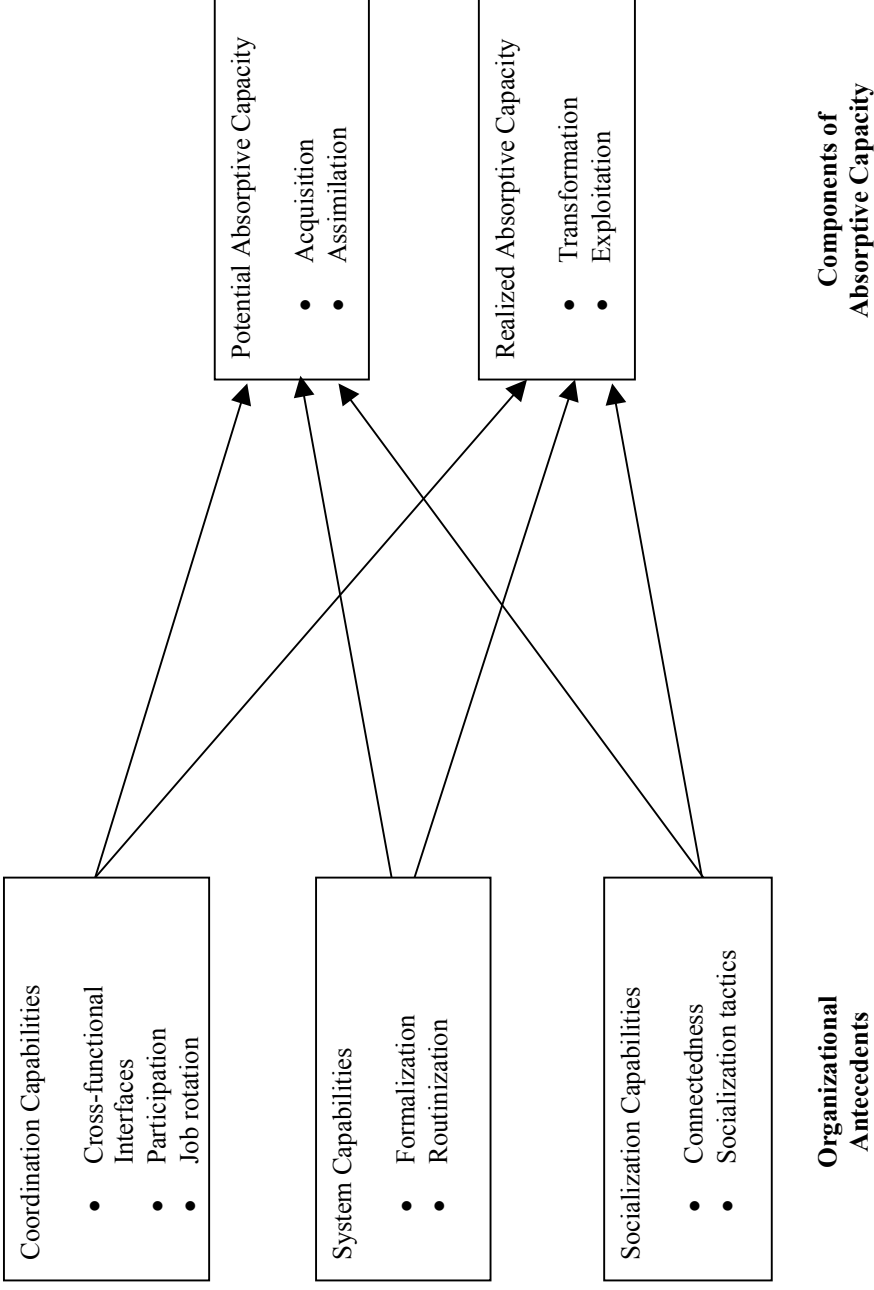


Figure 9: Organizational Antecedents and Absorptive Capacity (source: Jansen et al., 2005)

Organizational Mechanisms Associated with Coordination Capabilities

Coordination capabilities enhance knowledge exchange across disciplinary and hierarchical boundaries (Henderson & Cockburn, 1994; Matusik, 2002; Teece et al., 1997). Common features of coordination capabilities are cross-functional interfaces, participation in decision-making, and job rotation (Galbraith, 1973; Henderson & Cockburn, 1994; Van den Bosch et al., 1999). These organizational mechanisms bring together different sources of expertise and increase lateral interaction between functional or ‘component’ knowledge.

Units use *cross-functional interfaces* like liaison personnel, task forces, and teams to enable knowledge exchange (Gupta & Govindarajan, 2000). Cross-functional interfaces result in lateral forms of communication that deepen knowledge flows across functional boundaries and lines of authority. They promote non-routine and reciprocal information processing (Egelhoff, 1991) and contribute to a unit’s ability to overcome differences, interpret issues, and build understanding about new external knowledge (Daft & Lengel, 1986). Thus, cross-functional interfaces enhance knowledge acquisition and assimilation underlying a unit’s potential absorptive capacity.

Hypothesis 3a. Cross-functional interfaces will be positively related to acquisition and assimilation of new external knowledge (i.e. potential absorptive capacity)

In addition, cross-functional interfaces are beneficial to integrating diverse knowledge components and creating a desirable amount of redundancy within units (Cohen & Levinthal, 1990: 134; Daft & Lengel, 1986). They support unit members in rethinking the systematic nature of existing products and services and revisit the ways in which components are integrated together (Henderson & Cockburn, 1994). Accordingly, cross-functional interfaces enable employees to combine sets of existing and newly acquired knowledge. Moreover, cross-functional interfaces provide an effective way of generating commitment and facilitating the implementation of decisions (Bahrami & Evans, 1987). Thus, cross-functional interfaces increase transformation and exploitation, which underlie a unit’s realized absorptive capacity.

Hypothesis 3b. Cross-functional interfaces will be positively related to transformation and exploitation of new external knowledge (i.e. realized absorptive capacity)

Participation in decision-making indicates the extent to which subordinates take part in higher-level decision making processes (Hage & Aiken, 1967). Participation increases the range of prospective ‘receptors’ to the environment (Cohen & Levinthal, 1990). These receptors selectively act on new external knowledge and serve as both filter and facilitator of new external knowledge acquisition (Aldrich & Herker, 1977). In addition, participation allows for the interplay between a variety of perspectives and leads to a rich internal network of diverse knowledge (Hage & Aiken, 1967: 510) that supports assimilation of new external knowledge. Thus, exposure to external knowledge sources through ‘receptors’ and the interplay between diverse knowledge structures enable knowledge acquisition and assimilation and increase a unit’s potential absorptive capacity.

Hypothesis 4a. Participation in decision-making will be positively related to acquisition and assimilation of new external knowledge (i.e. potential absorptive capacity)

Although conceptual research has suggested that participation in decision-making increases the quantity and quality of ideas or proposals (e.g. Pierce & Delbecq, 1977; Sheremata, 2000), it may slow down transformation and exploitation of new external knowledge considerably. Zaltman, Duncan, and Holbek (1973), for instance, argued that participation facilitates the initiation stage of innovative behavior, but hinders the implementation stage. Because of the difficulty of gaining consensus, empirical research has indeed found a negative effect of participation on new product development speed (Atuahene-Gima, 2003). Moreover, Lin and Germain (2003) revealed that decentralization was inversely related to customer product knowledge utilization. These empirical results suggest that participation in decision-making hampers information-processing efficiency (Cardinal, 2001) and may decrease a unit’s realized absorptive capacity.

Hypothesis 4b. Participation in decision-making will be negatively related to transformation and exploitation of new external knowledge (i.e. realized absorptive capacity)

Job rotation is the lateral transfer of employees between jobs (Campion, Cheraskin, & Stevens, 1994). Job rotation has been assumed to enhance redundancy as well as diversity of backgrounds, to increase problem-solving skills, and to develop organizational contacts (Cohen & Levinthal, 1990; Noe & Ford, 1992). Diverse knowledge structures support explorative learning (McGrath, 2001) and increase the prospect that new external knowledge is related to existing knowledge. Rotation of employees who each possesses diverse and varied knowledge also augments a unit's capacity for making novel linkages and associations (Cohen & Levinthal, 1990). Job rotation therefore enables acquisition and assimilation of new external knowledge that constitute potential absorptive capacity.

Hypothesis 5a. Job rotation will be positively related to acquisition and assimilation of new external knowledge (i.e. potential absorptive capacity)

In addition, job rotation enhances the awareness of employees' knowledge and skills in other functional areas within the unit (Campion et al., 1994). Such awareness about where complementary expertise may reside increases the ability of employees to identify opportunities for transformation and exploitation of new external knowledge (Cohen & Levinthal, 1990: 133; Matusik & Hill, 1998). Moreover, job rotation develops organizational contacts that help with building a coalition needed for successful exploitation of new external knowledge (Mumford, 2000). Job rotation thus also increases transformation and exploitation of new external knowledge underlying a unit's realized absorptive capacity.

Hypothesis 5b. Job rotation will be positively related to transformation and exploitation of new external knowledge (i.e. realized absorptive capacity)

Organizational Mechanisms Associated with Systems Capabilities

Systems capabilities program behaviors in advance of their execution and provide a memory for handling routine situations (De Boer, Van den Bosch, & Volberda, 1999; Galbraith, 1973; March & Simon, 1958; Van den Bosch et al., 1999; Volberda, 1998). They typically exhibit common features, i.e. formalization and routinization, which establish patterns of organizational action (Cohen and Bacdayan, 1994: 555; Galunic & Rodan, 1998).

Formalization is the degree to which rules, procedures, instructions, and communications are formalized or written down (Khandwalla, 1977). The reliance on rules and procedures reduces the likelihood that individuals deviate from established behavior (Weick, 1979). Formalization acts as a frame of reference that constrains exploration efforts and directs attention toward restricted aspects of the external environment (Weick, 1979). In this sense, formalization tends to limit the intensity and scope of efforts expended in knowledge acquisition. Moreover, formalization also inhibits rich, reciprocal knowledge interaction and hinders individuals in assimilating new external knowledge. Accordingly, formalization negatively influences acquisition and assimilation of new external knowledge underlying potential absorptive capacity.

Hypothesis 6a. Formalization will be negatively related to acquisition and assimilation of new external knowledge (i.e. potential absorptive capacity)

Organizational units use formalization to respond to organizational phenomena in a known way (Daft & Lengel, 1986). Formalization supports the retrieval of knowledge that has already been internalized (Lyles & Schwenk, 1992) and enhances the causal understanding of sets of tasks within units. Accordingly, formalization increases the likelihood that unit members will identify opportunities for transformation of new external knowledge (Galunic & Rodan, 1998; Zollo & Winter, 2002: 342). Through formalization, units also codify best practices so as to make knowledge more efficient to exploit, easier to apply, and to accelerate its implementation (Lin & Germain, 2003; Zander & Kogut, 1995). Formalization, thus, enhances transformation and exploitation of new external knowledge underlying realized absorptive capacity.

Hypothesis 6b. Formalization will be positively related to transformation and exploitation of new external knowledge (i.e. realized absorptive capacity)

Units pursue *routinization* to develop a sequence of tasks that require relatively little attention (Galunic & Rodan, 1998) and to ensure that inputs are transformed into outputs (Perrow, 1967). Routine tasks are invariable, repetitious, and handle lower frequencies of unexpected and novel events (Hage & Aiken, 1969; Perrow, 1967; Withey, Daft, & Cooper, 1983). Employees that execute routine tasks only deal with a few exceptions and a narrow range of problems (Perrow, 1967; Volberda, 1996). Routinization therefore limits the search for new external knowledge and leads to a narrow scope of information processing. Moreover, it also restricts interaction among unit members (Daft & Macintosh, 1981; Galbraith, 1973) and decreases the range of unit members interpreting new external knowledge. Thus, routinization of organizational behavior decreases a unit's ability to acquire and assimilate new external knowledge underlying potential absorptive capacity.

Hypothesis 7a. Routinization will be negatively related to acquisition and assimilation of new external knowledge (i.e. potential absorptive capacity)

Routine tasks establish automatic patterns of behavior and increase understanding of task relationships. As unit members preplan the handling of their tasks (Daft & Macintosh, 1981), routinization provides efficient structures for collective action and decreases efforts spent on decision-making and implementation (Cohen & Bacdayan, 1994). In this sense, units that routinize organizational behavior are able to efficiently transform new external knowledge into existing sets of tasks (Cohen & Bacdayan, 1994). Additionally, as routine tasks are well-practiced and predictable, they permit closely coordinated exploitation of knowledge in pursuing collective objectives (Adler, Goldoftas, & Levine, 1999; Gersick & Hackman, 1990; Grant, 1996). Accordingly, routinization enables a unit's realized absorptive capacity.

Hypothesis 7b. Routinization will be positively related to transformation and exploitation of new external knowledge (i.e. realized absorptive capacity)

Organizational Mechanisms Associated with Socialization Capabilities

Socialization capabilities create broad, tacitly understood rules for appropriate action (Camerer & Vepsalainen, 1988). They contribute to common codes of communication and dominant values (Henderson & Cockburn, 1994; Teece et al., 1997; Verona, 1999) and exhibit two commonalities: connectedness and socialization tactics (Adler & Kwon, 2002; Nahapiet & Ghoshal, 1998). These organizational mechanisms refer to two aspects of social relations: the structural aspect or density of linkages and cognitive aspect or shared social experiences.

The density of linkages, or *connectedness*, serves as a governance mechanism and facilitates knowledge exchange (Jaworski & Kohli, 1993; Rowley, Behrens, & Krackhardt, 2000). Dense networks are advantageous for developing trust and cooperation, but increase the redundancy of information and diminish access to divergent perspectives (Nahapiet & Ghoshal, 1998; Sethi, Smith, & Park, 2001). Accordingly, dense networks constrain unit members to perform broad searches for a variety of external knowledge sources. They “limit the openness to information and to alternative ways of doing things, producing collective blindness” (Nahapiet & Ghoshal, 1998: 245). Therefore, connectedness inhibits the acquisition and assimilation of new external knowledge (i.e. potential absorptive capacity).

Hypothesis 8a. Connectedness will be negatively related to acquisition and assimilation of new external knowledge (i.e. potential absorptive capacity)

Connectedness develops trust and cooperation and fosters the commonality of knowledge (Rowley et al., 2000). It encourages communication and improves the efficiency of knowledge exchange throughout units (Galunic & Rodan, 1998). In this way, connectedness allows units to transform and exploit new external knowledge (Zahra & George, 2002: 194). Moreover, connectedness reduces the likelihood of conflict regarding goals and implementation (Rindfleisch & Moorman, 2001). Thus, connectedness facilitates the transformation and

exploitation of newly acquired knowledge and develops a unit's realized absorptive capacity.

Hypothesis 8b. Connectedness will be positively related to transformation and exploitation of new external knowledge (i.e. realized absorptive capacity)

Organizational units use *socialization tactics* to structure shared socialization experiences (Ashforth & Saks, 1996). Socialization tactics offer newcomers specific information and encourage them to interpret and respond to situations in a predictable way (Jones, 1986). They lead to custodial role orientations and the acceptance of the status quo because organizational members seek a high level of concurrence and conformance (Ashforth & Saks, 1996; Jones, 1986). Socialization tactics increase the commitment of unit members to past policies and procedures (Randall, 1987). They can create mental prisons and lead to poor information search as well as selective perception of information and alternatives (De Leeuw & Volberda, 1996; Janis, 1982). Thus, socialization tactics hamper the ability to tap into new external knowledge sources (Cohen & Levinthal, 1990) and impede a unit's ability to acquire and assimilate new external knowledge.

Hypothesis 9a. Socialization tactics will be negatively related to acquisition and assimilation of new external knowledge (i.e. potential absorptive capacity)

Socialization tactics affect the establishment of interpersonal relationships, and lead to the congruence of values, needs, and beliefs among individuals within units (Ashforth & Saks, 1996; Feldman, 1981; Van Maanen & Schein, 1979). They teach newcomers a unit-specific language that facilitates the comprehension of background knowledge and communication with others (Chao et al., 1994; Fisher, 1986). In this way, socialization tactics enhance the combination of newly acquired and existing knowledge through facilitating bisociation among unit members (Zahra & George, 2002). Moreover, socialization tactics lead to strong social norms and beliefs, which enhance commitment and compliance with exploitation processes of new external knowledge (Adler & Kwon, 2002). Thus, socialization tactics enhance transformation and exploitation of new external knowledge.

Hypothesis 9b. Socialization tactics will be positively related to transformation and exploitation of new external knowledge (i.e. realized absorptive capacity)

Consequences of Absorptive Capacity: Exploratory and Exploitative Innovations

Various outcomes of absorptive capacity have been identified and examined. In the context of ambidextrous organizations, this PhD research is focused on the role of absorptive capacity in pursuing exploratory and exploitative innovations. As shown in chapter three, ambidextrous firms need to renew themselves by both exploiting existing competencies and exploring new ones (Floyd & Lane, 2000). Accordingly, we hypothesized that ambidextrous organizations obtain higher levels of financial performance than non-ambidextrous organizations. Moreover, because of the difficulties associated with combining exploratory and exploitative innovations in organizational units, we have suggested that high-performing ambidextrous firms separate exploratory and exploitative innovations in different organizational units. Hence, organizational units need to manage their potential and realized absorptive capacity and develop exploratory and exploitative innovations. As shown in chapter two, *exploratory innovations* are radical innovations and are designed to meet the needs of emerging customers and markets (Benner & Tushman, 2003: 243). Exploratory innovations require new knowledge or departure from existing knowledge (Levinthal & March, 1993; McGrath, 2001). Conversely, *exploitative innovations* are incremental innovations and are designed to meet the needs of existing customers or markets (Benner & Tushman, 2003: 243). They broaden existing knowledge and skills, improve established designs, expand existing products and services, and increase the efficiency of existing distribution channels (Abernathy & Clark, 1985: 5). Hence, exploitative innovations build on existing knowledge and reinforce existing skills, processes, and structures (Abernathy & Clark, 1985; Levinthal & March, 1993; Lewin et al., 1999).

As shown in Figure 10, this paragraph relates a unit's potential and realized absorptive capacity to its exploratory and exploitative innovations. We not only predict that realized absorptive capacity is positively related to both exploitative as well as exploratory innovations, but also suggest that a unit's potential absorptive

capacity differentially moderates the relationship between a unit's realized absorptive capacity and both types of innovations.

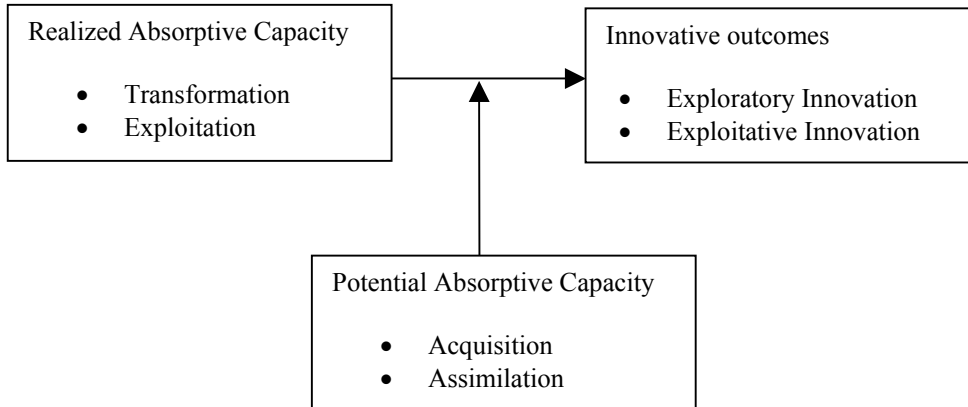


Figure 10: Absorptive Capacity and Innovative Outcomes

As Zahra and George (2002) argued, a unit's realized absorptive capacity is likely to influence a unit's performance through product and process innovation. Transformation, for instance, facilitates the combination of knowledge and the development of new perceptual schemas and proposals for changes to existing products, processes, and technologies. In addition, exploitation underlying a unit's realized absorptive capacity converts knowledge into products, services, and technologies. In this way, a unit's realized absorptive capacity is critical to a unit's innovation process and contributes to both a unit's exploratory and exploitative innovations. Transformation and exploitation processes may be aimed at deepening existing knowledge and skills, and improving efficiency. In this way, realized absorptive capacity helps organizational units to originate refinements to existing processes (Zahra & George, 2002) and to reduce associated costs. Moreover, realized absorptive capacity may also be aimed at developing and applying newly acquired external knowledge to pursue exploratory innovations. Exploratory innovations originate from combining and interpreting existing and newly acquired external knowledge in a different manner (Henderson & Clark, 1990; Kogut & Zander, 1992). Accordingly, we predict that a unit's transformation and exploitation processes underlying its realized absorptive

capacity are positively associated with its exploitative as well as exploratory innovation.

Hypothesis 10a. Realized absorptive capacity (i.e. transformation and exploitation of new external knowledge) will be positively related to exploitative innovation

Hypothesis 10b. Realized absorptive capacity (i.e. transformation and exploitation of new external knowledge) will be positively related to exploratory innovation

Although transformation and exploitation may enhance a unit's ability to initiate new ideas and convert knowledge into new products, services, and processes, organizational units also need to acquire and assimilate new external knowledge to continually renew their knowledge stock. The acquisition and assimilation of new external knowledge is especially critical to the development of exploratory innovations. While exploratory innovations may be the outcome of a unit's realized absorptive capacity, a unit's potential absorptive capacity becomes more critical to renew a unit's knowledge stock and develop innovative outcomes that differ substantially from existing products, services, and technologies. Henderson and Clark (1990: 18), for instance, argued that more radical innovations, such as exploratory innovations, place a premium on the assimilation of new external knowledge. Since exploratory innovations require new knowledge or departure from existing knowledge (Levinthal & March, 1993; McGrath, 2001), the acquisition and assimilation of new external knowledge contributes to a unit's ability to pursue exploratory innovations. However, without applying newly acquired and assimilated new external knowledge, organizational units are not able to pursue exploratory innovations successfully. Therefore, we hypothesize that a unit's potential absorptive capacity positively moderates the impact of realized absorptive capacity on exploratory innovations. In this way, these organizations increase the distinctiveness of their innovations (Yli-Renko et al., 2001) and are able to develop new innovations that differ substantially from existing products, services, and processes.

Although potential absorptive capacity may increase newly acquired external knowledge, exploitative innovations build on existing knowledge and are outcomes of deepening and broadening existing knowledge and skills. Therefore, we hypothesize that potential absorptive capacity is mainly critical to a unit's exploratory innovations. The development of a unit's potential absorptive capacity, therefore, may hinder the efficient transformation and exploitation of knowledge. In other words, organizational units that increase their potential absorptive capacity decrease the impact of realized absorptive capacity on exploitative innovations. These organizational units escalate resources the acquisition and assimilation of new external knowledge, while exploitative innovations are mainly associated with improvements to existing products, services, and technologies. In this sense, organizational units that increase their potential absorptive capacity hamper employees to focus on organizational tasks or operations to efficiently develop exploitative innovations. Therefore, we predict that potential absorptive capacity negatively moderates the relationship between realized absorptive capacity and a unit's exploitative innovations.

Hypothesis 11a. Potential absorptive capacity (acquisition and assimilation of new external knowledge) will negatively moderate the relationship between realized absorptive capacity (i.e. transformation and exploitation of new external knowledge) and exploitative innovation

Hypothesis 11b. Potential absorptive capacity (acquisition and assimilation of new external knowledge) will positively moderate the relationship between realized absorptive capacity (i.e. transformation and exploitation of new external knowledge) and exploratory innovation

Conclusion

This chapter has provided an overview of absorptive capacity research and has argued that despite the growing interest in absorptive capacity, few conceptual and empirical studies have captured the richness and multidimensionality of the concept. Although various studies have focused on organizational outcomes, such as innovative performance, financial performance, and knowledge transfer, organizational antecedents have been largely ignored. In addition, previous studies that have examined outcomes have treated absorptive capacity as a uniform construct.

To address these limitations, this chapter has examined the interrelationship between a unit's organizational antecedents; a unit's potential and realized absorptive capacity, and a unit's exploratory and exploitative innovations. In addition to deepening prior knowledge, organizational units need to develop organizational capabilities that enable units to "synthesize and acquire knowledge resources, and generate new applications from these knowledge resources" (Eisenhardt & Martin, 2000: 1107). These organizational capabilities, defined as combinative capabilities (Kogut & Zander, 1992), influence absorption of new knowledge from external sources (Van den Bosch et al., 1999; Verona, 1999: 134). Van den Bosch et al. (1999: 556) classified these organizational mechanisms along three types of combinative capabilities, i.e. coordination, systems, and socialization capabilities, and suggested that each influences a unit's absorptive capacity in specific ways. However, despite the important role of combinative capabilities in a unit's absorptive capacity, the effects of combinative capabilities on different dimensions of absorptive capacity are still unclear (Jansen et al., 2005).

This chapter has drawn on preceding literatures and has hypothesized how organizational mechanisms as common features of combinative capabilities influence potential and realized absorptive capacity. It has related various organizational mechanisms associated with coordination, systems, and socialization capabilities to acquisition and assimilation (i.e. potential absorptive capacity), and transformation and exploitation (i.e. realized absorptive capacity) of new external knowledge. In addition, this chapter has related a unit's potential and realized absorptive capacity to innovative outcomes, such as exploratory and exploitative innovations. As transformation and exploitation of knowledge (i.e. realized absorptive capacity) is related to product and process innovation (Zahra &

George, 2002), we predicted that realized absorptive capacity is associated with higher levels of exploratory and exploitative innovations. Moreover, the acquisition and assimilation of new external knowledge (i.e. potential absorptive capacity) is critical to a unit's exploratory innovations. Henderson and Clark (1990), for instance, argued that more radical innovations place a premium on the assimilation of new external knowledge. Accordingly, we hypothesized that potential absorptive capacity increases the impact of realized absorptive capacity on exploratory innovations. As newly acquired knowledge is transformed and exploited, organizational units are better able to deviate from existing knowledge and pursue exploratory innovations. Conversely, as exploitative innovations build on existing knowledge, increasing the level of potential absorptive capacity would lead to suboptimal results for developing exploitative innovations. Therefore, the relationship between realized absorptive capacity and a unit's exploratory innovations is predicted to be negatively moderated by a unit's potential absorptive capacity.

CHAPTER FOUR

RESEARCH METHODOLOGY AND RESULTS

Introduction

The former chapters have each introduced important aspects of the overall multilevel framework of this PhD study. They have posited various hypotheses regarding organizational ambidexterity, absorptive capacity, and financial performance. Chapter two, for instance, has discussed performance implications of organizational ambidexterity. It not only predicted that ambidextrous organizations obtain higher levels of financial performance, but also argued that high-performing ambidextrous organizations separate exploratory and exploitative innovations in different organizational units. Chapter three has focused on the organizational unit-level of analysis and proposed hypotheses regarding the interrelationship between organizational antecedents, potential and realized absorptive capacity, and exploratory and exploitative innovations. This chapter describes the research methods used to test these proposed hypotheses.

This chapter is organized as follows. In the next section, the research methods will be briefly explained. During the first phase of the empirical research, qualitative data were obtained from various managers at branches of the Dutch Rabobank Group. These qualitative data were not only aimed at generating initial ideas for the hypotheses, but were also used to develop adequate research designs for the subsequent quantitative data collection. Next, an overview is given of the Rabobank Group as the main research setting of this PhD research. Details of the development of suitable scales, the collection of the quantitative data, and the analysis of the data will be discussed. Finally, the concluding paragraph provides an overview of the main issues brought forward in this chapter.

Research Methods

Insights from the literature review and qualitative data obtained through in-depth interviews were combined and used to specify the theoretical domains of the constructs and to develop a multilevel framework. The multilevel framework hypothesizes relationships between the constructs at both the firm-level and the unit-level. As discussed in chapter two, qualitative data were obtained from various managers at branches of the Dutch Rabobank Group. In the Netherlands, the Rabobank Group consists of 328 branches that are geographically distinct entities with their own clientele (annual report Rabobank Group, 2003). These branches have been the focal research context of this PhD research. The qualitative data obtained during the first phase not only enhanced the rationale underlying the hypotheses, but also generated initial ideas how to design and obtain quantitative data that would enable testing the hypothesized relationships. The second phase of the PhD research entailed the design of quantitative data collection, the development of suitable scales and questionnaires, the collection of quantitative data, and the analysis of the obtained data. As discussed in the next paragraphs, quantitative data were collected through two surveys that were administered to multiple levels at branches of the Rabobank Group.

Research Setting: The Rabobank Group

The empirical research was conducted at a large European financial services firm, the Rabobank Group. The Rabobank Group has total assets of more than \$ 440 billion and ranks among the top 30 on the Fortune Global 500 in terms of total

revenue in the banking industry. It is a broad-based financial service provider having branches in various countries. The products and services of the branches cover asset management, insurance, leasing, equity participation, corporate banking, and investment banking. The Rabobank Group, as one of the three largest financial institutions in the Netherlands, celebrated its first centenary in 1998. "... A century of successful co-operative banking is a daunting heritage. As an organization, we must continue to create and offer the customer value that has been at the heart of that success since the first credit co-operatives were established by local communities in the 1890s..." (Annual report, 1998: 5).

The Rabobank group: a historical overview¹¹

The Rabobank was established over 100 years ago in the Netherlands as a cooperative agricultural bank. Both Hermann Schulze-Delitzsch (1803-1883) and Wilhelm Raiffeisen (1818 - 1888) had been driving forces behind the concept and growth of cooperatives in Germany. Schulze-Delitzsch for example, founded the first credit society in 1850, which were spread rapidly and were known as 'Volksbanken' or people's banks. During the late 19th century and the beginning of the 20th century, a nationwide development of cooperatives could be recognized, from none in 1895 to nearly 600 in 1910. This huge growth led in 1898 to the establishment of two central cooperatives, the 'Central Farmer's Credit Bank established by Catholic member banks in Eindhoven, within the southern province of Brabant and the Central Raiffeisen Bank in Utrecht, which took care of the Protestant network in the North of the Netherlands. By the late 1960s both organizations were coming to the conclusion that the advantages of cooperation made more sense than competing with each other. Intensive discussions and deliberations between both cooperatives and their member banks were needed to integrate each others organization within the Cooperative Raiffeisen-Farmer Credit Bank GA, the predecessor of the Rabobank. The merging of activities would certainly offer greater possibilities through massively increased economies of scale for the new organization. Moreover, it would also give the cooperative the financial strength and weight to become a financial partner on at least one specific global market, namely the international food- and agribusiness.

¹¹ This paragraph is based on Lavelle (1998), "*The art of Cooperation, The Netherlands and its Rabobank*"

The Rabobank Group's first decade was characterized by intense focus on creating an integrated organizational structure capable of responding adequately to changes in the external environment. In the early years after the merger, the Rabobank Group's total assets grew strongly from just over EUR 14 billion in 1973 to almost EUR 40 billion in 1980, a period which spanned one of the worst post-war recessions in the Netherlands and worldwide (oil-crisis). The huge rise in unemployment and the shift away from industry as an economic mainstay were very bad news for the Dutch economy as a whole. Both the Rabobank Group and commercial banks, such as the NMB and the AMRO fetched up into a financial crisis, but remained intact through a persevering trust in the national banking system. The takeover in 1982 of mortgage banks by the Rabobank Group and other commercial banks was the starting point of the broadening of banking activities. One of the examples of these broadenings was the increasing interest towards 95% in 'De Lage Landen', which is specialized in leasing and financing concepts. Besides the broadening towards other products and services, the Rabobank Group increased its interest into other buyer groups, such as small and medium-sized businesses and private persons. Both the changes resulted in a continual growth of total assets towards nearly EUR 133 billion in 1995 and EUR 403 billion in 2003.

Important developments within the late 1980s and the 1990s were the individualization of the society and a further integration of non-traditional banking activities into the service provision of financial institution. The latter movement became known as what the Germans call 'Allfinanz', and means the integration of 'traditional' banking activities with investment banking and assurance products and services. The Rabobank Group, for example, through a further integration with Interpolis (1990) and Robeco (1997), has also been developed into a financial conglomerate, which offers integrated tailor-made solutions towards its clients. In this vein, the Rabobank Group points out the crucial role of these specialized group members by emphasizing "...[t]his cluster of highly reputable providers of dedicated financial products represents a unique source of know-how. As this knowledge is easily accessible to other parties in the Group and is used consistently to improve products and innovate those solutions which distinguish the Rabobank Group's knowledge and customer driven focus..." (Annual report, 1997: 18-19).

The Rabobank group: ten years in figures

During the last decade, the Rabobank Group has grown steadily both in number of employees and financial performance. As shown in figure 11, the number of employees of the Rabobank Group has grown from 37,000 employees in 1994 to 57,000 in 2003. Although the Rabobank Group has become larger both in number of employees and total assets, the number of branches has been steadily decreased. The declining number of customers visiting branches as well as the introduction of other forms of banking, such as internet banking, has resulted in a decline of the number of branches from nearly 600 in 1994 to 328 branches in 2003. Today, the Rabobank Group consists of 321 local and autonomous branches which each provides a range of integrated financial products and services to the Dutch retail and business markets (half-year report 2004, Rabobank Group).

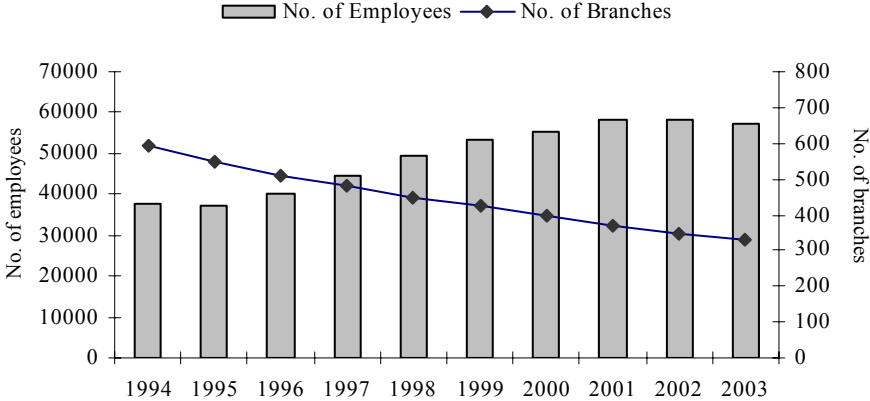


Figure 11: Total number of employees and branches

As shown in figure 12, total assets have increased from EUR 122 billion in 1994 to EUR 403 billion in 2003. Moreover, net profits of the Rabobank Group have increased from EUR 583 million to EUR 1403 million.

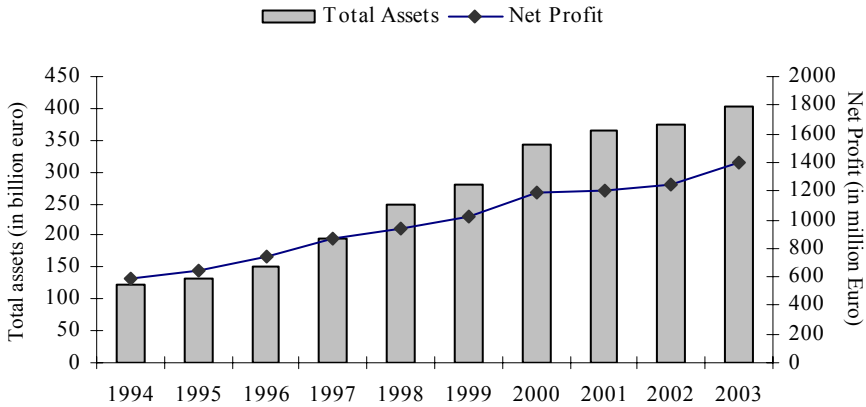


Figure 12: Total assets and number of branches of the Rabobank Group

The branches of the Rabobank Group are geographically distinct, autonomous decision entities with their own board of directors. Branches have autonomy with respect to types of products and services offered and markets within which to provide these products and services. Organizational units in these branches provide products and services that cover asset management, mortgages, loans and savings, insurance, leasing, equity participation, corporate banking, and investment banking. Each organizational unit has its own management team with budget responsibilities regarding several aspects of their operations such as pursuing exploratory and exploitative innovations. Moreover, organizational units within branches operate in markets with varying levels of environmental dynamism and competitiveness – a condition required to observe units pursuing different innovative activities (Han, Kim, & Srivastava, 1998).

Sample and Data Collection: Study I

Survey packages, each containing a copy of executive-director questionnaires and copies of organizational unit manager questionnaires (equal to the number of organizational units in each branch) were developed and were administered to 211 autonomous branches (branches with 70 full-time employees or more) in one country. The executive directors of these branches were asked to evaluate their branch’s exploratory innovations and exploitative innovations. In addition, managers of organizational units in these branches were asked to evaluate their

unit's exploratory and exploitative innovations. To ensure confidentiality, we agreed not to reveal the names of the respondents and we provided envelopes to return questionnaires directly to the research team. We received a total of 110 branch executive director surveys and 363 unit manager surveys, representing a response rate of 52 % at the branch level of analysis and 47 % at the unit-level of analysis. Listwise deletion of cases with missing values for either branch executive directors or organizational unit managers on study variables reduced our sample to 274 organizational units from 90 branches. Finally, 82 units from 43 branches were also excluded from the analyses, because measuring unit heterogeneity required at least 3 responding units per branch¹². Therefore, the final usable sample consisted of 192 organizational units from 47 branches, with the number of organizational units ranging from 3 to 5 per branch. The average size of the branches included in the sample is 140.27 full-time employees; the average size of the organizational unit is 33.45 full-time employees.

We examined differences between respondents and non-respondents to test for non-response bias. A t-test showed no significant differences between the two groups in the executive director and organizational unit manager samples based on number of full-time employees of branches, branch performance, and branch location. We also conducted comparisons of sample means for the usable cases and the dropped cases due to incomplete information and insufficient number of organizational units per branch on all study variables in the branch manager and unit manager samples. These comparisons did not reveal any significant differences ($p < .05$), indicating that non-response bias may not be a problem.

Measurement and Validation of Constructs: Study I

Variables relevant to the current study as well as their corresponding sources of information are described below. In addition to objective performance data, we used survey data to capture exploratory and exploitative innovations at the branch and unit level of analysis. Because appropriate scales for these two types of innovations were not available, we took several steps to develop new measures for these constructs. First, the authors reviewed relevant literature (e.g. Benner & Tushman, 2003; Lewin et al., 1999; March, 1991) and generated a pool of items to

¹² Gilson et al. (2005), for instance, measured their variables through various team members. Since their analyses were conducted at the team-level of analysis, they included only teams for which they received information from three or more respondents.

tap the domain of each construct. From the pool of items, unique items were selected for inclusion in the initial scales. Next, to enhance the construct validity of the survey measures, we conducted a pretest involving in-depth pilot interviews with 15 organizational unit managers and 5 branch executive directors with various tenures. The managers were asked to complete the questionnaire and indicate any ambiguity regarding the phrasing of the items. During follow-up interviews, managers were invited to provide suggestions for improvement of the questionnaire. After this pretest, the phrasing of items was further enhanced by the authors and peers and resulted into a final version of the questionnaire.

Firm financial performance

We measured a firm's financial performance by a branch's average profitability and a branch's average return on investment. In contrast to Gibson & Birkinshaw (2004) who used survey items to assess a business unit's performance and to He & Wong (2004) who used self-reported sales growth rates as indicator of firm performance, we used objective measures for a branch's profitability and return on investment. The figures for firm financial performance were included up to one year after the measurement of exploratory and exploitative innovations. Because the autonomous branches in our sample may have different strategic priorities, we adjusted financial performance data to evaluate each branch. Following Tsai (2001), we used a branch's profitability-achieved rate and a branch's return on investment-achieved rate, namely a branch's profitability divided by its target profitability and a branch's return on investment divided by its target return on investment. We ascertained a branch's profitability, target profitability, return on investment, and target return on investment through internal corporate records. We averaged the profitability-achieved rate and return on investment-achieved rate over a one-year period to help guard against random fluctuations in the data.

Firm-level ambidexterity

Following previous research (Gibson & Birkinshaw, 2004; He & Wong, 2004), we used a two-step approach to develop a measure for firm-level ambidexterity. First, branch executive directors provided information concerning the level of their branch's exploratory and exploitative innovations. A six-item scale measured *exploratory innovation*. The measure for exploratory innovation ($\alpha = .86$) captured the extent to which branches departure from existing knowledge and skills or existing customers, markets, and products (Benner & Tushman, 2003). A six-item

scale ($\alpha = .77$) measured firm-level *exploitative innovation* and captured the extent to which branches build upon existing knowledge and skills or existing customers, markets, and products (Benner & Tushman, 2003). To provide evidence of convergent and discriminant validity of firm-level exploratory and exploitative innovations, we performed exploratory factor analysis with varimax rotation and examined the factor structure of the two measures. As shown in table 9, firm-level exploratory innovation cleanly loaded on one factor and firm-level exploitative innovation cleanly loaded on a second factor. To capture a firm's ambidexterity, the second step for the construction of the measurement was the computation of the multiplicative interaction between firm-level exploratory and exploitative innovations. The computation of the multiplicative interaction reflected arguments that both are nonsubstitutable and interdependent (Gibson & Birkinshaw, 2004). Moreover, to test the second part of the ambidexterity-performance hypothesis (hypothesis 1b), we followed He and Wong (2004) and computed the absolute difference between exploratory and exploitative innovations. In this way, we are able to test performance implications of the relative imbalance between exploratory and exploitative innovations in branches.

Heterogeneity among organizational units

We created an index to reflect the extent to which branches separate exploratory and exploitative innovations in different organizational units. We created this branch index by computing an overall coefficient of variation (Allison 1978; Randel & Jaussi, 2003) that encompasses exploratory and exploitative innovations in organizational units. First, organizational unit managers provided information concerning their unit's level of exploratory and exploitative innovations. We used similar scales for measuring both types of innovations at the unit-level as at the firm or branch-level of analysis. Accordingly, the resulting six-item measure for *exploratory innovation* captured the extent to which units depart from existing knowledge and pursue innovations for emerging customers or markets. The measure for *exploitative innovation* captured the extent to which units build upon existing knowledge and meet the needs of existing customers (Abernathy and Clark 1985, Benner and Tushman 2003, Danneels 2002). Both measures for exploratory and exploitative innovations at the unit-level were unidimensional and reliable (exploratory innovations: $\alpha = .85$; exploitative innovations: $\alpha = .76$). Moreover, as shown in table 9, exploratory factor analysis of the 12 items pertaining to unit-level exploratory and exploitative innovations

resulted in a two-factor solution with significant factor loadings above .64 and cross-loadings below .18. Similar to the measures at the branch-level, findings from the exploratory factor analysis at the unit-level confirmed convergent and discriminant validity of both measures of exploratory and exploitative innovations. Second, we calculated two coefficients of variation for each branch as the standard deviation divided by the mean of (1) exploratory innovations and (2) exploitative innovations in organizational units. Third, we averaged these two coefficients of variation to create an overall index of units' heterogeneity in terms of exploratory and exploitative innovations. The higher the index, the more organizational units are different in terms of pursuing exploratory and exploitative innovations. In other words, the higher the branch index, the more a certain branch separate exploratory and exploitative innovations in different organizational units¹³.

Control variables

In the empirical study, we controlled for possible confounding effects by including various relevant variables. Because large branches may have resource advantages compared to small branches, we included *branch size* as a control. We measured branch size as the logarithm of the number of full-time employees within a branch. We also included a *branch's prior performance* measures. Branches that used to perform well in the past are likely to continue performing well in the future (Tsai, 2001). The branch's prior performance measures were collected for two years prior to the measurements through internal corporate records. The external environment in which branches are situated may also have performance implications. Therefore, branch executive directors provided information on a branch's environmental dynamism. Based on previous literatures, a five-item measure was included that captured *environmental dynamism* (cf. Dill, 1958; Volberda & Van Bruggen, 1997). The scale for environmental dynamism ($\alpha = .85$) tapped into the extent to which organizational units encounter changes in their external environment. Sample items are: 'environmental changes in our local market are intense' and 'in our local market, changes are taking place

¹³ We also checked the absolute difference between exploratory en exploitative innovations within organizational units to find out if certain branches may have heterogeneity across organizational units (high coefficient of variation), but exhibit homogeneous levels of both types of innovations within each organizational unit. We found, however, no branches that consisted of multiple organizational units with equal levels of both exploratory and exploitative innovations.

Research Methodology and Results

continuously'. Other external business dynamics may also influence a branch's performance. Therefore, we included a dummy variable, *urban/rural branch location* (0 = rural location; 1 = urban location) to account for these different effects (Dietz, Pugh & Wiley, 2004). The urban/rural classification was collected through internal corporate records.

	Firm-Level		Unit-Level	
	Exploratory innovation	Exploitative innovation	Exploratory innovation	Exploitative innovation
Exploratory Innovation				
Our unit accepts demands that go beyond existing products and services	.69	.01	.69	-.08
We invent new products and services	.83	-.07	.80	-.09
We experiment with new products and services in our local market	.86	.11	.81	.06
We commercialize products and services that are completely new to our unit	.77	-.07	.80	.07
We frequently utilize new opportunities in new markets	.71	.26	.75	.11
Our unit regularly uses new distribution channels	.71	.29	.68	.18
We regularly search for and approach new clients in new markets ^a				
Exploitative Innovation				
We frequently refine the provision of existing products and services	.29	.58	.09	.65
We regularly implement small adaptations to existing products and services	.07	.77	-.09	.75
We introduce improved, but existing products and services for our local market	.02	.71	.00	.64
We improve our provision's efficiency of products and services	-.10	.64	-.06	.68
We increase economies of scales in existing markets	.05	.68	.15	.67
Our unit expands services for existing clients	.16	.71	.11	.67
Lowering costs of internal processes is an important objective ^a				
Eigenvalue	4.06	2.55	3.61	2.71
Percent of explained variance	34	21	30	23

^a Item deleted after exploratory factor analyses

Table 9: Exploratory factor analyses of exploratory and exploitative innovations at the firm-level and unit-level

Analysis and Results: Study I

Table 10 presents descriptive statistics and correlations for the study variables regarding organizational ambidexterity and financial performance. To examine the issue of multicollinearity, we calculated variance inflation factors (VIF) in each of the regression equations. The maximum VIF within the models was 1.77, which is well below the rule-of-thumb cut-off of 10 (Neter, Wasserman & Kutner, 1990). Examination of externally studentized residuals and Cook’s D values to identify possible influential observations revealed that the data were consistent with underlying assumptions of the OLS.

	Mean	St. dev	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Firm performance (profitability)	102.95	8.92									
(2) Firm performance (ROE)	102.58	16.26	.45								
(3) Firm ambidexterity (mltp.interaction)	19.39	7.12	.54	.41							
(4) Firm ambidexterity (absolute difference)	1.85	1.31	-.31	-.12	-.65						
(5) Heterogeneity between units	0.18	0.07	.12	.03	.11	-.25					
(6) Branch size ^a	2.10	0.19	.01	.02	.15	-.04	-.05				
(7) Branch prior performance (profitability)	102.62	8.52	.39	.03	.21	-.09	-.11	.01			
(8) Branch prior performance (ROE)	103.33	13.26	.07	.35	.15	.07	-.22	-.08	.31		
(9) Environmental dynamism	4.54	1.12	.29	.15	.43	-.30	-.01	.11	.11	.07	
(10) Rural/urban location	0.47	0.50	.19	-.02	.20	-.28	.19	.56	-.04	-.22	.27

n = 47. Correlations above |.28| are significant at p<.05

^a log number of full-time employees

Table 10: Means, standard deviations, and correlations among study variables

Table 11 presents the results of the hierarchical regression analyses. Model 1 is the baseline model for firm profitability that contains the control variables. Model 2 introduces firm ambidexterity (multiplicative interaction) and heterogeneity between units. Model 3 includes firm ambidexterity (absolute difference) and heterogeneity among organizational units. Finally, model 4 includes the interaction effect between firm ambidexterity (multiplicative interaction) and heterogeneity among organizational units. Before entering the variables in model 4, we mean-

centered the data to account for problems of multicollinearity. Below, we will discuss the results obtained in models 2, 3, and 4.

	Firm Financial Performance (Profitability)			
	Model 1	Model 2	Model 3	Model 4
Independent variables				
Firm ambidexterity (multiplicative interaction)		0.44**		0.44**
Firm ambidexterity (absolute difference)			-0.17	
Unit heterogeneity		0.07	0.09	0.06
Interaction effect				
Firm ambidexterity (multiplicative interaction)*				0.37**
Heterogeneity between units				
Control variables				
Branch Size	-0.15	-0.16	-0.10	0.00
Branch prior performance (profitability)	0.37**	0.31*	0.37*	0.32**
Environmental dynamism	0.20	0.04	0.17	0.01
Urban/rural branch location	0.23	0.18	0.14	0.09
Adjusted R ²	.17*	.32**	.17*	
Δ adjusted R ²		.15**	.00	.43***
				.11**

n = 47. * p<.05; ** p<.01; *** p<.001

Table 11: Hierarchical Regression Analyses

As shown in model 2, firm ambidexterity (i.e. multiplicative interaction) is positively related to a firm’s profitability ($\beta = 0.44$, $p < .01$). Hypothesis 1a, the firm-level ambidexterity hypothesis for a firm’s profitability, is supported. Hypothesis 1b, that posited a negative relationship between firm-level ambidexterity in terms of the absolute difference between exploratory and exploitative innovations is negatively related to firm performance (i.e. the higher the relative imbalance, the lower a firm’s performance), is not supported. As shown in model 3, although the coefficient for the absolute difference measure of

Research Methodology and Results

firm ambidexterity is negative as predicted ($\beta = -0.17, p > .10$), it is not significant. Our results indicate that the relative imbalance of exploratory and exploitative innovations does not negatively influence a firm's profitability. As shown in model 4, the interaction effect between firm ambidexterity (i.e. multiplicative interaction between exploratory and exploitative innovations) and heterogeneity between units is positively related to firm financial performance ($\beta = 0.37, p < .01$). Hypothesis 2 is supported.

In addition to firm profitability, we also tested the ambidexterity hypotheses for a firm's return on investment as a complementary measure for financial performance (see table 12). Model 1 is the baseline model for a branch's return on investment that contains the control variables. Model 2 introduces firm ambidexterity (multiplicative interaction) and heterogeneity among organizational units. Model 3 includes firm ambidexterity (absolute difference) and heterogeneity among organizational units. Finally, model 4 includes the interaction effect between firm ambidexterity (multiplicative interaction) and heterogeneity among organizational units. Before entering the variables in model 4, we mean-centered the data to account for problems of multicollinearity. Below, we will discuss the results obtained in models 2, 3, and 4. As shown in model 2, firm ambidexterity (i.e. multiplicative interaction) is positively related to a firm's return on investment ($\beta = 0.38, p < .05$). Hypothesis 1a, the firm-level ambidexterity hypothesis, is also supported for a firm's financial performance in terms of return on investment. Hypothesis 1b, that posited a negative relationship between the absolute difference between exploratory and exploitative innovations is negatively related to firm performance (i.e. the higher the relative imbalance, the lower a firm's performance), is not supported. As shown in model 3, although the coefficient ($\beta = -0.10, p > .10$) for the absolute difference measure of firm ambidexterity is negative, it is not significant. Accordingly, similar to the results regarding a firm's profitability, these findings indicate that the relative imbalance of exploratory and exploitative innovations does not necessarily influence a firm's return on investment negatively.

	Firm Financial Performance (ROE)			
	Model 1	Model 2	Model 3	Model 4
Independent variables				
Firm ambidexterity (multiplicative interaction)		0.38*		0.38*
Firm ambidexterity (absolute difference)			-0.10	
Unit heterogeneity		0.06	0.10	0.05
Interaction effect				
Firm ambidexterity (multiplicative interaction)*				0.35*
Heterogeneity between units				
Control variables				
Branch size	0.03	0.03	0.07	0.18
Branch prior performance (ROE)	0.34*	0.30*	0.36*	0.29*
Environmental dynamism	0.13	-0.02	0.11	-0.04
Urban/rural branch location	-0.00	-0.05	-0.06	-0.15
Adjusted R ²	.06	.15*	.06	.25**
Δ adjusted R ²		.09*	-.01	.10*

n = 47. * p<.05; ** p<.01; *** p<.001

Table 12: Hierarchical Regression Analyses

As shown in model 4, the interaction effect between firm ambidexterity (i.e. multiplicative interaction) and heterogeneity between units is positively related to firm financial performance ($\beta = 0.35$, $p < .05$). Hence, hypothesis 2 is also supported for a firm's return on investment. Accordingly, the findings of the ambidexterity hypotheses and the moderating role of separating exploratory and exploitative innovations reveal similar results for a firm's financial performance in terms of profitability as well as in terms of a firm's return on investment. The coefficients for the multiplicative interaction between exploratory and exploitative innovations are significant for both measures of firm performance (profitability and return on investment). However, the coefficients for the relative imbalance of

Research Methodology and Results

exploratory and exploitative innovations are negative but not significant. These regression results indicate that ambidextrous firms with a low level of exploratory and a low level of exploitative innovations do not necessarily increase their financial performance. When the relative imbalance between exploratory and exploitative innovations is low, ambidextrous firms may have low levels of both types of innovations or high levels of both exploratory and exploitative innovations. Since the coefficients for the relative imbalance are not significant whereas the coefficients for the multiplicative interaction term are significant (indicating that ambidextrous firm have both high levels of exploratory and exploitative innovations), our results suggest that ambidextrous organizations need to have relatively high levels of exploratory and exploitative innovations simultaneously to obtain higher levels of financial performance in terms of profitability as well as return on investment. Following Gibson and Birkinshaw (2004) and He and Wong (2004) we divided the sample into four groups. As shown in table 13, group one consisted of 16 ‘exploitative’ branches with a relatively low level of exploratory innovation compared to a high level of exploitative innovations. Group two consisted of 9 ‘exploratory’ branches with a relatively high level of exploratory innovations compared to exploitative innovations. Group three consisted of 10 ‘moderately ambidextrous’ branches that have moderate levels of both exploratory innovations and exploitative innovation. Finally, group four consisted of 12 ‘highly ambidextrous’ branches that have high levels of exploratory and exploitative innovations simultaneously.

Number of branches	Type of firm	Exploitative Innovation	Exploratory Innovation	Mean performance profitability	Mean performance ROE
16	Exploitative	5.70	2.33	100.22	98.19
9	Exploratory	4.33	3.20	98.87	96.26
10	Moderately ambidextrous	5.65	4.05	103.31	103.09
12	Highly ambidextrous	5.50	5.24	109.35	112.76

Table 13: Results of Cluster Analysis

As shown in table 13, the means for firm profitability and firm return on investment indicate that highly ambidextrous organizations exhibit the highest performance figures, followed by moderately ambidextrous organizations. Exploratory branches have the lowest performance outcomes of all four groups, indicating that branches that mainly focus on exploratory innovations compared to exploitative innovations have low performance outcomes compared to branches that mainly focus on exploitation or the ambidextrous branches. The ANOVA F-test for the mean differences regarding profitability among the four groups was significant ($F = 3.77, p < .05$), indicating that all four groups had different performance level regarding profitability. The ANOVA F-test for the mean differences regarding return on investment across the four groups was moderately significant ($F = 2.68, p < .10$), indicating that all four groups had moderately different performance levels of return on investment.

The plot of the interactions between firm ambidexterity and heterogeneity among organizational units is shown in the next two figures (figure 13 and figure 14). Consistent with hypothesis 2, figure 13 shows a positive relationship between firm-level ambidexterity and firm profitability when heterogeneity among organizational units is high. Moreover, the plot also reveals that low heterogeneity between organizational units – indicating concurrently combining explorative and exploitative innovation within units – does not negatively influence the relationship between ambidexterity at firm level and firm profitability.

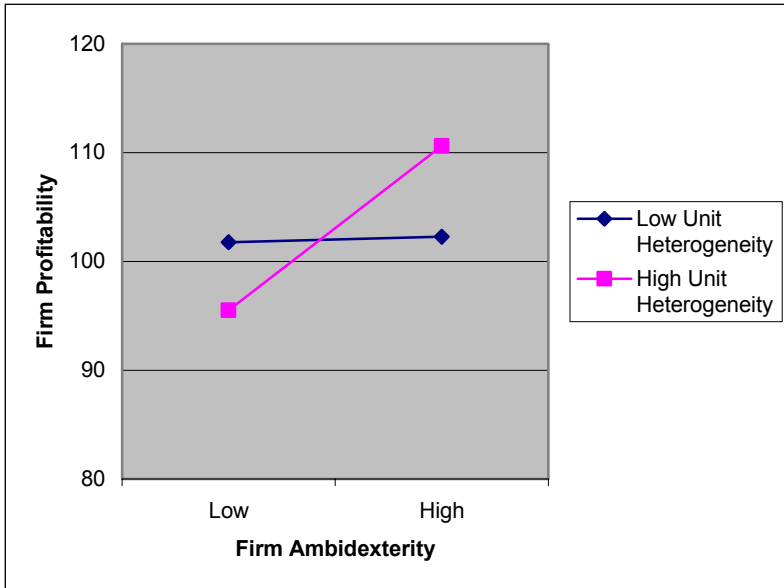


Figure 13: Interaction effect between firm ambidexterity and unit heterogeneity

Consistent with hypothesis 2, figure 14 also shows a positive relationship between ambidexterity at firm level and firm return on investment when heterogeneity between organizational units is high. Moreover, the plot also reveals that low heterogeneity between organizational units – indicating concurrently combining explorative and exploitative innovation within units – does not negatively influence the relationship between ambidexterity at firm level and firm return on investment.

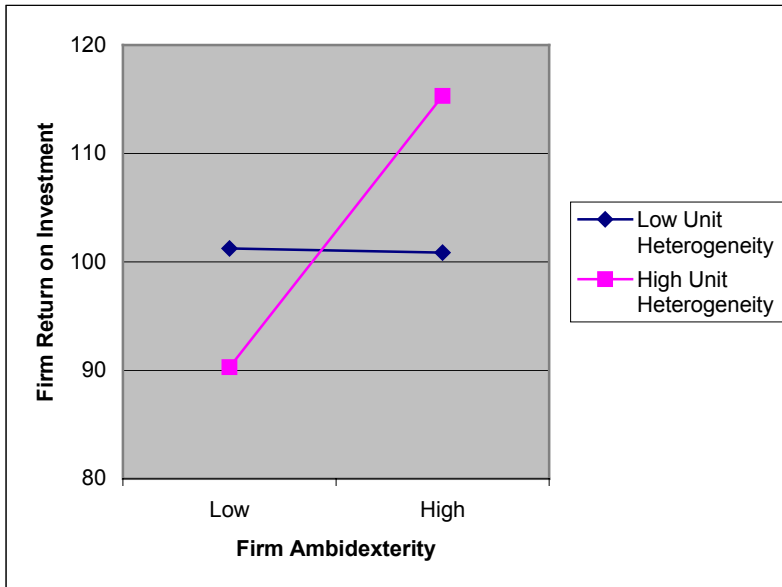


Figure 14: Interaction effect between Firm Ambidexterity and Unit Heterogeneity

Sample and Data Collection: Study II

The empirical sample for the second study on the interrelationships between organizational antecedents, dimensions of absorptive capacity, and exploratory and exploitative innovations consisted of organizational units within branches of the Rabobank Group. As indicated, branches of the Rabobank Group have autonomy with respect to types of products and services offered and markets within which to provide these products and services. Organizational units in these branches provide products and services that cover asset management, mortgages, loans and savings, insurance, leasing, equity participation, corporate banking, and investment banking. Each organizational unit has its own management team with budget responsibilities regarding several aspects of their operations such as pursuing exploratory and exploitative innovations. Moreover, organizational units within branches operate in markets with varying levels of environmental dynamism and competitiveness – a condition required to observe units pursuing different innovative activities (Han, Kim, & Srivastava, 1998).

Research Methodology and Results

We administered a survey to organizational unit managers of 769 organizational units within 220 branches in one country. To ensure confidentiality, we agreed not to reveal the manager's name and asked to return the questionnaire directly to the research team. A total of 462 questionnaires were returned, corresponding with a response rate of 60.1 percent. The respondents had a mean company tenure of 7.7 years (s.d. = 8.14). The average size of the organizational units was 32.79 (s.d. = 21.09) full-time employees.

To test for nonresponse bias, we examined differences between respondents and nonrespondents. A t-test showed no significant differences ($p < .05$) between the two groups based on the number of full-time employees of units and branches, total assets of branches, and units' prior performance. We also compared the early and late respondents in terms of demographic characteristics and model variables. These comparisons did not reveal any significant differences ($p < .05$), indicating that differences between respondents were not related to nonresponse bias.

To examine reliability issues associated with single-informant data, we surveyed two additional members of each responding unit. Both management team members and senior employees responsible for coordinating units were asked to participate. This follow-up survey resulted in 96 responses from 71 units that were comparable in size, age, and prior performance to our full sample. We calculated an interrater agreement score (r_{wg}) for each study variable (James, Demaree, & Wolf, 1993). The median interrater agreement ranged from .68 to .93, suggesting adequate agreement. In addition, examination of intra-class correlations revealed a strong level of interrater reliability: correlations were consistently significant at the .001 levels (Jones, Johnson, Butler, & Main, 1983). We also performed Harman's one-factor test on items included in our regression model to examine whether common method bias may have augmented relationships. Because we found multiple factors, and the first factor did not account for the majority of the variance, we were less concerned about potential problems associated with common method bias (Podsakoff & Organ, 1986).

Measurement and Validation of Constructs: Study II

This study mainly used existing scales from literature. However, appropriate scales for potential absorptive capacity, realized absorptive capacity, and job rotation were not available. The following steps were taken to develop new measures for these constructs. First of all, we reviewed relevant literature and

generated a pool of items to tap the domain of each construct. From this pool of items, unique items were selected for inclusion in initial scales. Next, we conducted in-depth interviews with 15 unit managers at different branches. The managers were asked to complete the questionnaire and indicate any ambiguity regarding the phrasing of the items. During follow-up interviews, they were invited to suggest improvements to the questionnaire. Subsequently, the phrasing of items was further enhanced by the authors and peers and resulted in a final version of the questionnaire. The measures are presented in Table 14.

Exploratory and exploitative innovation

Organizational unit managers provided information concerning their unit's level of exploratory and exploitative innovations. The measures for exploratory and exploitative innovations were identical to the measures used in study I. Accordingly, exploratory innovation captured the extent to which organizational units depart from existing knowledge and pursue innovations for emerging customers or markets. The measure for *exploitative innovation* captured the extent to which organizational units build upon existing knowledge and meet the needs of existing customers (Abernathy and Clark 1985, Benner and Tushman 2003, Danneels 2002). The resulting scales for exploratory innovation ($\alpha = .80$) and exploitative innovation ($\alpha = .71$) were reliable and unidimensional. Exploratory factor analysis revealed a two-factor solution with eigenvalues above one and factor loadings above .50.

Potential and realized absorptive capacity

To examine potential and realized absorptive capacity, we sought to measure the dimensions that have been defined (Zahra & George, 2002). Items were measured on a seven-point disagree/agree scale and were partially based on existing items in the literature regarding absorptive capacity (Szulanski, 1996) and market orientation (Jaworski & Kohli, 1993). The appendix presents the items of potential and realized absorptive capacity we used in our study. Potential absorptive capacity consists of acquisition and assimilation of new external knowledge. Six items assessed the intensity and direction of efforts expended in knowledge *acquisition*. In addition, three items measured *assimilation* and gauged the extent to which units were able to analyze and understand new external knowledge. The scales for acquisition and assimilation were reliable (reliabilities: acquisition, .79; assimilation, .76). Realized absorptive capacity includes

Research Methodology and Results

transformation and exploitation of new external knowledge. Six items measured *transformation* and assessed the extent to which units were able to facilitate recognizing opportunities and consequences of new external knowledge for existing operations, structures, and strategies (Zahra & George, 2002). Six items tapped into the extent to which units were able to *exploit* new external knowledge. The scale gauged the ability of units to incorporate new external knowledge into their operations. Both scales were reliable (reliabilities: transformation, .72; exploitation, .71).

We conducted confirmatory factor analysis (CFA) of the items pertaining to dimensions of potential and realized absorptive capacity in order to check for construct independence. Each item was allowed to load only on the factor for which it was a proposed indicator. Results indicate that a four-factor model fits the data moderately well ($\chi^2/df = 2.76$, goodness-of-fit index [GFI] = .91, comparative fit index [CFI] = .90, root-mean-square error of approximation [RMSEA] = .06). Item loadings were as proposed and were significant ($p < .001$), providing evidence for convergent validity. The hypothesis that the four underlying dimensions of absorptive capacity converged on one common factor was unambiguously rejected ($\Delta\chi^2_6 = 1097.00$, $p < .001$). Our four-factor model also provided a better fit to the data than its plausible rival two-factor model. All the fit indexes of the two-factor model were worse than those of our four-factor model. In addition, a chi-square difference test showed that the fit of the three-factor model was significantly worse than our four-factor model ($\Delta\chi^2_5 = 840.03$, $p < .001$). Accordingly, the four dimensions underlying potential and realized absorptive capacity are not only theoretically, but also empirically distinguishable.

To further assess the construct validity of the measures for potential and realized absorptive capacity, we compared the scores of the study variables with a separate overall measure of absorptive capacity (Szulanski, 1996). Using a nine-item scale ($\alpha = .90$), respondents described their unit's ability to absorb new external knowledge regarding a new knowledge-intensive financial service, i.e. employee benefits, that had been released six months before the initial questionnaire. Correlations between the study variables and the overall measure of absorptive capacity regarding the new financial service were positive and significant (acquisition, $r = .44$, $p < .001$; assimilation, $r = .37$, $p < .001$; transformation, $r = .34$, $p < .001$; exploitation, $r = .24$, $p < .001$), suggesting evidence for convergence validity. In addition, we collected archival data through

internal corporate records on the average number of services regarding employee benefits purchased by clients. Correlations between the study variables and this service performance measure were also positive and significant (acquisition, $r = .23$, $p < .001$; assimilation, $r = .13$, $p < .01$; transformation, $r = .22$, $p < .001$; exploitation, $r = .14$, $p < .01$), suggesting that organizational units with higher levels of potential and realized absorptive capacities obtained higher levels of service performance regarding the new financial service.

Organizational mechanisms associated with combinative capabilities

To measure *cross-functional interfaces*, we asked managers to indicate the extent to which their unit used liaison personnel, temporary task forces, and permanent teams to coordinate activities (Galbraith, 1973). The final measure was a weighted average of the three items (cf. Gupta & Govindarajan, 2000), ranging from 1 for liaison personnel to 3 for permanent teams (mean = 4.39; s.d. = 1.18). We used the construct of participation in decision-making (Dewar, Whetten, & Boje, 1980; Hage & Aiken, 1967) to measure *participation* ($\alpha = .79$). *Job rotation* was measured with two items that tapped into the extent to which employees were rotated between different functions within and between subunits ($\alpha = .77$). The items were as follows “employees in our unit are regularly rotated between different functions” and “employees are regularly rotated between different subunits”. To measure *formalization*, we used a five-item formalization scale ($\alpha = .73$) from Desphandé and Zaltman (1982). *Routinization* tapped into the extent to which tasks within units were invariable, uniform or predictable (Whitney, Daft, & Cooper, 1983). Based on Perrow’s (1967) work on unit technology, routinization ($\alpha = .73$) was measured by the exceptions scale of Whitney, Daft, and Cooper (1983). *Connectedness* ($\alpha = .74$) was measured with a four-item scale (Jaworski & Kohli, 1993). Connectedness measured the extent to which individuals in organizational units were networked to various levels of the hierarchy. We used two categorizations of Van Maanen and Schein’s model (1979: 232) to measure *socialization tactics*: collective versus individual and serial versus disjunctive tactics (cf. Jones, 1986). Previous research suggested that these two categorizations affect custodial role orientations, the congruence of values and beliefs, and newcomer adjustment to organizations (Ashforth & Saks, 1996; Grant & Bush, 1996). Since we were interested in the overall effect of socialization tactics, we constructed a measure for socialization tactics by averaging the scores of collective socialization tactics ($\alpha = .74$) and serial socialization tactics ($\alpha = .76$).

An integrated CFA on all items of exploratory innovation, exploitative innovation, potential and realized absorptive capacity, and organizational mechanisms associated with combinative capabilities (with each item constrained to load only on the factor for which it was the proposed indicator) yielded a model that fits the data moderately well ($\chi^2/df = 2.29$, goodness-of-fit index [GFI] = .89 comparative fit index [CFI] = .91, root-mean-square error of approximation [RMSEA] = .053). Item loadings were as proposed and significant ($p < .01$). The scale for cross-functional interfaces was not subjected to confirmatory factor analysis due to the weighted structure.

Control variables

As larger units may have more resources, yet may lack the flexibility to acquire and assimilate new external knowledge, we included the natural logarithm of the number of full-time employees within units to account for *unit size*. In accordance with the reasoning to include unit size, we included *branch size* as well. Branch size (average: 136.36 full-time employees) was calculated by the natural logarithm of the number of full-time employees within a branch. A *unit's age*, measured by the number of years from its founding, was included since age may influence knowledge acquisition and exploitation (Autio, Sapienza, & Almeida, 2000). To control for the effect that units may specialize in different markets and have different ranges of products and services, we included *unit client focus* that indicates whether the unit provided products and services for private clients (coded as 0) or for business clients (coded as 1). Units with a strong history of high performance are more likely to invest in absorptive capacity. Hence, we included a *unit's past performance*. Because units may have different strategic priorities, we adjusted performance data to evaluate each unit. Following Tsai (2001), we used a unit's profitability-achieved rate, a unit's profitability divided by its target profitability. We also controlled for *branch's past performance* and included a branch's profitability-achieved rate, a branch's return on investment divided by its target return. The performance measures, as well as the achieved rates for the units and branches in this study, were collected for the time period 1999-2001 through internal corporate records. Environmental aspects may trigger units to develop their potential or realized absorptive capacity. Accordingly, we included a dummy variable, *urban/rural unit location* (0 = rural location; 1 = urban location) to account for different business dynamics such as market concentration and

competitiveness (Dietz, Pugh & Wiley, 2004). The urban/rural classification was collected through internal corporate records. *Environmental dynamism* can trigger a unit to develop potential absorptive capacity (Zahra & George, 2002). We therefore included a three-item scale ($\alpha = .75$) that captures environmental dynamism (Dill, 1958; Volberda & Van Bruggen, 1997). Sample items are “our clients regularly ask for complete new products and services” and “in our market, changes are taking place continuously”.

Scales and Items Study II^a

Construct	Items
Potential Absorptive Capacity	
Acquisition	<p>Our unit has frequent interactions with corporate headquarters to acquire new knowledge</p> <p>Employees of our unit regularly visit other branches</p> <p>We collect industry information through informal means (e.g. lunch with industry friends, talks with trade partners)^b</p> <p>Other divisions of our company are hardly visited [®]</p> <p>Our unit periodically organizes special meetings with customers or third parties to acquire new knowledge</p> <p>Employees regularly approach third parties such as accountants, consultants, or tax consultants</p>
Assimilation	<p>We are slow to recognize shifts in our market (e.g. competition, regulation, demography) ^{®b}</p> <p>New opportunities to serve our clients are quickly understood</p> <p>We quickly analyze and interpret changing market demands</p>
Realized Absorptive Capacity	
Transformation	<p>Our unit regularly considers the consequences of changing market demands in terms of new products and services</p> <p>Employees record and store newly acquired knowledge for future reference</p> <p>Our unit quickly recognizes the usefulness of new external knowledge to existing knowledge</p> <p>Employees hardly share practical experiences [®]</p> <p>We laboriously grasp the opportunities for our unit from new external knowledge [®]</p> <p>Our unit periodically meets to discuss consequences of market trends and new product development</p>
Exploitation	<p>It is clearly known how activities within our unit should be performed</p> <p>Client complaints fall on deaf ears in our unit ^{®b}</p> <p>Our unit has a clear division of roles and responsibilities^c</p> <p>We constantly consider how to better exploit knowledge</p> <p>Our unit has difficulty implementing new products and services [®]</p> <p>Employees have a common language regarding our products and services^c</p>

Construct	Items
Coordination Capabilities	
Cross-functional Interfaces (Gupta & Govindarajan, 2000; Galbraith, 1973)	Indicate the extent to which your unit uses (weighted average of three items) 1. Liaison personnel 2. Temporary task forces 3. Permanent teams
Participation (Hage & Aiken, 1967; Dewar, Whetten, & Boje, 1980)	Employees participate in the decision to hire new staff Employees participate in decisions on the promotion of any of colleagues Employees participate in decisions on adoptions of new policies Employees participate in decisions on adoptions of new programs
Job rotation	Employees in our unit are regularly rotated between different functions Employees are regularly rotated between different subunits
Systems capabilities	
Formalization (Desphandé & Zaltman, 1982)	Whatever situation arises, written procedures are available for dealing with it Rules and procedures occupy a central place in the unit Written records are kept of everyone's performance Employees are hardly checked for rule violations ® Written job-descriptions are formulated for positions at all levels in the unit
Routinization (Whitney, Daft, & Cooper, 1983; Perrow, 1967)	Tasks in our unit are the same from day-to-day The work in our unit is routine People in this unit do about the same job in a same way most of the time Basically, unit members perform repetitive activities in doing their jobs The duties in our unit are not repetitious ®
Socialization Capabilities	
Connectedness (Jaworski & Kohli, 1993)	In our unit, there is ample opportunity for informal 'hall talk' among employees In this unit, employees from different subunits feel comfortable calling each other when the need arises Managers discourage employees discussing work related matters with those who are not immediate superiors ® People around here are quite accessible to each other

Construct	Items
Socialization tactics Collective (Jones, 1986; Ashforth & Saks, 1996)	New employees are extensively involved with other new recruits in common, job-related training activities Newcomers are instrumental in helping each other to understand job requirements Our unit puts all newcomers through the same set of learning experiences Most of a recruit's training is carried out apart from other newcomers [®] There is a sense of 'being in the same boat' amongst newcomers in this unit
Serial (Jones, 1986; Ashforth & Saks, 1996)	Experienced unit members see advising or training newcomers as one of their main job responsibilities Newcomers gain a clear understanding of their roles from observing senior colleagues Newcomers receive little guidance from experienced members as to how perform the job [®] Newcomers are generally left alone to discover what their role in the unit should be [®]
External environment	
Environmental Dynamism (Burns & Stalker, 1961; Dill, 1958; Volberda & Van Bruggen, 1997)	Our clients regularly ask for complete new products and services In our market, changes are taking place continuously In our market, the volumes of products and services to be delivered change fast and often

^a All items are measured on a 7-point scale with 1 "Strongly disagree" to 7 "Strongly agree", [®] means reversed coded item

^b Item adapted from Jaworski and Kohli (1993)

^c Item adapted from Szulanski (1996)

Table 14: Measures and Items (source: Jansen et al., 2005)

Analysis and Results: Study II – Organizational antecedents

Table 15 presents descriptive statistics and correlations for the study variables regarding organizational antecedents and absorptive capacity. To examine the issue of multicollinearity, we calculated variance inflation factors (VIF) in each of the regression equations. The maximum VIF within the models was 1.44, which is well below the rule-of-thumb cut-off of 10 (Neter, Wasserman, & Kutner, 1990).

	Mean	St. dev	(1)	(2)	(3)	(4)	(5)	(6)
(1) Acquisition	3.58	1.24	(.79)					
(2) Assimilation	4.74	1.13	.28	(.76)				
(3) Transformation	4.61	0.83	.35	.50	(.72)			
(4) Exploitation	5.26	0.72	.07	.40	.55	(.71)		
(5) Cross-functional Interfaces	4.39	1.18	.20	.17	.14	.07	--	
(6) Participation	3.87	1.05	.31	.10	.17	.01	.17	(.79)
(7) Job rotation	2.18	1.08	.20	.14	.14	.05	.26	.11
(8) Formalization	5.53	0.74	-.03	.11	.20	.38	.02	-.11
(9) Routinization	3.26	0.97	-.31	-.20	-.23	-.08	-.06	-.16
(10) Connectedness	5.60	0.78	.16	.27	.32	.31	.09	.04
(11) Socialization tactics	4.56	0.72	.02	.13	.28	.39	.14	.03
(12) Unit size ^a	1.44	0.27	-.18	-.18	-.20	-.11	.20	-.12
(13) Branch size ^a	2.10	0.18	.02	-.00	.06	-.03	.08	-.09
(14) Unit age	3.23	2.35	-.12	-.01	.02	-.01	-.09	-.07
(15) Unit client focus	0.42	0.50	.06	-.01	-.08	-.09	.12	-.01
(16) Past performance unit	102.92	24.64	.11	.09	.05	.00	-.02	-.01
(17) Past performance branch	103.20	30.31	-.01	-.02	.04	.04	-.14	-.05
(18) Urban/rural unit location	0.54	0.50	.02	.01	.00	-.02	.02	-.13
(19) Environmental dynamism	4.29	1.19	.13	.17	.13	.06	.01	.04

n = 462. Numbers in parentheses on the diagonal are Cronbach’s alphas of the composite

^a log number of full-time employees

Table 15: Means, standard deviations, and correlations among study variables

Research Methodology and Results

Table 16 presents the results of the hierarchical regression analyses for organizational antecedents and both components of absorptive capacity. Unstandardized coefficients with standard errors in parentheses as well as standardized coefficients in the adjacent column are reported. Models 1 and 2 relate to potential absorptive capacity.

(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
(.77)												
-.04	(.73)											
.01	-.02	(.73)										
.02	.14	-.15	(.74)									
.20	.28	.06	.13	(.75)								
.19	-.03	.16	-.13	.06	--							
.10	.01	-.04	.03	.10	.34	--						
-.07	.02	.10	.09	-.01	.00	-.12	--					
-.07	-.15	-.07	-.01	-.04	.11	-.02	.01	--				
.01	-.02	-.05	.00	.03	-.01	-.07	-.05	-.01	--			
-.07	-.03	-.03	.02	.06	.05	.01	.06	-.06	.19	--		
.11	-.03	-.03	.06	-.03	.15	.40	-.06	.03	-.15	-.06	--	
.15	-.02	-.13	.11	.04	-.05	.21	-.02	-.11	.03	.05	.18	(.75)

scales. Correlations above |.09| are significant at $p < .05$.

Table 15: Means, standard deviations, and correlations among study variables

As expected, organizational mechanisms associated with coordination capabilities have positive and significant effects on potential absorptive capacity. In particular, coefficients indicate that cross-functional interfaces (acquisition: $p <$

.01; assimilation: $p < .01$) and job rotation (acquisition: $p < .01$; assimilation: $p < .05$) enhance a unit's potential absorptive capacity, consistent with hypotheses 3a and 5a. Regarding hypothesis 4a we found mixed results. Participation in decision-making is positively associated with acquisition ($p < .001$), but not with assimilation ($p > .10$). Thus, participation in decision-making only triggers unit members to acquire new external knowledge. The coefficients for formalization (acquisition: $p > .10$; assimilation: $p > .10$) are not significant. Hypothesis 6a is not supported. Routinization of tasks (acquisition: $p < .001$; assimilation: $p < .05$) has significant and negative effects on acquisition and assimilation of new external knowledge, supporting hypothesis 7a. Accordingly, the negative effect of organizational mechanisms associated with systems capabilities on potential absorptive capacity mainly originates from routinization of tasks. Hypothesis 8a that posits a negative influence of connectedness on a unit's potential absorptive capacity is not supported. Results show that connectedness does not affect acquisition ($p > .10$), and even positively influences assimilation ($p < .01$). Thus, contrary to our prediction, connectedness even enhances the assimilation of new external knowledge. Hypothesis 9a, which claims a negative relationship between socialization tactics and potential absorptive capacity, is also not supported. The coefficients (acquisition: $p > .10$; assimilation: $p > .10$) are not significant. Thus, connectedness and socialization tactics do not disrupt acquisition and assimilation of new external knowledge.

	Potential Absorptive Capacity			
	Acquisition		Assimilation	
	Model 1		Model 2	
Coordination Capabilities				
Cross-functional Interfaces		0.15**		0.15**
Participation		0.21***		0.01
Job rotation		0.13**		0.10*
Systems capabilities				
Formalization		-0.03		0.06
Routinization		-0.20***		-0.11*
Socialization Capabilities				
Connectedness		0.07		0.16**
Socialization tactics		-0.02		0.07
Control variables				
Unit size	-0.22***	-0.20***	-0.20***	-0.20***
Branch size	0.05	0.04	0.04	0.01
Unit age	-0.11*	-0.06	0.01	0.02
Unit client focus	0.11*	0.07	0.02	0.01
Past performance unit	0.10*	0.10*	0.11*	0.10*
Past performance branch	-0.05	-0.02	-0.03	-0.02
Urban/rural unit location	-0.01	0.02	0.00	0.00
Environmental dynamism	0.13**	0.05	0.16**	0.10*
Adjusted R ²	.08***	.23***	.06***	.15***
Δ adjusted R ²		.15***		.09***

Standardized coefficients are reported.

* p < .05, ** p < .01, *** p < .001

Table 16: Results of Hierarchical Regression Analyses

Models 1 and 2 in Table 17 present the results of the hierarchical regression analysis for organizational antecedents and realized absorptive capacity. The coefficients for cross-functional interfaces (transformation: $p < .05$; exploitation: $p > .10$) and job rotation (transformation: $p < .05$; exploitation: $p > .10$) are positive and significant for transformation; however, they are not significant for exploitation. Hypotheses 3b and 5b receive only support in model 3; that is, they are supported for transformation of new external knowledge. Cross-functional interfaces and job rotation do not increase exploitation of knowledge underlying realized absorptive capacity. Participation in decision-making (transformation: $p < .05$; exploitation: $p > .10$) has no significant negative effect on realized absorptive capacity. Contrary to our prediction, participation in decision-making even increases transformation of new external knowledge. Hypothesis 4b is not supported. As hypothesized, formalization (transformation: $p < .05$; exploitation: $p < .001$) positively influences a unit's realized absorptive capacity. Hypothesis 6b is supported. The coefficients for routinization (transformation: $p < .01$; exploitation: $p > .10$) are both negative and only significant for transformation. Hypothesis 7b, positing a positive relationship between routinization and realized absorptive capacity, is not supported. The relationships between common features of socialization capabilities and a unit's realized absorptive capacity are as expected. Coefficients for connectedness (transformation: $p < .001$; exploitation: $p < .001$) and socialization tactics (transformation: $p < .001$; exploitation: $p < .001$) are positive and highly significant. In accordance with hypotheses 8b and 9b, connectedness and socialization tactics increase a unit's realized absorptive capacity¹⁴.

¹⁴ We ran additional regression analyses to examine curvilinear relationships. Results revealed an inverted U-shaped relationship between cross-functional interfaces and transformation. Thus, although cross-functional interfaces contribute to transformation, using many liaison persons, task forces, and cross-functional teams may eventually hurt transformation because of creating too much redundancy among unit members.

	Realized Absorptive Capacity			
	Transformation		Exploitation	
	Model 1		Model 2	
Coordination Capabilities				
Cross-functional Interfaces		0.12*		0.05
Participation		0.11*		-0.01
Job rotation		0.09*		-0.00
Systems capabilities				
Formalization		0.10*		0.29***
Routinization		-0.14**		-0.06
Socialization Capabilities				
Connectedness		0.20***		0.20***
Socialization tactics		0.20***		0.30***
Control variables				
Unit size	-0.25***	-0.24***	-0.10	-0.07
Branch size	0.13*	0.08	-0.01	-0.08
Unit age	0.03	0.04	-0.02	-0.04
Unit client focus	-0.04	-0.05	-0.07	-0.04
Past performance unit	0.05	0.04	-0.00	-0.01
Past performance branch	0.03	0.03	0.05	0.03
Urban/rural unit location	-0.04	-0.02	0.00	0.02
Environmental dynamism	0.13	0.06	0.04	0.01
Adjusted R ²	.08***	.26***	.00	.29***
Δ adjusted R ²		.18***		.29***

Standardized coefficients are reported.

* p < .05, ** p < .01, *** p < .001

Table 17: Results of Hierarchical Regression Analyses

Comparison of Relative Effects

To gain further insights into the relative effects of organizational antecedents on potential and realized absorptive capacity, we determined the relative importance of each set of organizational mechanisms (i.e. associated with each type of combinative capability) over another, by performing F-tests involving both the full and restricted models (c.f. Hansen & Wernerfelt, 1989; Kota & Nair, 1995). Results suggested several important issues. First, acquisition of new

external knowledge is most strongly affected by organizational mechanisms associated with coordination capabilities; organizational mechanisms associated with socialization capabilities have little or no impact. Second, organizational mechanisms associated with coordination and socialization capabilities primarily explain assimilation of new external knowledge. Interestingly, organizational mechanisms associated with socialization capabilities have the strongest effect. Third, the effects of organizational mechanisms associated with socialization capabilities on transformation and exploitation (i.e. realized absorptive capacity) are stronger than organizational mechanisms associated with either coordination capabilities or systems capabilities. Connectedness and socialization tactics, for instance, account for more than three times as much variance of transformation as cross-functional interfaces, participation in decision-making, and job-rotation.

Analysis and Results: Study II – Absorptive Capacity and Outcomes

Table 18 presents descriptive statistics and correlations for the study variables regarding absorptive capacity and innovative outcomes. Since we were interested in the overall effects of potential and realized absorptive capacity on exploratory and exploitative innovations, we averaged the scores for acquisition and assimilation (i.e. potential absorptive capacity) and transformation and exploitation (i.e. realized absorptive capacity). To examine the issue of multicollinearity, we calculated variance inflation factors (VIF) in each of the regression equations. The maximum VIF within the models was 1.43, which is well below the rule-of-thumb cut-off of 10 (Neter, Wasserman, & Kutner, 1990).

	Mean	St. dev	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Exploitative innovation	4.60	0.71										
(2) Exploratory innovation	3.90	1.04	.25									
(3) Realized absorptive capacity	4.94	0.69	.31	.27								
(4) Potential absorptive capacity	4.16	0.95	.16	.42	.47							
(5) Unit size ^a	1.44	0.27	.04	-.17	-.18	-.23						
(6) Branch size ^a	2.10	0.18	.01	.18	.02	.01	.33					
(7) Unit age	3.23	2.35	-.03	-.10	.01	-.08	.00	-.12				
(8) Prior performance unit	102.92	24.64	.02	.09	.03	.13	-.01	-.07	-.05			
(9) Prior performance branch	103.20	30.31	.02	-.00	.05	-.02	.05	.01	.06	.19		
(10) Rural/urban location	0.54	0.50	-.07	.12	-.01	.02	.15	.41	-.06	-.15	-.06	
(11) Environmental dynamism	4.29	1.19	.04	.28	.11	.18	-.05	.21	-.02	.03	.05	.18

N=462. Correlations above |.09| are significant at $p < .05$.

Table 18: Means, standard deviations, and correlations among study variables

Models 1-3 in Table 19 present the results of the hierarchical regression analysis for the relationship between potential and realized absorptive capacity and exploitative innovation. The coefficients for realized absorptive capacity ($p < .001$) and exploitative innovation is positive and significant. Hypotheses 10a, which stated that realized absorptive capacity increases a unit’s exploitative innovations, is supported. Subsequently, model 3 includes the interaction effect between potential and realized absorptive capacity to test whether potential absorptive capacity negatively moderates the relationship between realized absorptive capacity and exploitative innovation. Because the coefficient for the interaction effect is not significant ($p > .10$), potential absorptive capacity does not moderate the proposed relationship. Together with the nonsignificant relationship between potential absorptive capacity and exploitative innovations, model 3 in table 19 indicates that a unit’s exploitative innovations are mainly based on a unit’s realized absorptive capacity. Accordingly, organizational units need to develop their transformation and exploitation processes underlying their realized absorptive capacity to pursue exploitative innovations.

	Exploitative Innovation		
	Model 1	Model 2	Model 3
Absorptive Capacity			
Potential Absorptive Capacity		0.04	0.04
Realized Absorptive Capacity		0.32***	0.32***
Potential Absorptive Capacity x Realized Absorptive Capacity			0.04
Control variables			
Unit size	0.05	0.12*	0.13*
Branch size	0.01	-0.01	-0.01
Unit age	-0.04	-0.04	-0.03
Unit client focus	0.02	0.04	0.03
Past performance unit	0.02	0.01	0.01
Past performance branch	0.01	-0.01	-0.01
Urban/rural unit location	-0.09	-0.09	-0.09
Environmental dynamism	0.08	0.04	0.04
Adjusted R ²	.00	.10***	.10***
Δ adjusted R ²		.10***	.00

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

Table 19: Hierarchical Regression Analyses

Models 1-3 in Table 20 present the results of the hierarchical regression analyses for the relationships between potential and realized absorptive capacity and exploratory innovation. Unexpectedly, the coefficient for realized absorptive capacity ($p<.10$) and exploratory innovation is positive, but only moderately significant. Hypotheses 10b, which stated that realized absorptive capacity increases a unit’s exploratory innovation, is marginally supported. Subsequently, model 3 includes the interaction effect between potential and realized absorptive capacity to test whether potential absorptive capacity positively moderates the relationship between realized absorptive capacity and exploitative innovation. As shown in table 20, the coefficient for the interaction effect is positive and significant ($p<.01$). In addition, model three significantly improves the explained variance ($p<.01$). Accordingly, as predicted, realized absorptive capacity is stronger related to exploratory innovation when a unit’s potential absorptive capacity is high. The control variables indicate that larger organizational more often pursue exploitative innovations than smaller organizational units.

	Exploratory Innovation		
	Model 1	Model 2	Model 3
Absorptive Capacity			
Potential Absorptive Capacity		0.31***	0.33***
Realized Absorptive Capacity		0.08 [†]	0.09 [†]
Potential Absorptive Capacity x Realized Absorptive Capacity			0.13**
Control variables			
Unit size	-0.21***	-0.12**	-0.11*
Branch size	0.18**	0.16**	0.16**
Unit age	-0.06	-0.04	-0.03
Unit client focus	0.09*	0.08	0.06
Past performance unit	0.10*	0.06	0.05
Past performance branch	-0.01	0.00	-0.00
Urban/rural unit location	0.05	0.05	0.04
Environmental dynamism	0.24***	0.18***	0.17***
Adjusted R ²	.15***	.25***	.27***
Δ adjusted R ²		.08***	.02**

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

Table 20: Hierarchical Regression Analyses

Organizational units, thus, which need to pursue exploratory innovation increase their effectiveness by developing both their levels of potential and realized absorptive capacity. Regarding the control variables, model three indicates that larger organizational units pursue less exploratory innovation than smaller units (p<.05). Compared to exploitative innovations (see significant results of control variable unit size in tables 19 and 20), exploratory innovations are largely pursued in smaller organizational units. On the other hand, organizational units situated in larger branches pursue more exploratory innovations than organizational units in smaller branches. This result suggests that larger branches have more resources and capabilities for organizational units to pursue exploratory innovation.

The plot of the interaction is shown in Figure 15. Consistent with hypothesis 11b, figure 15 shows a positive relationship between realized absorptive capacity and exploratory innovations when potential absorptive capacity in organizational units is high.

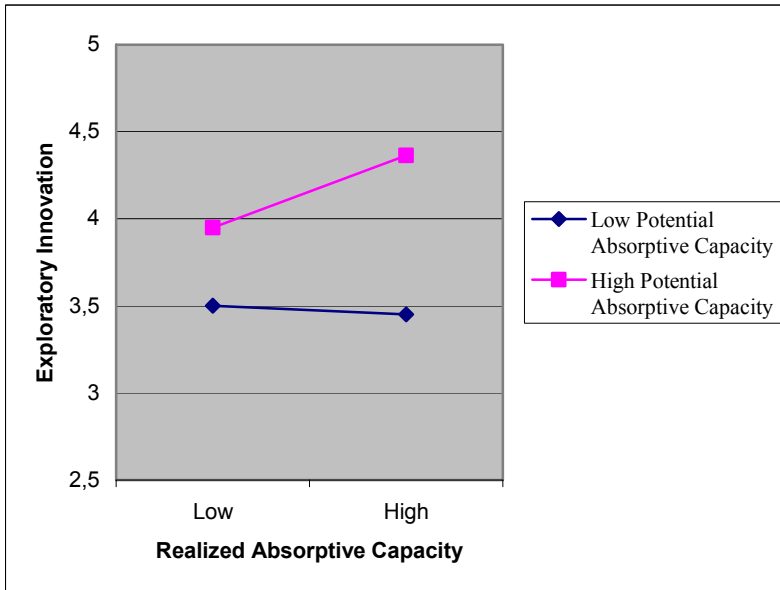


Figure 15: Interaction effect of potential absorptive capacity

Analysis of Mediation

The theoretical model regarding organizational antecedents, absorptive capacity, and exploratory and exploitative innovations assumes that potential and realized absorptive capacity mediate the relationships between combinative capabilities and both types of innovations. Analyzing mediation involves three steps (Baron & Kenny, 1986; Kenny, Kashy, & Bolger, 1998). First, we need to establish that the organizational mechanisms associated with the three types of combinative capabilities influences potential and realized absorptive capacity. As shown in this chapter (table 16 and 17), several relationships between organizational mechanisms and both components of absorptive capacity have appeared to be statistically significant. Second, we need to demonstrate that the independent variables (i.e. organizational mechanisms associated with combinative capabilities) influence exploratory and exploitative innovations. This step was supported since various organizational mechanisms appeared to be significantly related to either exploratory innovations or exploitative innovations ($p < .05$).

Research Methodology and Results

Lastly, we need to demonstrate that the effects of organizational mechanisms on exploratory and exploitative innovations are no longer significant when the mediators, i.e. potential and realized absorptive capacity, are entered in the model. We tested this mediating effect for independent variables (organizational mechanisms) that were significantly related to either exploratory or exploitative innovation. When we entered potential and realized absorptive capacity in the model, we found that the relationships between organizational mechanisms and exploratory and exploitative innovation were no longer significant except for the relationship between routinization and exploratory innovation. Accordingly, these examinations support the theoretical arguments for a full-mediation model. The effect of routinization, however, appeared to be partially mediated by potential and realized absorptive capacity.

Conclusion

This chapter has provided an overview of the empirical research and has described the main research approaches followed to test the proposed hypotheses. The multilevel research design described in this chapter allowed for the examination of the proposed hypotheses at multiple levels of analysis. At the firm-level and unit-level of analysis, this PhD research collected quantitative data that served for the analysis whether ambidextrous organizations obtain higher levels of financial performance. Consistent with the ambidexterity hypothesis, the empirical study indicated that organizational ambidexterity is positively related to a firm's financial performance in terms of profitability as well as return on investment. Interestingly, the coefficients for the multiplicative interaction between exploratory and exploitative innovations are significant for both measures of firm performance (profitability and return on investment). However, the coefficients for the relative imbalance of exploratory and exploitative innovations are negative but not significant. These regression results indicated that ambidextrous firms with a low level of exploratory innovation and a low level of exploitative innovation do not necessarily increase their financial performance. Hence, ambidextrous organizations need to have high levels of both types of innovations to obtain higher levels of financial performance in terms of profitability and return on investment. In addition to examining performance implications of organizational ambidexterity at the firm-level of analysis, a survey was subjected to organizational unit managers to analyze performance implications of separating

and combining exploratory and exploitative innovations in organizational units. The findings indicated that separation of both types of innovations in different organizational unit positively moderated the relationship between organizational ambidexterity and firm-level performance. Hence, ambidextrous organizations that develop organizational units that focus more on exploratory and organizational units that focus more on exploitative innovations perform better than ambidextrous organizations that develop contextually ambidextrous organizational units that combine both types of innovations within their boundaries.

At the unit-level of analysis, the second survey was aimed at uncovering how organizational units develop exploratory and exploitative innovations. Since outside knowledge sources have been associated with innovative output of firms, a unit's absorptive capacity is crucial to its exploratory and exploitative innovations. Accordingly, the second survey collected quantitative data to analyze organizational antecedents, dimensions of absorptive capacity, and exploratory/exploitative innovations. Based on a total of 462 returned questionnaires, this PhD research indicated that organizational mechanisms differentially influence potential and realized absorptive capacity. Moreover, results revealed the importance of realized absorptive capacity in converting knowledge into new products, services, and processes. Zahra and George (2002), for instance, posited that organizational units (or firms) with a well-developed realized absorptive capacity are more likely to achieve a competitive advantage through innovation and product development. Our study provides empirical evidence for the importance of a unit's transformation and exploitation processes (i.e. realized absorptive capacity) to innovative outcomes. Interestingly, we found however that realized absorptive capacity was positively related to exploitative innovations (hypothesis 10a), but was only moderately related to exploratory innovations (hypothesis 10b). Accordingly, although previous research has argued that transformation and exploitation underlying a unit's realized absorptive capacity contribute to its innovativeness (e.g. Zahra & George, 2002), our study reveals that the impact of realized absorptive capacity on different types of innovations is not uniform. Organizations units that increase their realized absorptive capacity are able to enhance their level of exploitative innovations however, they do not necessarily increases their level of exploratory innovation.

To provide a more fine-grained analysis of the relationships between potential and realized absorptive capacity, this chapter examined the moderating role of potential absorptive capacity in developing both types of innovations in

Research Methodology and Results

organizational units. Contrary to our prediction, a unit's potential absorptive capacity does not negatively moderate the relationship between realized absorptive capacity and a unit's exploitative innovations. Although we suggested that developing potential absorptive capacity may hinder the efficient transformation and exploitation of knowledge, our results provided no evidence of such a negative moderating effect. As expected, the acquisition and assimilation of new external knowledge (i.e. potential absorptive capacity) contribute to a unit's ability to pursue exploratory innovations. Although the independent effect of realized absorptive capacity on exploratory innovations is only moderately significant, organizational units that develop their potential absorptive capacity increase their exploratory innovations. In other words, our results indicate that realized absorptive capacity is mainly associated with exploitative innovations, however, organizational units with higher levels of potential absorptive capacity and realized absorptive capacity increase their exploratory innovations. Although previous research has argued that transformation and combination of existing knowledge contributes to more radical innovations, our study indicates that the acquisition and assimilation of new external knowledge become critical. As Henderson and Clark (1990: 18) argued, more radical innovations place a premium on the assimilation of new external knowledge. Organizational units that need to pursue exploratory innovations, therefore, require the development of both potential and realized absorptive capacity. Organizational units, on the other hand, that focus on pursuing exploitative innovation are better off by developing their transformation and exploitation processes underlying their realized absorptive capacity.

CHAPTER FIVE

DISCUSSION, LIMITATIONS, AND CONCLUSION

Introduction

This research was aimed at examining how ambidextrous organizations may successfully cope with potentially conflicting demands from exploratory and exploitative innovations. To enable such an examination, the empirical research has not only examined whether pursuing exploratory and exploitative innovation simultaneously results in higher levels of financial performance, but has also examined the moderating role of separating both types of innovations in different organizational units. In other words, this PhD research questioned whether most effective ambidextrous organizations combine or separate exploratory and exploitative innovations in different organizational units. Additionally, it has examined how organizational units develop exploratory and exploitative innovations. In this way, this PhD research provides the first empirical study that has assessed potential and realized absorptive capacity and has examined the linkage between organizational mechanisms as organizational antecedents of dimensions of absorptive capacity (Jansen et al., 2005).

Theoretical Implications

Ambidextrous organizations and firm performance

Organizational learning and organization theory literatures have long argued that organizations capable of pursuing exploration and exploitation simultaneously obtain superior performance and enhance their long term survival. Although various scholars have claimed the competitive benefits from both types of activities, few studies have actually studied performance implications of the ‘ambidexterity hypothesis’ (He & Wong, 2004). Only recently, empirical studies have examined whether ambidextrous business units and ambidextrous organizations have higher performance levels. Based on a sample of business units, Gibson & Birkinshaw (2004) found that business units that are simultaneously adaptive and aligned have higher levels of financial performance. They measured performance by a subjective score on four items that reflected the business unit’s performance over the preceding five years. He and Wong (2004) found that ambidextrous organizations in terms of pursuing explorative and exploitative innovation strategies have higher performance in terms of sales growth. They relied on self-reported data to measure sales growth in the last three years. Accordingly, both studies relied either on subjective data or on self-reported data that ranged from the year of measurement to five years prior to the measurement of organizational ambidexterity. This PhD study has been able to collect data on financial performance through internal corporate records and included performance measures for up to one year after the measurement of organizational ambidexterity. As previous literatures have argued, the time horizon for benefits from exploratory and exploitative innovations is different. Benefits from exploratory innovations, for instance, are more distant in time and riskier than benefits from exploitative innovations (Levinthal & March, 1993; Lewin et al., 1999; March, 1991).

Results from our study confirmed the ambidexterity hypothesis that ambidextrous organizations obtain higher financial performance. Accordingly, organizations that are able to simultaneously pursue exploratory and exploitative innovations are not only able to efficiently exploit existing products, services, and processes, but are also able to develop new schemas, experiment, and develop more radical products and services aimed at new customers and markets. Although simultaneously managing exploratory and exploitative innovations in one organization is difficult, our study indicates that becoming ambidextrous has

several important benefits for organizations. Interestingly, our results also indicated that ambidextrous organizations need to maintain relatively high levels of exploratory and exploitative innovations to increase their financial performance. The ‘relative imbalance’ measure (He & Wong, 2004) for capturing organizational ambidexterity was not significantly related to firm financial performance. Accordingly, balancing low levels of exploratory and exploitative innovations is less beneficial than balancing high levels of exploratory and exploitative innovations.

H1a	Firm-level ambidexterity (multiplicative interaction between exploratory and exploitative innovation) will be positively related to firm performance	Supported
H1b	The relative imbalance (absolute difference) between firm-level exploratory and exploitative innovation will be negatively related to firm performance	Not supported
H2	Firm ambidexterity (multiplicative interaction between exploratory and exploitative innovation) will be more positively related to firm performance when exploratory and exploitative innovations are separated in different organizational units than when exploratory and exploitative innovations are combined in organizational units	Supported

Table 21: Main findings regarding firm ambidexterity and firm performance

In addition to examining whether organizational ambidexterity is positively related to firm performance, this PhD research has also investigated how effective ambidextrous organizations manage exploratory and exploitative innovations in organizational units. In this way, the results of this multi-level study draw attention to considering organizational ambidexterity as a multi-level construct (Klein, Tosi & Cannella, 1999). Although various literatures have stressed the importance of balancing and synchronizing exploratory and exploitative innovations, multiple views have been brought forward how ambidextrous firms may actually strike this balance. On the one hand, scholars have suggested *separating* exploratory and exploitative innovations in organizational units (Benner & Tushman, 2003; Tushman & O’Reilly, 1996). On the other hand, scholars have increasingly recognized the importance of *combining* seemingly

Discussion, Limitations, and Conclusion

contradictory tensions from exploration and exploitation in organizational units (Gibson & Birkinshaw, 2004). Our findings indicate that ambidextrous organizations that aim at separating exploratory and exploitative innovations in different organizational units obtain higher financial performance. Interviews held with various managers at different branches revealed that the combination of both types of innovations in organizational units would result in various problems of coordination and integration within organizational units. Moreover, separation of exploratory and exploitative innovations in different organizational units allows for the simultaneous adaptation to contradictory environmental demands. Ambidextrous organizations that consist of exploratory and exploitative units are able to adapt to specific local environmental conditions without changing the larger system (Scott, 1981; Weick, 1982).

This PhD research contributes to research on organizational ambidexterity by confirming the importance of becoming ambidextrous and pursuing exploratory and exploitative innovations simultaneously. Moreover, it indicates that spatial separation of exploratory and exploitative innovations leads to higher levels of financial performance. Although He and Wong (2004) and Gibson and Birkinshaw (2004) found that ambidexterity is positively associated with higher levels of financial performance, our study indicates that incorporating multiple-levels of analysis is valuable to further uncover how organizations may successfully manage contradictory innovations within their boundaries. By including multiple levels of analyses, we have been able to show that organizations act ambidextrously at the firm-level by separating exploratory and exploitative innovation at the unit-level of analysis.

Absorptive Capacity: Organizational Antecedents

In addition to exploring a multilevel framework on the performance implications of organizational ambidexterity, this PhD study has explored the differential effects of organizational antecedents on a unit's potential and realized absorptive capacity. Although much research has been devoted to various outcomes of absorptive capacity, organizational antecedents of absorptive capacity have been largely ignored. In addition, research on absorptive capacity has only begun exploring components and dimensions. This empirical study has assessed potential and realized absorptive capacity and has examined the linkage between

specific organizational mechanisms as common features of combinative capabilities and dimensions of absorptive capacity.

Our study contributes to literatures on absorptive capacity and combinative capabilities in several ways. Most importantly, our results reveal that organizational mechanisms associated with combinative capabilities differentially drive a unit's potential and realized absorptive capacity. The present study contributes to our understanding as to why certain units are able to acquire and assimilate new external knowledge, but are not able to transform and exploit it successfully. Overall, our research indicates that organizational mechanisms associated with coordination capabilities (i.e. cross-functional interfaces, participation, and job-rotation) primarily enhance potential absorptive capacity while organizational mechanisms associated with socialization capabilities (connectedness and socialization tactics) primarily strengthen realized absorptive capacity. These results reveal that organizational units may differ in their ability to manage levels of potential and realized absorptive capacity, follow different developmental paths, and differ in their ability to create value from their absorptive capacity.

Our findings indicate that organizational mechanisms associated with coordination capabilities enhance a unit's potential absorptive capacity. Participation in decision-making, however, only increases acquisition of new external knowledge; it does not enhance assimilation of newly acquired knowledge. A possible explanation for this result is that participation in decision-making does not necessarily result into collective assimilation efforts, but rather leads to lower-level assimilation of new external knowledge by narrowly focused unit members. Future studies may incorporate different levels of analyses to investigate the unanticipated effect of participation in decision-making on assimilation of new external knowledge. Although cross-functional interfaces, participation in decision-making, and job rotation have relatively little impact, they also enhance a unit's realized absorptive capacity. However, these organizational mechanisms only increase transformation of new external knowledge; they are not related to exploitation. These results suggest that, in contrast to transformation, exploitation requires more stable and densely connected knowledge structures.

Discussion, Limitations, and Conclusion

H3a	Cross-functional interfaces will be positively related to acquisition and assimilation of new external knowledge (i.e. potential absorptive capacity)	Supported
H3b	Cross-functional interfaces will be positively related to transformation and exploitation of new external knowledge (i.e. realized absorptive capacity)	Supported for transformation; Not supported for exploitation
H4a	Participation in decision-making will be positively related to acquisition and assimilation of new external knowledge (i.e. potential absorptive capacity)	Supported for acquisition; Not supported for assimilation
H4b	Participation in decision-making will be negatively related to transformation and exploitation of new external knowledge (i.e. realized absorptive capacity)	Not supported
H5a	Job-rotation will be positively related to acquisition and assimilation of new external knowledge (i.e. potential absorptive capacity)	Supported
H5b	Job-rotation will be positively related to transformation and exploitation of new external knowledge (i.e. realized absorptive capacity)	Supported for transformation; Not supported for exploitation

Table 22: Main findings regarding mechanisms associated with coordination capabilities

The temporal nature of cross-functional interfaces and job-rotation indeed fosters acquisition, assimilation, and transformation of new external knowledge, but may be insufficient to embed new external knowledge into systems and structures (Matusik & Hill, 1998). Moreover, results indicate that participation does not negatively influence transformation as predicted. Rather, participation in

decision-making positively influences transformation through initiating new ideas, insights, and opportunities.

Organizational mechanisms associated with systems capabilities provide somewhat surprising results. Firstly, although formalization contributes to a unit's realized absorptive capacity as we predicted, it does not decrease a unit's potential absorptive capacity. One main reason could be that acquisition and assimilation may be formalized to some extent. Well-designed rules and procedures capture prior experiences that may enable employees to search for, and assimilate, new external knowledge (Adler & Borys, 1996). Secondly, our study confirms that routinization negatively influences a unit's potential absorptive capacity. However, contrary to our prediction, it also shows that routinization negatively influences transformation underlying a unit's realized absorptive capacity. Although it has been suggested that routinization enhances efficient integration of existing knowledge (cf. Grant, 1996; Gersick & Hackman, 1990), our study reveals that it impedes the flexible incorporation of newly acquired *and* existing knowledge (Volberda, 1996). These two contradicting results regarding systems capabilities highlight the benefits of codifying established behavior over holding it tacit (Zollo & Winter, 2002). In contrast to making established behavior tacit through routinization, codification efforts through formalization enhance a unit's ability to transform and exploit new external knowledge, and to initiate recombinations necessary for developing new competences and capabilities (Galunic & Rodan, 1998; Zollo & Winter, 2002). Routinization seems to separate knowledge, to constrain joint learning, and to restrict the creation of new knowledge by imposing existing knowledge (Dougherty, 1992).

H6a	Formalization will be negatively related to acquisition and assimilation of new external knowledge (i.e. potential absorptive capacity)	Not supported
H6b	Formalization will be positively related to transformation and exploitation of new external knowledge (i.e. realized absorptive capacity)	Supported
H7a	Routinization will be negatively related to acquisition and assimilation of new external knowledge (i.e. potential absorptive capacity)	Supported
H7b	Routinization will be positively related to transformation and exploitation of new external knowledge (i.e. realized absorptive capacity)	Not supported

Table 23: Main findings regarding mechanisms associated with systems capabilities

Our findings reveal the relative importance of organizational mechanisms associated with socialization capabilities in enhancing realized absorptive capacity. Interestingly, we also found a relatively strong and positive effect of connectedness on potential absorptive capacity, or in particular, the assimilation of new external knowledge. To some degree this pattern bears similarities with recent studies that suggest that low connectedness increases the overall access to diverse knowledge sources, yet may not be sufficient in supporting a regular and reliable flow of knowledge (e.g. Hansen, 1999). A dense network *within units* may motivate employees to be of assistance to each other, and allow two-way interaction that helps the interpretation and understanding of new external knowledge (Cohen & Levinthal, 1990; Morrison, 2002). Our study contributes to current literature by suggesting that in addition to establishing ties with external sources of new knowledge (Hansen, 1999; Tsai, 2001), units require dense networks of ties *within units* to assimilate, transform, and exploit new external knowledge.

H8a	Connectedness will be negatively related to acquisition and assimilation of new external knowledge (i.e. potential absorptive capacity)	Not supported
H8b	Connectedness will be positively related to transformation and exploitation of new external knowledge (i.e. realized absorptive capacity)	Supported
H9a	Socialization tactics will be negatively related to acquisition and assimilation of new external knowledge (i.e. potential absorptive capacity)	Not supported
H9b	Socialization tactics will be positively related to transformation and exploitation of new external knowledge (i.e. realized absorptive capacity)	Supported

Table 24: Main findings regarding mechanisms associated with socialization capabilities

The present study advances our understanding of combinative capabilities through conceptually identifying and empirically examining common features of coordination, systems, and socialization capabilities. Although effective combinative capabilities for absorbing new external knowledge exhibit common features, it does not imply that a particular type of combinative capability is identical across units (Eisenhardt & Martin, 2000). Our findings reveal, for instance, that cross-functional interfaces, such as liaison devices and cross-functional teams, positively influence acquisition and assimilation of new external knowledge. However, the composition of a cross-functional team or location of liaison devices may be idiosyncratic to units. Moreover, formalization strongly increases the level of a unit's realized absorptive capacity. However, units may use various rules and procedures that differ in design and content, thereby executing formalization differently and developing an idiosyncratic systems capability. Thus, effective coordination, systems, and socialization capabilities may differ in details as long as important commonalities as identified and examined in our study are present (Eisenhardt & Martin, 2000: 1110).

Absorptive capacity: innovative outcomes

In addition to examining organizational antecedents of potential and realized absorptive capacity, this PhD research has also investigated innovative outcomes of both components of absorptive capacity. As expected, realized absorptive capacity has an important role in converting new external knowledge into new products, services, and processes. Zahra and George (2002), for instance, argued that transformation and exploitation processes underlying a unit's realized absorptive capacity contributes to the effectiveness through product and process innovations. Hence, they posited that organizational units (or firms) with a well-developed realized absorptive capacity are more likely to achieve a competitive advantage through innovation and product development (Zahra & George, 2002: 196). Our study provides empirical evidence for the importance of a unit's transformation and exploitation processes (i.e. realized absorptive capacity) to exploitative innovative outcomes. Organizations units that increase their realized absorptive capacity are able to enhance their level of exploitative innovations. Interestingly, we found however that realized absorptive capacity was positively related to exploitative innovations (hypothesis 10a), but only moderately to exploratory innovations (hypothesis 10b)¹⁵. Accordingly, although previous research has argued that transformation and exploitation underlying a unit's realized absorptive capacity contribute to its innovativeness, our study reveals their differential effects on incremental and more radical innovation types.

¹⁵ In fact, the coefficient for realized absorptive capacity was positive and moderately significant ($p < .10$). Accordingly, transformation and exploitation underlying a unit's realized absorptive capacity marginally influence a unit's ability to pursue exploratory innovations.

H10a	Realized absorptive capacity (i.e. transformation and exploitation of new external knowledge) will be positively related to exploitative innovation	Supported
H10b	Realized absorptive capacity (i.e. transformation and exploitation of new external knowledge) will be positively related to exploratory innovation	Moderately supported
H11a	Potential absorptive capacity (i.e. acquisition and assimilation of new external knowledge) will negatively moderate the relationship between realized absorptive capacity (i.e. transformation and exploitation of new external knowledge) and exploitative innovation	Not supported
H11b	Potential absorptive capacity (i.e. acquisition and assimilation of new external knowledge) will positively moderate the relationship between realized absorptive capacity (i.e. transformation and exploitation of new external knowledge) and exploratory innovation	Supported

Table 25: Main findings regarding absorptive capacity and innovative outcomes

The moderating effects of a unit's potential absorptive capacity provide interesting insights into the complex relationships between a unit's absorptive capacity and exploratory and exploitative innovations. As shown in chapter four, a unit's potential absorptive capacity does not negatively moderate the relationship between realized absorptive capacity and a unit's exploitative innovations. However, as expected, the acquisition and assimilation of new external knowledge (i.e. potential absorptive capacity) contributes to a unit's ability to pursue exploratory innovations. Although the independent effect of realized absorptive capacity on exploratory innovations is only moderately significant, organizational units that develop their potential absorptive capacity as well as their realized absorptive capacity increase their exploratory innovations. In other words, our results indicate that realized absorptive capacity is mainly associated with exploitative innovations, however, organizational units with higher levels of potential absorptive capacity *and* realized absorptive capacity increase their exploratory innovations. Although previous research has argued that

Discussion, Limitations, and Conclusion

transformation and combination of existing knowledge contribute to more radical innovations, our study indicates that the acquisition and assimilation of new external knowledge become critical. As Henderson and Clark (1990: 18) argued, more radical innovations place a premium on the assimilation of new external knowledge. Organizational units that need to pursue exploratory innovations, therefore, require increasing the levels of both potential and realized absorptive capacity. Organizational units, on the other hand, that focus on pursuing exploitative innovation are better off by developing their transformation and exploitation processes underlying their realized absorptive capacity.

Our findings regarding the relationships between organizational antecedents, potential and realized absorptive capacity, and exploratory and exploitative innovations have interesting implications for research on ambidextrous organizations. Benner and Tushman (2003) and O'Reilly and Tushman (2004), for instance, argue that ambidextrous organizations consist of exploratory and exploitative organizational units which are characterized by consistent organizational arrangements. They posit that while exploratory units are small and decentralized with loose cultures and processes, exploitative units are larger and more centralized with strong cultures and processes. Although our results confirm that effective ambidextrous organizations separate exploratory and exploitative innovations in different organizational units, they also suggest that the development of exploratory innovations in organizational units requires a more complex pattern of organizational arrangements. Since more exploratory units need to develop both their potential and realized absorptive capacity, they not only need to implement coordination capabilities to develop potential absorptive capacity, but also need to implement systems and socialization capabilities to develop their realized absorptive capacity. Accordingly, our study indicates that organizational mechanisms underlying the development of exploratory innovations consist of a more complex combination than previously mentioned in the literature (e.g. Benner & Tushman, 2003; O'Reilly & Tushman, 2004). Although effective ambidextrous organizations separate innovative outcomes in different organizational units, our study reveals that exploratory units still need to combine - possible contradictory - organizational mechanisms to increase their levels of potential and realized absorptive capacity, and subsequently, their exploratory innovations.

Managerial Implications

This PhD research informs practitioners on important issues regarding managing exploratory and exploitative innovations in their organization. Our research reveals, for instance, that organizations should strive for balancing and synchronizing exploratory and exploitative innovation. Compared to organizations that focus on either exploitative innovations or exploratory innovations, ambidextrous organizations obtain higher levels of financial performance in terms of profitability and return on investment. Accordingly, such organizations simultaneously undertake improvements to existing products, services, and processes for existing customers and markets and develop new products, services, and processes for emerging customers and markets. Senior management's challenge is to build a single organization that consists of multiple exploratory and exploitative units that are inconsistent with each other (Tushman & O'Reilly, 1996; Tushman & Smith, 2002). Managers in ambidextrous organizations, therefore, are confronted with strategic role conflicts: they face "inconsistent behavioural expectations based on the need to efficiently deploy existing competencies and the need to experiment with new ones" (Floyd & Lane, 2000: 154). Accordingly, an important task for senior management teams is the establishment of strategic integration among loosely coupled exploratory and exploitative organizational units. Tushman and O'Reilly (1996) and Tushman and Smith (2002: 401-402) argued that ambidextrous senior teams can support internally contradictory structures through clarity and consistency of vision, heterogeneity in expertise and competencies, and team-based rewards. In a similar vein, Volberda, Baden-Fuller, and Van den Bosch (2001: 167) argued that the role of top management is to create a strategic context for nurturing and selecting promising renewal initiatives by ensuring the maximum incentives. Front-line managers, on the other hand, initiate lower-level initiatives and judge the feasibility of these new initiatives. They act as an arbiter for new ideas or proposals for exploratory or exploitative innovations in their organizational unit, while top management in ambidextrous organizations create the overall identity and context for multiple contradictory organizational units.

Organizational units that focus on pursuing exploitative innovations need to increase their transformation and exploitation processes underlying realized absorptive capacity through developing systems and socialization capabilities. Accordingly, such organizational units may increase the connectedness among

Discussion, Limitations, and Conclusion

their employees and implement socialization tactics to structure shared socialization experiences. In addition, our study indicates that these organizational units may establish rules and procedures to increase the efficiency of knowledge exchange among employees and the conversion of knowledge into new products, services, and processes. Conversely, our study also reveals that organizational units that pursue exploratory innovations need to increase both their levels of potential and realized absorptive capacity. In this way, they need to manage a complex configuration of organizational mechanisms as common features of coordination, systems, and socialization capabilities. Although organizational mechanisms associated with coordination capabilities are beneficial to a unit's potential absorptive capacity, organizational mechanisms associated with systems and socialization capabilities are mainly beneficial to a unit's realized absorptive capacity. Accordingly, our study indicates that managing exploratory innovations in organizational units requires a complex configuration of different types of combinative capabilities. Future studies may explore and uncover how organizational units implement various potentially conflicting combinative capabilities to successfully develop exploratory innovations.

In addition to utilizing different organizational mechanisms and enhancing a unit's potential and realized absorptive capacity and subsequent innovative outcomes, organizational unit managers may use different leadership styles. Based on the distinction between transactional and transformational leadership styles (Bass, 1985), Vera and Crossan (2004) made clear that both leadership styles provide different opportunities for organizational learning. Whereas transformational leadership emphasizes experimentation, risk taking, punctuated change, and multiple alternatives, transactional leadership is aimed at incremental change, efficiency, and continuity (Vera & Crossan, 2004: 230). Since this PhD study indicates that exploratory and exploitative organizational units differ in the same terms, organizational unit managers of exploitative units are expected to behave transactional while organizational unit managers of exploratory units are expected to behave transformational. Accordingly, our study suggests that ambidextrous organizations may implement and utilize different profiles for unit managers of exploratory and exploitative units.

Limitations

Several limitations of this study merit discussion. First, our data were self-reported assessments of executive directors of branches and organizational unit managers in these branches. Although we took several steps both in the design and testing phases to limit concerns regarding single-informant data, the issues of key informant bias and common method bias cannot be totally ruled out. However, a strong interrater agreement and interrater reliability, together with the confidentiality that was assured for respondents reduced our concerns that respondents artificially inflated or disguised their responses. Additionally, Harman's one-factor analysis provided evidence against the presence of one common factor. For instance, common method bias would also have produced consistent effects of the same variables on both components of absorptive capacity. Yet we found differential effects of several organizational mechanisms on potential and realized absorptive capacity. Moreover, potential and realized absorptive capacity exhibited different implications for a unit's exploratory and exploitative innovations. Second, although the results presented here confirm the majority of the hypotheses, the study is to some degree exploratory. New scales were developed for inherently difficult to measure constructs such as the dimensions of absorptive capacity as well as exploratory and exploitative innovations. Although we conducted additional analyses to assess the validity of our measures, it would be useful to further enhance these measurements and develop more elaborate scales. Future studies may also try to measure dimensions of absorptive capacity as well as exploratory and exploitative innovation using objective measures and relate these to our measures for the study variables. Third, our empirical study included performance data up to one year after the measurement of exploratory and exploitative innovations. Future studies may benefit from gathering performance data that span more than one year. Moreover, it would enable analyzing performance implications at different points in time to contrast the effects of exploratory and exploitative innovations. Fourth, our survey research was conducted at multiple organizational units within branches of a large financial services firm. Such a focus helped to account for corporate-, industry- and country-specific differences that might have otherwise masked significant effects. Empirical studies in a wider variety of organizations within different industries are necessary to further generalize the findings. Fifth, the data employed in this study were cross-sectional. Although our results are consistent with the

Discussion, Limitations, and Conclusion

theoretical predictions, further longitudinal research should empirically establish the causal claim of our model.

Future Research Directions

Our study provides various pathways for future research. The future research streams can be related to the inclusion of additional variables, to the usage of complementary measures, to the examination of additional ways to cope with paradoxes, to the inclusion of moderating and non-linear effects, and to the investigation of the influence of interdependencies among organizational units within organizations.

Firm ambidexterity and financial performance

Regarding the link between organizational ambidexterity and financial performance, future studies may also examine other dimensions of a firm's performance, such as sales growth, and market share. In this way, scholars as well as practitioners are provided with further insights how organizational ambidexterity influence important outcomes. Firms may, for instance, have different strategic priorities and may not always pursue maximum financial performance, but rather may aim at increasing their market share or customer satisfaction. In a similar vein, future research may use other measures underlying a firm's ambidexterity. Whereas He and Wong (2004) used explorative and exploitative innovation strategies, and Gibson and Birkinshaw (2004) used adaptability and alignment, this PhD research has focused on exploratory and exploitative innovations as underlying a firm's ambidexterity. Other studies may include other distinctions, such as revolutionary and evolutionary change (Tushman & O'Reilly, 1996), responsiveness and efficiency (Hanssen-Bauer & Snow, 1996), or change and preservation (Volberda, 1996; 1998).

Future studies may also aim at investigating environmental contingencies. Although our research has indicated that organizational ambidexterity is positively related to firm performance, environmental characteristics such as dynamism, uncertainty, and competitiveness may impact the relationship between organizational ambidexterity and firm performance. Moreover, a promising extension of this PhD research would be to more systematically examine how environmental diversity impacts the results found. Weick (1982), for instance, indicated that loosely-coupled systems may be beneficial for ambidextrous

organizations when confronted with a diverse and segmented environment. Accordingly, future research may include environmental complexity and heterogeneity in terms of inputs and demands (*cf.* Thompson, 1967; Schilling & Steensma, 2001) because it may strengthen the moderating effect of separating exploratory and exploitative innovations in different organizational units. In other words, separation of exploratory and exploitative innovations in organizational units may be particularly beneficial to ambidextrous organizations when they compete in dynamically competitive environments.

As discussed in chapter two, firms have different ways to deal with the paradoxical nature of pursuing exploration and exploitation. Although this study has examined the tension between combination and separation of both types of innovations in organizational units, firms may also pursue other options. For instance, organizations may choose to outsource one side of the paradox and may focus on either exploration or exploitation (Baden-Fuller & Volberda, 1997). In addition, ambidextrous organizations may alternate between exploration and exploitation over time. Duncan (1976), for instance, argued that organizations manage the innovation process, *i.e.* the initiation and implementation of innovations, through alternating between organic and mechanistic structures. Future research may contrast various ways of dealing with paradoxical tensions for exploration and exploitation and uncovering whether certain options are more viable than others.

Another issue that future research may address is the role of interdependencies among organizational units. Galbraith (1973) and Weick (1976; 1982) have argued that the more tightly integrated or coupled an organization system needs to be, the greater is the need for lateral relations among those managing the organization's subunits. The effective management of such lateral relations requires integrators to know, have trusting relationships with, and facilitate the interaction between these subunits managers (Galbraith, 1973; Lawrence & Lorsch, 1967). Alternatively, the greater the need for integration because of mutual task dependence or reciprocal interdependency (*e.g.* Thompson, 1967; Walton & Dutton, 1969), ambidextrous organizations may benefit from developing organizational units that pursue both types of innovations simultaneously rather than creating exploratory and exploitative organizational units. Accordingly, future research may examine the impact of interdependency among organizational units (*e.g.* Doz *et al.*, 1997; Lawrence & Lorsch, 1967; Scott, 1992; Walton & Dutton, 1969). For instance, when the interdependency among organizational units is high, *i.e.* suggesting the

Discussion, Limitations, and Conclusion

need for integration, future research may find that combining exploratory and exploitative innovations units may be necessary to counter difficulties with the strategic integration of contradictory exploratory and exploitative units.

Another stream of future research may examine the role of top-, middle-, and lower-level management in enhancing organizational ambidexterity. Our study shows that ambidextrous organizations separating exploratory and exploitative innovations in organizational units obtain superior performance. Management at multiple levels within ambidextrous firms therefore need to support horizontal integration of seemingly different exploratory and exploitative organizational units. O'Reilly and Tushman (2004), for instance, suggested that senior-team integration, articulation of a compelling vision and values and common senior-team rewards are crucial in realizing ambidextrous designs. In addition, Floyd and Lane (2000) proposed that several managerial roles at top-level, middle-level, and operating-level are linked to exploration and exploitation underlying strategic renewal of firms. Future research may examine what managerial roles at multiple levels in ambidextrous organizations support successful horizontal integration of exploratory and exploitative units (e.g. Volberda et al., 2001).

Absorptive capacity: organizational antecedents and consequences

Regarding absorptive capacity, future research may incorporate additional organizational antecedents of absorptive capacity such as organizational form (Van den Bosch et al., 1999) and incentive systems. In addition, Kim (1998) indicated the importance of intentionally creating crises in organizations to increase a firm's absorptive capacity. Empirical studies, therefore, may investigate the role of additional organizational antecedents. Future studies may also incorporate multiple levels of analysis and examine individual-level as well as organizational-level variables. Furthermore, investigating combined or moderating effects of organizational antecedents (Siggelkow, 2002) would further enhance our understanding of how organizational units manage levels of potential and realized absorptive capacity. Particular combinations of organizational mechanisms, for instance, may even enhance both a unit's potential and realized absorptive capacity. Accordingly, future research may investigate how such units combine contradictory elements and increase both their levels of potential and realized absorptive capacities. As shown in our research, the interaction between potential and realized absorptive capacity are especially useful for units that need to increase exploratory innovations.

To better understand the effectiveness of exploratory and exploitative innovations, future studies may investigate environmental contingencies. For instance, we may expect that organizational units operating in more dynamic environments need to increase exploratory innovations to increase their effectiveness (Sidhu, Volberda, & Commandeur, 2004). Conversely, organizational units operating in more stable environments may focus on improvements in efficiency and lowering costs to be effective. It would be useful to include various consequences of a unit's exploratory and exploitative innovations as well as environmental moderators such as competitiveness and market growth. Examining various consequences and moderating effects would enhance our understanding of how certain (relative) levels of exploratory and exploitative innovations may contribute to achieving and sustaining competitive advantages at the unit-level of analysis. Future studies may also address the role of knowledge attributes in considering the effectiveness of organizational antecedents and potential and realized absorptive capacity. Subramaniam and Venkatraman (2001), for instance, found that a higher degree of tacitness of newly acquired knowledge requires richer information-processing mechanisms such as cross-functional teams, higher frequencies of communication, and more experienced members. Accordingly, we would expect that knowledge attributes, such as knowledge tacitness and complexity, moderate the relationship between organizational antecedents and potential and realized absorptive capacity. In addition, future research may aim at examining the newness of new external knowledge to the easiness by which new external knowledge is assimilated and exploitation. The more distant a particular stock of knowledge to existing knowledge, the more difficult its subsequent absorption.

Conclusion

In conclusion, studying performance implications of organizational ambidexterity and the interrelationship between organizational antecedents, potential and realized absorptive capacity, and innovative outcomes in terms of exploratory and exploitative innovations offers intriguing insights for both researchers and practitioners. We acknowledge that organizational ambidexterity and absorptive capacity are multifaceted and multilevel constructs and provide new insights how ambidextrous organizations may develop important sources of sustainable competitive advantages.

REFERENCES

- Abernathy, W. J., & Clark, K.B. 1985. Innovation: Mapping the winds of creative destruction. *Research Policy*, 14: 3-22.
- Adler, P.S., & Borys, B. 1996. Two Types of Bureaucracy: Enabling and Coercive. *Administrative Science Quarterly*, 41: 61-89
- Adler, P.S., Goldoftas, B., & Levine, D.I. 1999. Flexibility versus Efficiency? A Case Study of Model Changeovers in the Toyota Product System. *Organization Science*, 10: 43-68
- Adler, P.S., & Kwon, S. 2002. Social Capital: Prospects for a New Concept. *Academy of Management Review*, 27: 17-40
- Ahuja, G., & Lampert, C.M. 2001. Entrepreneurship in the Large Corporation: a Longitudinal Study of how Established Firms create Breakthrough Inventions. *Strategic Management Journal*, 22: 521- 543
- Aiken, L.S., & West, S.G. 1991. *Multiple regression: Testing and interpreting interactions*. Sage: Newbury Park, CA
- Aldrich, H., & Herker, D. 1977. Boundary Spanning Roles and Organization Structure. *Academy of Management Review*, 2: 217-230
- Allen, T. 1984 . *Managing the Flow of Technology*. MIT Press, Cambridge, MA
- Allison, P.D. 1978. Measures of Inequality. *American Sociological Review*, 43: 865-80

- Anderson, P., & Tushman, M.L. 1990. Technological discontinuities and dominant designs: A cyclical model of technological change. *Administrative Science Quarterly*, 35: 604-633.
- Argote, L. 1999. *Organizational Learning: Creating, Retaining, and Transferring Knowledge*. Kluwer Academic Publishers: Boston, MA.
- Argyris, C. 1977. Double loop Learning in Organizations. *Harvard Business Review*, September/October: 115-125
- Argyris, C., & Schön, D. 1978. *Organizational Learning: A Theory of Action Perspective*. Addison-Wesley, Reading: MA
- Argyris, C., & Schön, D. 1996. *Organizational Learning II: Theory, Methods, and Practics*. Addison-Wesley, Reading: MA
- Ashforth, B.E., & Saks, A.M. 1996. Socialization Tactics: Longitudinal Effects on Newcomer Adjustments. *Academy of Management Journal*, 39: 149-178
- Atuahene-Gima, K. 2003. The Effects of Centrifugal and Centripetal Forces on Products Development Speed and Quality: How does Problem Solving Matter? *Academy of Management Journal*, 46: 359-373
- Autio, E., Sapienza, H.J., & Almeida, J.G. 2000. Effects of Age at Entry, Knowledge Intensity, and Imitability on International Growth. *Academy of Management Journal*, 43: 909-924
- Baden-Fuller, Ch. & Volberda, H.W. 1997. Strategic Renewal in Large Complex Organizations: A Competence Based View. In: Heene, A. & Sanchez, R. (eds.). *Competence-Based Strategic Management*. Wiley & Sons, Chichester, pp. 89-110
- Bahrami, H., & Evans, S. 1987. Stratocracy in High Technology Firms. *California Management Review*, 30: 51-66
- Baron, R.M., & Kenny, D.A. 1986. The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations. *Journal of Personality and Social Psychology*, 51: 1171-1182
- Bass, B. 1985. *Leadership and Performance beyond Expectations*. The Free Press: New York, NY
- Bateson, G. 1972. *Steps to an Ecology of Mind*. Ballentine Books, New York
- Benner, M.J. & Tushman, M.L. 2003. Exploitation, Exploration, and Process Management: The Productivity Dilemma Revisited. *Academy of Management Review*, 28: 238-256
- Bettis, R.A., & Hitt, M.A. 1995. The new competitive landscape. *Strategic Management Journal*, 16: 7-19

References

- Birkinshaw, J., & C. Gibson. 2004. Building Ambidexterity into an Organization. *Sloan Management Review*, 45: 47-55
- Birkinshaw, J., Hood, N., & Jonsson, S. 1998. Building Firm-specific Advantages in Multinational Corporations: The Role of Subsidiary Initiative. *Strategic Management Journal*, 19: 221-241
- Bobko, P. 1985. Removing Assumptions of Bipolarity: Towards Variation and Circularity. *Academy of Management Review*, 10: 99-108.
- Bradach, J.L. 1997. Using the Plural Form in the Management of Restaurant Chains. *Administrative Science Quarterly*, 42: 276-303
- Brown, J.S., & Duguid, P. 1991. Organizational learning and communities-of-practice: Toward a Unified view of Working, Learning, and Innovation. *Organization Science*, 2: 40-57
- Brown, S.L., & Eisenhardt, K.M. 1997. The art of Continuous Change: Linking Complexity Theory and Time-paced Evolution in Relentlessly Shifting Organizations. *Administrative Science Quarterly*, 42: 1-34
- Brown, S.L., & Eisenhardt, K.M. 1998. *Competing on the edge - Strategy as Structured Chaos*. Harvard Business School Press: Boston, MA
- Bryman, A. 1989. *Research methods and organization studies*. Unwin Hyman: London, UK
- Burgelman, R.A. 1984. Designs for Corporate Entrepreneurship in Established Firms. *California Management Review*, 26: 154-166
- Burgelman, R.A. 1985. Managing the New Venture Division: Research Findings and Implications for Strategic Management. *Strategic Management Journal*, 6: 39-54
- Burgelman, R.A. 1991. Intraorganizational ecology of strategy making and organizational adaptation: Theory and field research. *Organization Science*, 2: 239-262
- Burgelman, R.A. 1996. A Process Model of Strategic Business Exit: Implications for an Evolutionary Perspective on Strategy, *Strategic Management Journal*, 17: Special Issue: Evolutionary Perspectives on Strategy, 193-214
- Burgelman, R.A. 2002. Strategy as Vector and the Inertia of Co-evolutionary Lock-in. *Administrative Science Quarterly*, 47: 325-357
- Burns, T., & Stalker, G. 1961. *The Management of Innovation*. Tavistock: London
- Cameron, K.S. 1986. Effectiveness as Paradox: Consensus and Conflict in conceptions of Organizational Effectiveness. *Management Science*, 32: 539-553

- Camerer, C., & Vepsäläinen, A. 1988. The Economic Efficiency of Corporate Culture. *Strategic Management Journal*, 9: 115-126
- Campion, M.A., Cheraskin, L., & Stevens, M.J. 1994. Career-related Antecedents and Outcomes of Job Rotation. *Academy of Management Journal*, 37: 1518-1542
- Cangelosi, V.E., & Dill, W.R. 1965. Organizational Learning: Observations Toward a Theory. *Administrative Science Quarterly*, 10: 175-203
- Cardinal, L.B. 2001. Technological Innovation in the Pharmaceutical Industry: The Use of Organizational Control in Managing Research and Development. *Organization Science*, 12: 19-36
- Chao, G.T., O'Leary-Kelly, A.M., Wolf, S., Klein, H.J., & Gardner, P.D. 1994. Organizational Socialization: Its content and Consequences. *Journal of Applied Psychology*, 79: 730-743
- Chen, C. 2004. The Effects of Knowledge Attributes, Alliance Characteristics, and Absorptive Capacity on Knowledge Transfer Performance. *R&D Management*, 34: 311-321
- Child, J. 1984. *Organisations: A Guide to Problems and Practice*. Harper & Row: London, UK
- Cockburn, I.M., & Henderson, R.M. 1998. Absorptive Capacity, Coauthoring Behavior, and the Organization of Research in Drug Discovery. *Journal of Industrial Economics*, 46: 157-82
- Cockburn, I.M., Henderson, R.M., & Stern, S. 2000. Untangling the Origins of Competitive Advantage. *Strategic Management Journal*, 21: 1123-1146
- Cohen, M.D., & Bacdayan, P. 1994. Organizational Routines are Stored as Procedural Memory. *Organization Science*, 5: 554-568
- Cohen, W.M., & Levinthal, D.A. 1989. Innovation and Learning: The Two Faces of R&D. *Economic Journal*, 99: 569-596
- Cohen, W., & Levinthal, D. 1990. Absorptive Capacity: A new Perspective on Learning and Innovation. *Administrative Science Quarterly*, 35: 128-152
- Creswell, J.W. 1994. *Research Design: Qualitative and Quantitative Approaches*. Sage: Thousand Oaks, CA
- Crossan, M.M., Lane, H.W., & White, R.E. 1999. An Organizational Learning Framework: From Intuition to Institution. *Academy of Management Review*, 24: 522-537

References

- Crossan, M.M., Lane, H.W., White, R.E., & Djurfeldt, L. 1995. Organizational learning: Dimensions for a Theory. *The International Journal of Organizational Analysis*, 3: 337-360.
- Cyert, R.M. & March, J.G. 1963. *A Behavioral Theory of the Firm*. Englewood Cliffs, NJ: Prentice-Hall.
- Daft, R.L., & Lengel, R.H. 1986. Organizational Information Requirements, Media Richness and Structural Design. *Management Science*, 32: 554-571
- Daft, R.L., & Macintosh, N.B. 1981. A Tentative Exploration into the Amount and Equivocality of Information Processing in Organizational Work Units. *Administrative Science Quarterly*, 26: 207-224
- Daft, R.L. & Weick, K.E. 1984. Toward a model of Organizations as Interpretation Systems. *Academy of Management Review*, 9: 284-295
- Danneels E. 2002. The Dynamics of Product Innovation and Firm Competences. *Strategic Management Journal*, 23: 1095-1121
- Danneels, E. 2003. Tight-Loose Coupling with Customers: The Enactment of Customer Orientation. *Strategic Management Journal*, 24: 559-76
- D'Aveni. R. 1994. *Hypercompetition: Managing the Dynamics of strategic Maneuvering*. The Free Press, New York
- Deeds, D.L. 2001: The Role of R&D Intensity, Technical Development and Absorptive Capacity in Creating Entrepreneurial Wealth in High Technology Start-ups. *Journal of Engineering and Technology Management*, 18, 29-47
- De Leeuw, A.C.J., & Volberda, H.W. 1996. On the Concept of Flexibility: A Dual Control Perspective. *Omega*, 24: 121-139
- Demsetz, H. 1991. The Theory of the Firm Revisited. In: Williamson, O.E. & Winter, S.G. (eds.). *The Nature of the Firm*. Oxford University Press: New York, pp. 159-178
- Denzin, D. 1978. *The Research Act, A Theoretical Introduction to Sociological Methods*. McGraw-Hill, New York, NY
- Desphandé, R., & Zaltman, G. 1982. Factors affecting the use of Market Research Information: A Path Analysis. *Journal of Marketing Research*, 19: 14-31
- Dewar, R.D., & Dutton, J.E. 1986. The Adoption of Radical and Incremental Innovations: An Empirical Analysis. *Management Science*, 32: 1422-1433.
- Dewar, R.D., Whetten, D.A., & Boje, D. 1980. An Examination of the Reliability and Validity of the Aiken and Hage Scales of Centralization, Formalization, and Task Routiness, *Administrative Science Quarterly*, 25: 120-128

- DiBella, A.J., Nevis, E.C., & Gould, J.M. 1996. Understanding Organizational Learning Capability. *Journal of Management Studies*, 33: 361-379
- Dierickx, I., & Cool, K. 1989. Asset stock Accumulation and Sustainability of Competitive Advantage. *Management Science*, 35: 1504-1511
- Dietz, J., Pugh, S.D., & Wiley, J.W. 2004. Service Climate Effects on Customer Attitudes: An Examination of Boundary Conditions. *Academy of Management Journal*, 47: 81-92
- Dill, W.R. 1958. Environments as an Influence on Managerial Autonomy. *Administrative Science Quarterly*, 2: 409-443
- Dodgson, M. 1993. Organizational learning: A Review of Some Literatures. *Organization Studies*, 14: 375-394
- Dougherty, D. 1992. Interpretive Barriers to Successful Product Innovation in Large Firms. *Organization Science*, 3: 179-202
- Duncan, R.B. 1976. The Ambidextrous organization: Designing Dual Structures for Innovation, in R. Kilman & L. Pondy (eds.) *The Management of Organizational Design*. New York: North Holland: 167-188
- Duncan, R.B., & Weiss, A. 1979: Organizational Learning. Implications for Organizational Design. In: Staw, B. M. (ed.) *Research in Organizational Behavior*, Vol. 1, Greenwich/Conn., pp. 75-123
- Easterby-Smith M. 1997. Disciplines of Organizational Learning: Contributions and Critiques. *Human Relations*, 50: 1085-1113
- Easterby-Smith, M., Crossan, M.M., & Nicolini, D. 2000. Organizational Learning: Debates Past, Present and Future. *Journal of Management Studies*, 37: 783-796
- Edmondson, A., & Moingeon, B. 1998. From Organizational Learning to the Learning Organization. *Management Learning*, 29: 5-20
- Egelhoff, W.G. 1991. Information-Processing Theory and the Multinational Enterprise. *Journal of International Business Studies*, 22: 341-368
- Eisenhardt, K.M. 1989. Building theories from case study research. *Academy of Management Review*, 14: 532-550
- Eisenhardt, K.M. 2000. Paradox, Spirals, Ambivalence: The New Language of Change and Pluralism. *Academy of Management Review*, 25: 703-705
- Eisenhardt, K.M., & Martin, J.A. 2000. Dynamic Capabilities: What are they? *Strategic Management Journal*, 21: 1105-1121

References

- Eisenhardt, Kathleen M., and Behnam N. Tabrizi 1995. Accelerating Adaptive Processes: Product Innovation in the Global Computer Industry. *Administrative Science Quarterly*, 40: 84-110
- Ettlie, J.E., Bridges, W.P., & O'Keefe, R.D. 1984. Organization strategy and structural differences for radical versus incremental innovation. *Management Science*, 30: 682-695
- Feldman, D.C. 1981. The Multiple Socialization of Organization Members. *Academy of Management Review*, 6: 309-318
- Fiol, C.M., & Lyles, M.A. 1985. Organizational Learning. *Academy of Management Review*, 10: 803-813
- Fisher, C.D. 1986. Organizational Socialization: An Integrative Review. *Research in Personnel and Human Resource Management*, 4: 101-145
- Floyd, S.W., & Lane, P.J. 2000. Strategizing Throughout the Organization: Managing Role Conflict in Strategic Renewal. *Academy of Management Review*, 25: 154-177
- Galbraith, J.R., 1973. *Designing Complex Organizations*. Reading: Addison-Wesley
- Galunic, D.C., & Rodan, S. 1998. Resource Recombinations in the Firm: Knowledge Structures and the Potential for Schumpeterian Innovation. *Strategic Management Journal*, 19: 1193-1201
- Gambardella, A. 1992. Competitive Advantages from In-house Scientific Research: The US Pharmaceutical Industry in the 1980s. *Research Policy*, 21: 391-407.
- Gavetti, G., & Levinthal, D. 2000. Looking Forward and Looking Backward: Cognitive and Experiential Search. *Administrative Science Quarterly*, 45: 113-137
- Gersick, C.J.G., & Hackman, J.R. 1990. Habitual Routines in Task-Performing Groups. *Organizational Behavior and Human Decision Processes*, 47: 65-97
- Ghemawat, P., & Ricart I Costa, J. 1993. The organizational tension between static and dynamic efficiency. *Strategic Management Journal*, 14: 59-73.
- Gibson, C.B., & Birkinshaw, J. 2004. The Antecedents, Consequences, and Mediating Role of Organizational Ambidexterity. *Academy of Management Journal*, 47: 209-226
- Gilson, L.L., Mathieu, J.E., Shalley, C.E., & Ruddy, T.M. 2005. Creativity and Standardization: Complementary or Conflicting Drivers of Team Effectiveness? *Academy of Management Journal*, forthcoming

- Grant, E.S., & Bush, A.J. 1996. Salesforce Socialization Tactics: Building Organizational Value Congruence. *Journal of Personal Selling & Sales Management*, 3: 17-32
- Grant, R.M. 1996a. Prospering in Dynamically-competitive Environments: Organizational capability as Knowledge Creation. *Organization Science*, 7: 375-387.
- Grant, R. 1996b. Toward a Knowledge Based Theory of the Firm. *Strategic Management Journal*, 17: 109-122
- Gupta, A.K., & Govindarajan, V. 2000. Knowledge Flows within Multinational Corporations. *Strategic Management Journal*, 21: 473-496
- Hage, J., & Aiken, M. 1967. Program Change and Organizational Properties: A Comparative Analysis. *American Journal of Sociology*, 72: 503-519
- Hage, J., & Aiken, M. 1969. Routine Technology, Social Structure, and Organization Goals. *Administrative Science Quarterly*, 14: 366-376
- Hall, R.H. 1962. Intraorganizational Structure Variation. *Administrative Science Quarterly*, 7: 295-308
- Hamel, G. 1991. Competition for Competence and Inter-partner Learning Within International Strategic Alliances. *Strategic Management Journal*, 12: 83-104
- Hamel, G., & Prahalad, C.K. 1993. Strategy as Stretch and Leverage. *Harvard Business Review* 71:75-84
- Hamel, G., & Prahalad, C.K. 1994. *Competing for the Future*. Harvard Business School Press, Boston, MA.
- Han, J.K., Kim, N., Srivastava, R.K. 1998. Market Orientation and organizational performance: Is innovation a missing link? *Journal of Marketing*, 62: 30-46
- Hansen, G.S., & Wernerfelt, B. 1989. Determinants of Firm Performance: The Relative Importance of Economic and Organizational Factors. *Strategic Management Journal*, 10: 399-411
- Hansen, M.T. 1999. The Search-Transfer Problem: The Role of Weak Ties in Sharing Knowledge across Organization Subunits. *Administrative Science Quarterly*, 44: 82-111
- Hanssen-Bauer, J., & Snow, C.C. 1996. Responding to hypercompetition: The Structure and Processes of a Regional Learning Network Organization. *Organization Science*, 7: 413-427.
- He, Z.L. & Wong, P.K. 2004. Exploration vs. Exploitation: An Empirical Test of the Ambidexterity Hypothesis. *Organization Science*, 15: 481-494

References

- Hedberg, B. 1981. How Organizations Learn and Unlearn. In: Nystrom, P.C., & Starbuck, W.H. (eds.), *Handbook of Organizational Design*. Cambridge University Press: London, pp: 3-27
- Hedberg, B. L. T., Nystrom, P. C., & Starbuck, W. H. 1976. Camping on Seesaws: Prescriptions for a Self-designing Organization. *Administrative Science Quarterly*, 21: 41-65
- Helfat, C. E. 1994. Evolutionary Trajectories in Petroleum Firm R&D. *Management Science*, 40: 1720-1747
- Henderson, R. M. & Clark, K. B. 1990. Architectural innovation: The reconfiguration of existing product technologies and the failure of established firms. *Administrative Science Quarterly*, 35: 9-30
- Henderson, R.M., & Cockburn, I. 1994. Measuring Competence? Exploring Firm Effects in Pharmaceutical Research. *Strategic Management Journal*, 15: 63-84
- Hill, C.W.L., & Rothaermel, F.T. 2003. The Performance of Incumbent Firms in the Face of Radical Technological Innovation. *Academy of Management Review*, 28: 257-274
- Holmqvist, M. 2003. A Dynamic Model of Intra- and Interorganizational Learning. *Organization Studies*, 24: 95-123
- Holmqvist, M. 2004. Experiential Learning Processes of Exploitation and Exploration. An Empirical Study of Product Development. *Organization Science*, 15: 70-81
- Huber, G.P. 1991. Organizational Learning: The Contributing Processes and the Literatures. *Organization Science*, 2: 88-115
- Iansiti, M., & Clark, K.B. 1994. Integration and Dynamic Capability: Evidence from Product Development in Automobiles and Mainframe Computers. *Industrial and Corporate Change*, 3: 557-605
- Imai, K, Nonaka, I., & Takeuchi, H. 1985. Managing the new product development process: how Japanese companies learn and unlearn. In: Clark, K.B., Hayes, R.H., & Lorenz, C. (eds.). *The Uneasy Alliance: Managing the Productivity-technology Dilemma*. Harvard Business School Press, Boston, MA, pp. 533-561
- Inkpen, AC. 2000. Learning through joint ventures: A framework of knowledge acquisition. *Journal of Management Studies*, 37: 1019-1043
- Inkpen, A.C., & Crossan, M.M. 1995. Believing is Seeing: Joint Ventures and Organization Learning. *Journal of Management Studies*, 32: 595-618

- James, L.R., Demaree, R.G., & Wolf G. 1993. R_{wg} : An Assessment of Within-Group Interrater Agreement. *Journal of Applied Psychology*, 78: 306-309
- Jansen, J.J.P., Van den Bosch, F.A.J., & Volberda, H.W. 2003. Strategische vernieuwing van ondernemingen: het managen van innovatie en efficiency. *Management & Organisatie*, 57: 25-36 (in Dutch)
- Jansen, J.J.P., Van den Bosch, F.A.J., & Volberda, H.W. 2005. Managing Potential and Realized Absorptive Capacity: How do Organizational Antecedents Matter. *Academy of Management Journal*, 48: forthcoming
- Janis, I.L. 1982. *Groupthink*. Boston: Houghton Mifflin
- Jaworski, B.J., & Kohli, A.K. 1993. Market Orientation: Antecedents and Consequences. *Journal of Marketing*, 57: 53-70
- Jick, T.D. 1979. Mixing qualitative and Quantitative Methods: Triangulation in Action. *Administrative Science Quarterly*, 24: 602-611
- Johnston, H.R. 1976. A New Conceptualization of Source of Organizational Climate. *Administrative Science Quarterly*, 21: 95-103
- Jones, A.P., Johnson, L.A., Butler, M.C., & Main, D.S. 1983. Apples and Oranges: An Empirical Comparison of Commonly Used Indices of Interrater Agreement. *Academy of Management Journal*, 26: 507-519
- Jones, G.R. 1986. Socialization tactics, Self Efficacy, and Newcomer Adjustments to Organizations. *Academy of Management Journal*, 29: 262-279
- Kamien, M.I., & Zang, I. 2000. Meet me halfway: Research Joint Ventures and Absorptive Capacity. *International Journal of Industrial Organization*, 18: 995-1012
- Katila, R., & Ahuja, G. 2002. Something Old, Something New: A Longitudinal Study of Search Behaviour and New Product Introduction. *Academy of Management Journal*, 45: 1183-1194
- Kenny, D.A., Kashy, D.A., Bolger, N. 1998. Data Analysis in Social Psychology. In: Gilbert, D., Fiske, S., & Lindzey, G. (eds). *The Handbook of Social Psychology*, Vol. 1: 223-265. Boston: McGraw-Hill
- Khandwalla, P.N. 1977. *Design of Organizations*. New York: Harcourt Brace Jovanovich
- Kim, D.H. 1993. The link between individual and organizational learning. *Sloan Management Review*, 33: 37-50
- Kim, L. 1998. Crisis Construction and Organizational Learning: Capability Building in Catching-up at Hyundai Motor. *Organization Science*, 9: 506-521

References

- Klein, K.J., Tosi, J., Canella, A.A. 1999. Multilevel Theory Building: Benefits, Barriers, and new Developments. *Academy of Management Review*, 24: 243-248
- Klein, K.J., Dansereau, F., Hall, R.J. 1994. Levels issues in theory development, data collection, and analysis. *Academy of Management Review*, 19, 2: 195-229
- Kogut, B., & Zander, U. 1992. Knowledge of the Firm, Combinative Capabilities, and the Replication of Technology. *Organization Science*, 3: 383-397
- Koot, W., Sabelis, I. & Ybema, S. 1996. *Contradictions in Context. Puzzling over Paradoxes in Contemporary Organizations*. VU University Press: Amsterdam
- Kotha, S., & Nair, A. 1995. Strategy and Environment as Determinants of Performance: Evidence from the Japanese Machine Tool Industry. *Strategic Management Journal*, 16: 497-518
- Koza, M. P., & Lewin, A.Y. 1998. The Coevolution of Strategic Alliances. *Organization Science*, 9: 255-264
- Kyriakopoulos, K., & Moorman, C. 2004. Tradeoffs in marketing exploitation and exploration strategies: the overlooked role of market orientation. *International Journal of Research in Marketing*, 21: 219-240
- Lane, P.J., Koka, B., & Pathak, S. 2002. A Thematic Analysis and Critical Assessment of Absorptive Capacity Research. *Paper presented at the Annual Academy of Management Meeting*, Denver, CO
- Lane, P.J., & Lubatkin, M. 1998. Relative Absorptive Capacity and Interorganizational Learning. *Strategic Management Journal*, 19: 461-477
- Lane, P.J., Salk, J.E., & Lyles, A. 2001. IJV Learning and Performance. *Strategic Management Journal*, 22: 1139-1161
- Lant, T.K. & Mezias, S.J. 1992. An Organizational Learning Model of Convergence and Reorientation. *Organization Science*, 3: 47-71
- Lant, T.K., Milliken, F.J., & Batra, B. 1992. The Role of Managerial Learning and Interpretation in Strategic Persistence and Reorientation: An Empirical Exploration. *Strategic Management Journal*, 13: 585-608.
- Lawrence, P., & Lorsch, J. 1967. *Organizations and Environments*. Harvard Business School Press: Boston, MA.
- Leana, C., & Barry, B. 2000. Stability and Change as Simultaneous Experiences in Organizational Life. *Academy of Management Review*, 25: 753-759
- Lee, H; Smith, K.G., & Grimm, C.M. 2003. The Effect of new Product Radicality and Scope on the Extent and Speed of Innovation Diffusion. *Journal of Management*, 29: 753-768

- Lenox, M. & King, A. 2004. Prospects for Developing Absorptive Capacity Through Internal Information Provision. *Strategic Management Journal*, 25: 331-345
- Leonard-Barton, D. A. 1992. Core Capabilities and Core Rigidities: A Paradox in Managing New Product Development. *Strategic Management Journal*, 13: 111-125
- Levinthal, D. 1997. Adaptation on Rugged Landscapes. *Management Science*, 43: 934-950
- Levinthal, D.A., & March, J.G. 1993. The Myopia of Learning. *Strategic Management Journal*, 14 (Winter Special Issue): 95-112.
- Levinthal, D. A. & March, J. G. 1981. A model of adaptive organizational search. *Journal of Economic Behavior and Organization*, 2: 307-333.
- Levitt, B., & March, J.G. 1988. Organizational learning. *Annual Review of Sociology*, 14: 319-340
- Lewin, A.Y., Long, C.P., & Carroll, T.N. 1999. The Coevolution of New Organizational Forms. *Organization Science*, 10: 535-550
- Lewin, A.Y. & H.W. Volberda (2003), Co-evolutionary Dynamics Within and Between Firms: From Evolution to Co-evolution. *Journal of Management Studies*, 40: 2111-2136.
- Lewis, M.W. 2000. Exploring Paradox: Toward a more Comprehensive Guide. *Academy of Management Review*, 25: 760-776
- Liao, J, Welsch, H., & Stoica, M. 2003. Organizational absorptive capacity and responsiveness: an empirical investigation of growth-oriented SMEs. *Entrepreneurship Theory & Practice*, 28: 63-85
- Lin, X., & Germain, R. 2003. Organizational Structure, Context, Customer Orientation, and Performance: Lessons from Chinese State-owned Enterprises. *Strategic Management Journal*, 24: 1131-1151
- Lippman, S., & Rumelt, R. 1982. Uncertain Imitability: An Analysis of Interfirm Differences in Efficiency Under Competition. *Bell Journal of Economics*, 13: 418-438.
- Lyles, M.A., & Salk, J.E. 1996. Knowledge Acquisition from foreign Parents in International Joint-ventures. *Journal of International Business Studies*, 27: 905-927
- Lyles, M.A., & Schwenk, C.R. 1992. Top Management, Strategy and Organizational Knowledge Structures. *Journal of Management Studies*, 29: 155-174

References

- Mahnke, V., Pedersen, T., & Venzin, M. 2005. The Impact of Knowledge Management on MNC Subsidiary Performance: The Role of Absorptive Capacity. *Management International Review*, forthcoming
- Makhija, M.V., & Ganesh, U. 1997. The Relationship between Control and Partner Learning-related Joint Ventures. *Organization Science*, 8: 508-527
- March, J. G. 1981. Footnotes to organizational change. *Administrative Science Quarterly*, 26: 563-577.
- March, J.G. 1991. Exploration and Exploitation in Organizational Learning. *Organization Science*, 2: 71-87.
- March, J.G., & Olsen, J.P. 1975. *Ambiguity and Choice in Organizations*, Universitetsforlaget: Bergen
- March, J.G., Schulz, M., & Zhou, X. 2000. *The Dynamics of Rules*. Stanford University Press: Stanford, CA
- March, J.G., & Simon, H.A. 1958. *Organizations*. John Wiley, New York
- Martin, X., W. Mitchell. 1998. The Influence of local search and Performance Heuristics on new Design Introduction in a New Product Market. *Research Policy*, 26: 753-771
- Matusik, S.F. 2002. An Empirical Investigation of Firm Public and Private Knowledge. *Strategic Management Journal*, 23: 457-467
- Matusik, S.F., & Hill, C.W.L. 1998. The Utilization of Contingent Work, Knowledge Creation, and Competitive Advantage. *Academy of Management Review*, 23: 680-697
- McDonough, E., & Leifer, R. 1983. Using Simultaneous Structures to Cope with Uncertainty. *Academy of Management Journal*, 26: 727-736
- McEvily, S. & Chakravarthy, B. 2002. The Persistence of Knowledge-based Advantage: An Empirical Test for Product Performance and Technological Knowledge. *Strategic Management Journal*, 23: 285-305
- McGrath, R.G. 2001. Exploratory Learning, Innovative Capacity, and Managerial Oversight. *Academy of Management Journal*, 44: 118-131
- Meeus, M.T.H., Oerlemans, L.A.G., & Hage, J.: Patterns of Interactive Learning in a High Tech Region. An Empirical Exploration of an Extended Resource-based model. *Organization Studies*, 22: 145-172
- Mezias, S.S., & Eisner, A.B. 1997. Competition, imitation, and innovation: An Organizational Learning Approach. *Adv. in Strategic Management*, 14: 261-294

- Mezias, S.J., Glynn, M.A. 1993. The three Faces of Corporate Renewal: Institution, Revolution and Evolution. *Strategic Management Journal*, 14: 77-101
- Miles, R.E., & Snow, C.C. 1978. *Organization Strategy, Structure, and Process*. McGraw-Hill: New York
- Miller, D. 1986. Configuration of Strategy and Structure: Towards a Synthesis. *Strategic Management Journal*, 7: 233-249
- Miller, D. 1994. What happens after the Success: The Perils of Excellence. *Journal of Management Studies*, 31: 325-358
- Miller, D. & Friesen, P.H. 1977. Strategy Making in Context: Ten Empirical Archetypes. *Journal of Management Studies*, 14: 255-280.
- Miller, D., & Friesen, P.H. 1978. Archetypes of Strategy Formulation. *Management Science*, 24: 921-933.
- Miller, D., & Friesen, P.H. 1980. Structural Change and Performance: Quantum vs. Piecemeal-incremental Approaches. *Academy of Management Journal*, 25: 867-892.
- Miller, D., & Friesen, P.H. 1982. The Longitudinal Analysis of Organizations: A Methodological Perspective. *Management Science*, 28: 1013-1034
- Miller, D., & Friesen, P.H. 1984. *Organizations: A Quantum View*. Prentice Hall: New York, NY
- Minbaeva D., Pedersen T., Björkman I., Fey C.F., & Park H.J. 2003. MNC knowledge transfer, subsidiary absorptive capacity, and HRM. *Journal of International Business Studies*, 34: 586-599
- Miner, A., & Mezias, S. 1996. Ugly duckling no more: Pasts and futures of organizational learning research. *Organization Science*, 7: 88-99
- Mintzberg, H. 1973. Strategy-making in three modes. *California Management Review*, 16: 44-53.
- Moch, M.K., & Morse, E.V. 1977. Size, Centralization and Organizational Adoption of Innovations. *American Sociological Review*, 42: 716-725
- Mom, T.J.M., Van Den Bosch, F.A.J., & Volberda, H.W. 2002. Exploratie en Exploratie van kennis. *Management en Organisatie*, 56: 23-43 (in Dutch).
- Morrison, E.W. 2002. Newcomers' Relationships: The Role of Social Network Ties during Socialization. *Academy of Management Journal*, 45: 1149-1160
- Mowery, D.C. 1983. The Relationship between Intrafirm and Contractual Forms of Industrial Research in American Manufacturing, 1900-1940. *Explorations in Economic History*, 20: 351-374.

References

- Mowery, D.C., Oxley, J.E., & Silverman, B.S. 1996. Strategic Alliances and Interfirm Knowledge Transfer. *Strategic Management Journal*, 17: 77-91
- Mumford, M.D. 2000. Managing Creative People: Strategies and Tactics for Innovation. *Human Resource Management Review*, 10: 313-351
- Murnighan, J.K, & Conlon, D.E. 1991. The Dynamics of Intense Work Groups: A study of British String Quartets. *Administrative Science Quarterly*, 36: 165-186
- Nahapiet, J., & Ghoshal, S. 1998. Social Capital, Intellectual Capital, and the Organizational Advantage. *Academy of Management Review*, 23: 242-266
- Narver, J.C. & Slater, S.F. 1990. The effect of a Market Orientation on Business Profitability. *Journal of Marketing*, 54: 20-34
- Nelson, R. R. & Winter, S. G. 1982. *An Evolutionary Theory of Economic Change*. Boston: Belknap
- Neter, J., Wasserman, W., & Kutner, M.H. 1990. *Applied Linear Statistical Models*. Irwin: Homewood, IL
- Noe, R.A., & Ford, J.K. 1992. Emerging Issues and New Directions for Training Research. In G.R. Ferris & K.M. Rowland (Eds.), *Research in Personnel and Human Resources Management*, 10: 345-384. JAI Press: Greenwich
- Nonaka, I. 1994. Dynamic Theory of Organizational Knowledge Creation. *Organizational Science*, 5: 14 - 37
- Nonaka, I., & Takeuchi, H. 1995. *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*. Oxford University Press: Oxford
- Nord, W.R., & Tucker, S. 1987. *Implementing Routine and Radical Innovations*. Lexington Books: Lexington, MA.
- O'Reilly, C.A., & Tushman, M. 2004. The Ambidextrous Organization. *Harvard Business Review*, 82: 74-82
- Parkhe, A. 1991. Interfirm Diversity, Organizational Learning, and Longevity in Global Strategic Alliances. *Journal of International Business Studies*, 22: 579-601
- Pawlowski, P. 2001. The Treatment of Organizational Learning in Management Science. In: Dierkes, M., Antal, A.B., Child, J, Nonaka, I. (eds). *Handbook of Organizational Learning and Knowledge*. Oxford University Press, Oxford, pp. 61-88
- Pennings, J.M., & Harianto, F. 1992. The Diffusion of Technological Innovation in the Commercial Banking Industry. *Strategic Management Journal*, 13: 29-46.

- Perrow, C. 1967. A Framework for the Comparative Analysis of Organizations. *American Sociological Review*, 32: 194-208
- Peters, T.J., & Waterman, R.H. 1982. *In Search of Excellence: Lessons from America's Best Run Companies*. Harper and Row: New York, NY
- Pierce, J.L., & Delbecq, A.L. 1977. Organization Structure, Individual Attitudes and Innovation. *Academy of Management Review*, 2: 27-37
- Polanyi, M. 1966. *The Tacit Dimension*. Routledge and Kegan Paul: London, UK
- Prahalad, C. K., & Hamel, G. 1994. *Competing for the Future*, Harvard Business School Press: Boston, MA
- Podsakoff, P.M., MacKenzie, S.B., Lee, J., & Podsakoff, N.P. 2003. Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies. *Journal of Applied Psychology*, 88: 879-903
- Podsakoff, P.M., & Organ, D.W. 1986. Self-reports in Organization Research: Problems and Prospects. *Journal of Management*, 40: 308-338
- Poole, M. S., & Van de Ven, A. H. 1989. Using Paradox to Build Management and Organization Theories. *Academy of Management Review*, 14: 562-578
- Quinn, R.E., & Cameron, K.S, (Eds.) 1988. *Paradox and transformation: Toward a theory of change in organization and management*. Cambridge: Cambridge, MA
- Randall, D.M. 1987. Commitment and the Organization: The Organization Man Revisited. *Academy of Management Review*, 12: 460-471
- Randel, A.E., & Jaussi, K.S. 2003. Functional Background Inentity, Diversity, and Individual Performance in Cross-functional Teams. *Academy of Management Journal*, 46: 763-774
- Reed, R. & deFillippi, R.J. 1990. Causal ambiguity, Barriers to Imitation and Sustainable Competitive Advantage. *Academy of Management Review*, 15: 88-102
- Rindfleisch, A., & Moorman, C. 2001. The Acquisition and Utilization of Information in New Product Alliances: A Strength-of-Ties Perspective. *Journal of Marketing*, 65: 1-18
- Rogers, E. M. 1995. *Diffusion of Innovations*. The Free Press: New York
- Romanelli, E., & Tushman, M. 1994. Organization Transformation as Punctuated Equilibrium. *Academy of Management Journal*, 37: 1141-1166.
- Rothaermel, F.T., & Deeds, D.L. 2004. Exploration and Exploitation Alliances in Biotechnology. *Strategic Management Journal*, 25: 201-221

References

- Rowley, T., Behrens, D., & Krackhardt, D. 2000. Redundant Governance Structures: An Analysis of Structural and Relational Embeddedness in the Steel and Semiconductor Industries. *Strategic Management Journal*, 21: 369-386
- Rosenkopf, L., & Nerkar, A. 2001. Beyond Local Search: Boundary-spanning, Exploration, and Impact in the Optical Disc Industry. *Strategic Management Journal*, 22: 287-306
- Sackmann, S.A. 1992. Culture and subcultures: An analysis of Organizational Knowledge. *Administrative Science Quarterly*, 37: 140-161
- Sadler-Smith, E., Spicer, D. P. & Chaston, I. 2001. Learning orientations and growth in smaller firms. *Long Range Planning*, 34: 139-158
- Sanchez, R., & Heene, A. 1997. *Strategic Learning and Knowledge Management*. Jon Wiley & Sons: New York
- Sanchez, R., Heene, A., & Thomas, H. 1996. *Dynamics of Competence-based Competition*. Jon Wiley & Sons: New York
- Schein, E.H. 1993. On Dialogue, Culture, and Organizational Learning. *Organizational Dynamics*, 22: 40-51
- Schein, E.H. 1985. *Organizational Culture and Leadership*. Jossey-Bass: San Francisco
- Schilling, M.A., & Steensma, H.K. 2001. The Use of Modular Organizational Forms: An Industry-level Analysis. *Academy of Management Journal*, 44: 1149-1168
- Schuler, R.S., & Jackson S.E. 1987. Linking Competitive Strategies with Human Resource Management Practices. *Academy of Management Executive*, 1: 207-219.
- Scott, R.W. 1992. *Organizations: Rational, Natural, and Open Systems*. Prentice Hall: Englewood Cliffs, NJ
- Senge, P.M. 1990. *The fifth discipline: Mastering the Five Practices of the Learning Organisation*. Doubleday: New York, NY
- Sethi, R., Smith, D.C., & Park, C.W. 2001. Cross-Functional Product Development Teams, Creativity, and the Innovativeness of New Consumer Products. *Journal of Marketing Research*, 38: 73-85
- Sheremata, W.A. 2000. Centrifugal and Centripetal Forces in Radical New Product Development under Time Pressure. *Academy of Management Review*, 25: 389-408
- Shepard, H.A. 1967. Innovation-Resisting and Innovation-Producing Organizations. *Journal of Business*, 40: 470 - 477

- Shrivastava, P. 1983. A typology of Organisational Learning Systems. *Journal of Management Studies*, 20: 7-28
- Sidhu, J.S., Volberda, H.W., & Commandeur, H.R. 2004. Exploring Exploration Orientation and its Determinants: Some Empirical Evidence. *Journal of Management Studies*, 41: 913-932
- Sieber, S.D. 1973. The Integration of Fieldwork and Survey Methods. *American Journal of Sociology*, 78: 1335-1359
- Siggelkow, N. 2002. Evolution toward Fit. *Administrative Science Quarterly*, 47: 125-159
- Simon, H. 1969. *The Sciences of the Artificial*. MIT: Cambridge, MA
- Slaatte, H.A. 1968. *The Pertinence of Paradox: The Dialectics of Reason-in-existence*. Humanities Press: New York, NY
- Sorensen, J.B., & Stuart, T.E. 2000. Aging, Obsolescence, and Organizational Innovation. *Administrative Science Quarterly*, 45: 81-112
- Spender, J.C. & Grant, R. 1996. Knowledge and the Firm: Overview. *Strategic Management Journal*, 17: 5-9
- Starbuck, W.H. 1992. Learning by Knowledge-intensive Firms. *Journal of Management Studies*, 29: 713-740
- Stata, R. 1989. Organizational Learning - The key to Management Innovation. *Sloan Management Review*, 30: 63-74
- Stinchcomb, A.L. 1965. Social Structure and Organizations. In: March, J.G. (ed.). *Handbook of Organizations*. Chicago: Rand McNally, pp. 142-193
- Stock, G.N., Greis, N.P., & Fischer, W.A. 2001. Absorptive capacity and new product development. *The Journal of High Technology Management Research*, 12: 77-91
- Stuart, T.E., & Podolny, J.M. 1996. Local Search and the Evolution of Technological Capabilities. *Strategic Management Journal*, 17: 21-38.
- Subramaniam, M., & Venkatraman, N. 2001. Determinants of Transnational New Product Development Capability: Testing the Influence of Transferring and Deploying Tacit Overseas Knowledge. *Strategic Management Journal*, 22: 359-378
- Zsulanski, G. 1996. Exploring Internal Stickiness: Impediments to the Transfer of Best Practices within the firm. *Strategic Management Journal*, 17: 27-44
- Teece, D.J., Pisano, G., & Shuen, A. 1997. Dynamic Capabilities and Strategic Management. *Strategic Management Journal*, 18: 509-533
- Thompson, J.D. 1967. *Organizations in Action*. McGraw-Hill: New York, NY

References

- Tsai, W. 2001. Knowledge Transfer in Intra-organizational Networks: Effects of Network Position and Absorptive Capacity on Business Unit Innovation and Performance. *Academy of Management Journal*, 44: 996-1004
- Tsai, W. 2002. Social Structure of 'Coopetition' Within a Multiunit Organization: Coordination, Competition, and Intraorganizational Knowledge Sharing. *Organization Science*, 13: 179-190.
- Tsang, E. 1997. Organizational Learning and the Learning Organization: a Dichotomy between Descriptive and Prescriptive Research. *Human Relations*, 50: 57-70
- Tushman, M.L., & Anderson, P. 1986. Technological Discontinuities and Organizational Environments. *Administrative Science Quarterly*, 31: 439-465.
- Tushman, M.L., & Nadler, D.A. 1978. Information Processing as an Integrative Concept in Organizational Design. *Academy of Management Review*, 3: 613-624
- Tushman, M.L., & Nadler, D.A. 1986. Organizing for innovation. *California Management Review*, 28: 74-92.
- Tushman, M.L., & Romanelli, E. 1985. Organizational evolution: A metamorphosis model of convergence and reorientation. In: Cummings, L.L., & Staw, B.M. (eds.), *Research in Organizational Behavior*, 7: 171-222. JAI Press: Greenwich, CT
- Tushman, M., & O'Reilly, C.A. 1996. Evolution and Revolution: Mastering the Dynamics of Innovation and Change, *California Management Review*, 38: 8-30
- Tushman, M., & Smith, W. 2002. Technological Change, Ambidextrous Organizations, and Organizational Evolution. In: Baum, J. (ed). *The Blackwell Companion to Organizations*. Blackwell Publishers, London, pp. 386-414
- Tushman, M.L., Newman, W.H., & Romanelli, E. 1986. Convergence and upheaval: Managing the Unsteady pace of Organizational Evolution. *California Management Review*, 29: 29-44.
- Van de Ven, A. 1986. Central problems in the management of innovation. *Management Science*, 325: 590-607
- Van den Bosch, F.A.J., Van Wijk, R., & Volberda, H.W. 2003. Absorptive Capacity: Antecedents, Models, and Outcomes. In Easterby-Smith, M. & Lyles, M.A. (eds), *Handbook of Organizational Learning and Knowledge Management*. Blackwell Publishing: Oxford, pp. 278-301

- Van den Bosch, F.A.J., Volberda, H.W., & De Boer, M. 1999. Coevolution of Firm Absorptive Capacity and Knowledge Environment: Organizational Forms and Combinative Capabilities. *Organization Science*, 10: 551-568
- Van Maanen, J., & Schein, E.H. 1979. Toward a Theory of Organizational Socialization. In B.M. Staw (Ed.), *Research in Organizational Behavior*, 1: 209-264. Greenwich: JAI Press
- Van Wijk, R., Van den Bosch, F.A.J., & Volberda, H.W. 2001. The impact of the depth and breadth of absorbed knowledge on levels of exploration and exploitation. *paper presented at the Academy of Management Conference*, August 3-8, Washington DC
- Vera, D., & Crossan, M.M. 2004. Strategic Leadership and Organization Learning, *Academy of Management Review*, 29: 222-240
- Vieira da Cunha, J., & Clegg, S.R., & Pina e Cunha, M. 2000. Management, paradox, and Permanent Dialectics. In: Clegg, S.R. (ed). *Management and Organization Paradoxes*. John Benjamins Pub, Philadelphia, pp. 11-40
- Verona, G. 1999. A Resource-based View of Product Development. *Academy of Management Review*, 24: 132-142
- Vince, R., & Broussine, M. 1996. Paradox, Defense and Attachment: Accessing and Working with Emotions and Relations Underlying Organizational Change. *Organization Studies*, 17: 1-21
- Virany, B., Tushman, M.L., & Romanelli, E. 1992. Executive Succession and Organization Outcomes in Turbulent Environments: An organizational learning approach. *Organization Science*, 3: 72-91
- Volberda, H.W. 1996. Toward the Flexible Form: How to Remain Vital in Hypercompetitive Environments. *Organization Science*, 7: 359-374
- Volberda, H.W. 1998. *Building the Flexible Firm: How to Remain Competitive*. Oxford University Press, Oxford
- Volberda, H.W. & Lewin, A.Y. 2003. Co-evolutionary Dynamics within Evolution to Co-evolution. *Journal of Management Studies*, 40: 2111- 2136
- Volberda, H.W., & Van Bruggen, G.H. 1997. Environmental Turbulence: A Look into its Dimensionality. *NOBO Onderzoeksdag 1997*, Enschede
- Volberda, H.W., & Van den Bosch, F.A.J. 2005. Ruim baan voor de Nederlandse Innovatie Agenda. *Management en Organisatie*, 59: 1-23 (in Dutch)
- Volberda, H.W., Baden-Fuller, Ch., & Van den Bosch, F.A.J. 2001. Mastering Strategic Renewal: Mobilising Renewal Journeys in Multi-unit Firms *Long Range Planning*, 34: 159-178

References

- Walsh, J.P., Ungson, G.R. 1991. Organizational Memory. *Academy of Management Review*, 16: 57-91
- Walton, R.E., & Duttan, J.M. 1969. The Management of Interdepartmental Conflict: A Model and Review. *Administrative Science Quarterly*, 14: 73-84
- Weick, K.E. 1979. *The Social Psychology of Organizing*. Reading: Addison-Wesley
- Weick, K.E. 1982. Management of organizational change among loosely coupled elements. In: Goodman, P.S. (ed.), *Change in Organizations*. Jossey-Bass: San Francisco, CA, pp. 375-408
- Weick, K.E. 1996. The Non-traditional Quality of Organizational Learning. In: Cohen, M.D., & Sproull, L.S. (eds). *Organizational Learning*. Sage: London, pp. 163-173
- Weick, K. E., & Westley, F. 1996. Organizational Learning: Affirming an Oxymoron. In: Clegg, S.R., Hardy, C., & Nord, W.R. (eds). *Handbook of Organization Studies*. Sage: London, pp. 440-458
- Westenholz, A. 1993. Paradoxical Change of Frames of Reference. *Organization Studies*, 14: 37-58
- Wilson, J.Q. 1966. Innovation in Organization: Notes toward Theory. In: Thompson, J.D. (ed.). *Approaches to Organizational Design*. University of Pittsburgh Press: Pittsburgh, pp. 193-218
- Withey, M., Daft, R.L., & Cooper, W.H. 1983. Measures of Perrow's Work Unit Technology: An Empirical Assessment and a New Scale. *Academy of Management Journal*, 26: 45-63
- Yelle, L. E. 1979. The learning curve: Historical review and comprehensive survey. *Decision Science*, 10: 302-328
- Yeoh P.L., & Roth K. 1999. An empirical Analysis of Sustained Advantage in the U.S. Pharmaceutical Industry: Impact of Firm Resources and Capabilities. *Strategic Management Journal*, 20: 637 – 653
- Yli-Renko, H., Autio, E., & Sapienza, H. J. 2001. Social Capital, Knowledge Acquisition, and Knowledge Exploitation in Technology-Based Young Firms. *Strategic Management Journal*, 21: 587-613.
- Zahra, S.A., & George, G. 2002. Absorptive Capacity: A Review, Reconceptualization, and Extension. *Academy of Management Review*, 27: 185-203
- Zaltman, G., Duncan, R., & Holbek, J. 1973. *Innovations and Organizations*. New York: Wiley

References

- Zander, U., & Kogut, B. 1995. Knowledge and the Speed of the Transfer and Imitation of Organizational Capabilities: An Empirical Test. *Organization Science*, 6: 76-92
- Zollo, M.M., & Winter, S.G. 2002. Deliberate Learning and the Evolution of Dynamic Capabilities. *Organization Science*, 13: 339-351

NEDERLANDSE SAMENVATTING

(DUTCH SUMMARY)

De toegenomen concurrentie binnen nationale en internationale afzetmarkten, de veranderende (Europese) wetgeving en de ontwikkelingen op technologisch gebied, hebben de concurrentieverhoudingen tussen ondernemingen drastisch veranderd. Niet alleen het aantal veranderingen, maar ook de intensiteit waarmee marktontwikkelingen plaatsvinden, confronteren ondernemingen in toenemende mate met een spanning tussen efficiency en kostenverlaging (exploitatie) enerzijds, en flexibiliteit en innovativiteit (exploratie) anderzijds. Hoewel ondernemingen behoefte hebben aan stabiliteit om huidige activiteiten effectief te kunnen aansturen, moeten ze nieuwe producten en diensten ontwikkelen voor nieuwe markten. Echter, doordat beide activiteiten moeilijk zijn te verenigen, wordt het managen van exploitatie en exploratie gezien als een van de belangrijkste uitdagingen voor het behalen van een duurzaam concurrentievoordeel (Levinthal & March, 1993; March, 1991). Ondanks verschillende studies die hebben aangetoond dat deze ambidexter organisaties¹⁶ bovengemiddelde resultaten behalen, is het nog onduidelijk hoe ondernemingen zowel efficiency als innovatie kunnen combineren binnen hun organisaties.

¹⁶ Van Dale Groot woordenboek der Nederlandse taal geeft aan het woord ‘ambidexter’ de volgende betekenis: (1) iemand die zich even vaardig van de linker- als van de rechterhand weet te bedienen; (2) zeer handig man.

Box 1: Exploratieve en Exploitatieve Innovaties binnen Ondernemingen

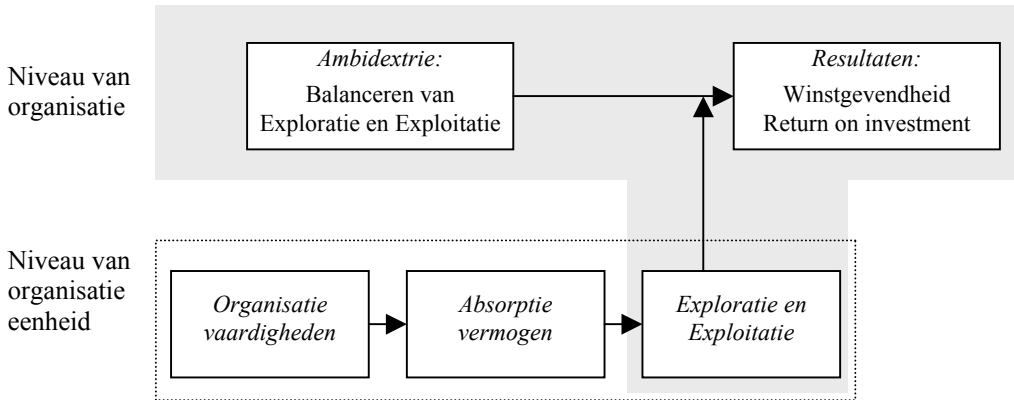
Exploratieve innovaties zijn radicale innovaties die gericht zijn op de behoeften van nieuwe klanten en/of markten. Exploratieve innovaties bieden nieuwe producten en diensten, creëren nieuwe markten en ontwikkelen nieuwe distributiekkanalen. Door het radicale karakter, zullen ondernemingen nieuwe kennis moeten ontwikkelen door middel van variatie, flexibiliteit, experimenteren, en het nemen van risico.

Exploitatieve innovaties zijn incrementele innovaties die gericht zijn op de behoeften van bestaande klanten en/of markten. Exploitatieve innovaties zijn gericht op het verbeteren van en voortbouwen op bestaande producten en diensten, afzetmarkten en distributiekkanalen. Door het incrementele karakter, zullen ondernemingen hun bestaande kennis verdiepen door verfijning, efficiencyverbeteringen, en productie.

Bron: Abernathy & Clark, 1985; Benner & Tushman, 2003

Dit onderzoek beoogt nieuwe inzichten te verschaffen hoe organisaties de balans tussen exploratieve en exploitatieve innovaties (Abernathy & Clark, 1985; Benner & Tushman, 2003; Danneels, 2002) succesvol kunnen managen. Verschillende onderzoeken hebben beargumenteerd dat ambidexter organisaties bovengemiddelde resultaten behalen (Tushman & O'Reilly, 1996). Echter, er zijn weinig empirische studies die deze theoretische claim daadwerkelijk getest hebben met financiële data (Gibson & Birkinshaw, 2004; He & Wong, 2004). Daarnaast is nog onduidelijk hoe ambidexter organisaties beide activiteiten succesvol kunnen aansturen in verschillende organisatie-eenheden. Een belangrijke keuze voor het management van ambidexter organisaties is bijvoorbeeld of exploratieve en exploitatieve innovaties dienen te worden gescheiden binnen verschillende organisatie-eenheden of juist te worden gecombineerd binnen één organisatie-eenheid (Volberda, 1998; Weick, 1982). In tegenstelling tot theoretische bijdragen betreffende beide mogelijkheden, ontbreekt het tot op heden nog aan empirische studies die verschillende methoden van balanceren vergelijken. Zoals in onderstaand onderzoeksmodel is weergegeven, focust dit promotieonderzoek op de relatie tussen het balanceren van exploratie en exploitatie en de financiële resultaten van dergelijke ambidexter organisaties op zowel het organisatieniveau als het niveau van organisatie-eenheden.

Figuur 1: Het Multilevel Onderzoeksmodel



Het *theoretische onderzoek* van het promotieonderzoek valt uiteen in twee delen. In het eerste deel wordt beargumenteerd dat ambidexter organisaties betere financiële resultaten behalen (Gibson & Birkinshaw, 2004; He & Wong, 2004). Ondernemingen die focussen op exploitatie zijn in staat om op korte termijn de financiële resultaten te verbeteren door efficiencyverbeteringen, maar zijn onvoldoende in staat producten en diensten aan te passen aan veranderende omstandigheden (Ahuja & Lampert, 2001; Jansen et al., 2005; Sorensen & Stuart, 2002). Overmatige exploratie kan echter ook negatieve gevolgen hebben voor organisaties doordat het kan resulteren in een neerwaartse spiraal van continue verandering en innovatie (Levinthal & March, 1993). Ondanks de vernieuwingen binnen ondernemingen, krijgen organisaties te maken met hoge ontwikkelings- en veranderkosten zonder constante opbrengsten die voortvloeien uit de exploitatie van bestaande producten en diensten. Verschillende studies hebben daarom aangeduid dat ondernemingen die exploratie en exploitatie balanceren – de ambidexter organisatie – betere financiële resultaten behalen (Levinthal & March, 1993; March, 1991; Tushman & O’Reilly, 1996; Volberda & Lewin, 2003).

Daarnaast hebben theoretische bijdragen verschillende methoden naar voren gebracht hoe ambidexter organisaties kunnen omgaan met exploratie en exploitatie binnen organisatie-eenheden. Opvallend is dat daarbij twee perspectieven de boventoon voeren (Gibson & Birkinshaw, 2004): organisaties kunnen beide

activiteiten scheiden in verschillende organisatie-eenheden ('structural ambidexterity') of juist combineren binnen organisatie-eenheden ('contextual ambidexterity'). Het *scheiden* van exploratie en exploitatie heeft tot gevolg dat twee soorten organisatie-eenheden ontstaan: eenheden die meer gericht zijn op innovatie, vernieuwing en flexibiliteit (bijv. R&D afdelingen) en eenheden die meer gericht zijn op efficiency, productie en stabiliteit (bijv. productieafdelingen). Hoewel deze benadering leidt tot een eenduidige managementaansturing binnen organisatie-eenheden, dient het management van deze ambidexter organisaties dwarsverbanden te creëren tussen meer exploratieve en meer exploitatieve organisatie-eenheden (Tushman & O'Reilly, 1996).

Het *combineren* van exploratie en exploitatie binnen organisatie-eenheden heeft tot gevolg dat eenheden ontstaan die tegelijkertijd zowel gericht zijn op innovatie en vernieuwing alsook efficiency en stabiliteit (Johnston, 1976; McDonough & Leifer, 1983). Deze organisatie-eenheden dienen in staat te zijn om tegenstrijdige krachten te integreren en werknemers in staat stellen om beslissingen te nemen ten aanzien van exploratie en exploitatie (Gibson & Birkinshaw, 2004). Doordat exploratie en exploitatie op lagere niveaus binnen de organisatie gecombineerd worden, zal de nadruk van het management gericht zijn op het implementeren van de juiste context binnen organisatie-eenheden. Echter, het creëren van een organisatiecontext die zowel exploratie als exploitatie ondersteunt is een zeer veeleisende taak voor het management. Het duale karakter van deze organisatie-eenheden noodzaakt het management om tegenstrijdige elementen zoals decentralisatie en regels en procedures te verenigen in één organisatiecontext (Adler & Borys, 1996; Sheremata, 2000).

Door de moeilijkheden die ontstaan bij de integratie van exploratie en exploitatie binnen organisatie-eenheden wordt binnen dit onderzoek beargumenteerd dat succesvolle ambidexter organisaties beide typen innovaties op verschillende locaties binnen hun organisatie onderbrengen (Benner & Tushman, 2003; Hill & Rothaermel, 2003; Tushman & O'Reilly, 1996; Weick, 1982). Het scheiden van exploratie en exploitatie in verschillende organisatie-eenheden maakt het mogelijk om in een bepaalde organisatie-eenheid te vernieuwen terwijl andere organisatie-eenheden hun stabiliteit bewaren (Thompson, 1967; Weick, 1982). Op deze manier kunnen ambidexter organisaties lokale aanpassingen doorvoeren in organisatie-eenheden zonder de dagelijkse gang van zaken binnen de rest van de organisatie te verstoren. In het eerste deel van het theoretische onderzoek wordt dan ook op basis van de bestaande theorie beargumenteerd dat ambidexter

organisaties die exploratie en exploitatie scheiden in verschillende organisatie-eenheden betere financiële resultaten behalen.

In het tweede deel wordt de aandacht verschoven naar het niveau van organisatie-eenheden (zie figuur onderzoeksmodel) en wordt de relatie onderzocht tussen verschillende organisatiekenmerken, het kennisabsorptievermogen en de mate van exploratie en exploitatie binnen organisatie-eenheden. Omdat nieuwe externe kennis in belangrijke mate het innovatiesucces bepaalt (Cohen & Levinthal, 1990), speelt het kennisabsorptievermogen binnen het tweede deel van de dissertatie een centrale rol. Het kennisabsorptievermogen bestaat uit twee componenten (Zahra & George, 2002), namelijk het aantrekken en assimileren ('potential absorptive capacity') en het transformeren en exploiteren ('realized absorptive capacity') van externe kennis. In de huidige studie wordt beargumenteerd dat organisatie-eenheden specifieke organisatievaardigheden dienen te ontwikkelen en implementeren om beide componenten van het absorptievermogen succesvol te kunnen managen. Er worden aan de hand van een drietal organisatievaardigheden, coördinatie, systeem, en socialisatievaardigheden meerdere organisatiekenmerken geïdentificeerd (Kogut & Zander, 1992; Van den Bosch et al., 1999) die beide componenten van het absorptievermogen verschillend beïnvloeden (Jansen et al., 2005). Door het testen van de hypothesen, biedt dit onderzoek niet alleen nieuwe inzichten hoe verschillende aspecten van het kennisabsorptievermogen kunnen worden aangestuurd, maar worden ook verklaringen gegeven waarom sommige organisatie-eenheden moeilijkheden ondervinden bij het ontwikkelen van beide typen innovaties. Zo kan het bijvoorbeeld voorkomen dat organisatie-eenheden goed in staat zijn om kennis te transformeren en exploiteren, maar moeilijkheden ondervinden bij het aantrekken en assimileren van nieuwe kennis. Omdat exploratieve innovaties veelal gebaseerd zijn op nieuwe externe kennis, zullen deze organisatie-eenheden minder goed in staat zijn om nieuwe producten en diensten te ontwikkelen en zich meer focussen op het verder verbeteren van bestaande producten, diensten en marktbediening.

Het **empirisch onderzoek** bestaat uit een gecombineerde aanpak van kwalitatieve en kwantitatieve methoden (Creswell, 1994; Denzin, 1978; Jick, 1979). Tijdens het empirische onderzoek is kwalitatieve data verzameld door interviews. Deze data is gebruikt voor het creëren van een rijk en geïntegreerd beeld van de verschillende constructen. De kwalitatieve data is tevens gebruikt

voor de verdere onderbouwing van de verschillende hypothesen (Eisenhardt, 1989; Jick, 1979). Daarnaast is kwantitatieve data verzameld op zowel het organisatieniveau als het niveau van organisatie-eenheden. Door middel van meerdere vragenlijsten is de kwantitatieve data verzameld en geanalyseerd om de hypothesen te testen. De aanpak van het empirisch onderzoek valt uiteen in drie delen.

Het eerste gedeelte bestaat uit een uitgebreid overzicht van bestaande literatuur over exploratie en exploitatie. De inzichten van de literatuurstudie en kwalitatieve data verzameld door middel van interviews zijn gecombineerd en hebben geleid tot de ontwikkeling van een multilevel framework. Er zijn in totaal 36 interviews gehouden met algemeen directeuren en managers binnen lokale Rabobanken. De Rabobank Groep is een van de grootste financiële dienstverleners in Nederland en bestaat naast de lokale Rabobanken uit verschillende gespecialiseerde bedrijfsonderdelen, zoals Interpolis, Lage Landen en Robeco. De producten en diensten van lokale Rabobanken omvatten standaard bankdiensten, verzekeringen, pensioenen, hypotheek, corporate banking en investment banking. Lokale Rabobanken bestaan uit meerdere organisatie-eenheden die de producten en diensten aanbieden in marktgebieden met verschillende niveaus van competitiviteit en dynamiek (Han et al., 1998). De interviews met de algemeen directeuren en managers van de organisatie-eenheden hebben niet alleen bijgedragen aan het onderbouwen van de verschillende hypothesen, maar ook aan het genereren van ideeën hoe de kwantitatieve dataverzameling plaats zou kunnen vinden.

Het tweede gedeelte van het empirisch onderzoek omvat het ontwikkelen van *nieuwe meetschalen* voor verschillende constructen (Jansen et al., 2005), het verzamelen van de kwantitatieve data door middel van meerdere vragenlijsten, en het analyseren van de verzamelde data. De eerste vragenlijst is ontwikkeld om de financiële resultaten van ambidexter organisaties te onderzoeken. De vragenlijst meet onder andere de mate van ambidextrie van lokale Rabobanken en de mate van exploratie en exploitatie binnen verschillende organisatie-eenheden. In totaal hebben 110 algemeen directeuren en ruim 363 managers van organisatie-eenheden binnen de betreffende lokale Rabobanken geparticipeerd. In aanvulling op de eerste vragenlijst is een tweede vragenlijst ontwikkeld en verzonden aan managers van verschillende organisatie-eenheden binnen lokale Rabobanken. De tweede vragenlijst is gebruikt om organisatiekenmerken, het absorptievermogen, en de mate van exploratie en exploitatie binnen organisatie-eenheden te meten. Van deze tweede vragenlijst zijn in totaal 462 exemplaren door de managers geretourneerd.

Nederlandse Samenvatting (Dutch Summary)

Om te testen of er sprake is van nonresponse bias in de dataset, zijn de respondenten vergeleken met die niet-respondenten. Beide groepen waren echter niet verschillend ten aanzien van verschillende kenmerken, zoals de financiële resultaten en de grootte van de lokale Rabobank.

Om de interpretatie en praktische implicaties van de resultaten verder te onderbouwen, zijn tijdens het derde gedeelte van het empirisch onderzoek meerdere feedbacksessies georganiseerd op de Erasmus Universiteit Rotterdam en verscheidene lokale Rabobanken. Tijdens deze sessies zijn de onderzoeksresultaten gepresenteerd en zijn praktische implicaties besproken met algemeen directeuren en managers van lokale Rabobanken en Rabobank Nederland.

Door het ontwikkelen en testen van een multi-level raamwerk betreffende het managen van exploratie en exploitatie binnen ondernemingen, heeft dit onderzoek verschillende *theoretische en empirische bijdragen*. Ten eerste, hoewel meerdere studies hebben geopperd dat organisaties die exploratie en exploitatie balanceren zeer succesvol zouden zijn, zijn er weinig studies die deze relatie daadwerkelijk getest hebben. Recente studies hebben door middel van dataverzameling met subjectieve meetschalen voor financiële resultaten aangetoond dat ambidextrie leidt tot betere financiële resultaten (Gibson & Birkinshaw, 2004; He & Wong, 2004). Dit onderzoek draagt bij aan deze eerdere studies door met objectieve data betreffende winstgevendheid en return-on-investment aan te tonen dat ondernemingen die exploratie en exploitatie balanceren binnen hun organisatie betere financiële resultaten behalen.

Box 2: Belangrijkste bevindingen

‘Ambidexter organisaties en financiële resultaten’

Organisaties die zowel exploreren als exploiteren (ambidexter organisaties) behalen een beduidend hoger resultaat in termen van winstgevendheid en return on investment

Ambidexter organisaties die exploratie en exploitatie meer scheiden in verschillende organisatie-eenheden behalen een beter financieel resultaat dan ambidexter organisaties die exploratie en exploitatie meer combineren in organisatie-eenheden

Ten tweede, empirisch onderzoek heeft zich in het verleden òf gericht op het niveau van ondernemingen, òf gericht op het niveau van organisatie-eenheden. Studies hebben daardoor nog geen inzicht kunnen verschaffen hoe de meest succesvolle ambidexter organisaties omgaan met de balans tussen exploratie en exploitatie binnen organisatie-eenheden. Door gebruik te maken van *een multilevel framework* is het huidige onderzoek in staat geweest om te testen of het scheiden danwel combineren van beide typen innovaties in organisatie-eenheden consequenties heeft voor de financiële resultaten van ambidexter organisaties. De empirische bevindingen laten zien dat de meest succesvolle ambidexter organisaties organisatie-eenheden creëren die enerzijds meer gericht zijn op exploratieve innovaties en anderzijds meer gericht zijn op exploitatieve innovaties. Op deze manier kan het management binnen de desbetreffende organisatie-eenheden zich meer richten op de aansturing van één type innovatie (Benner & Tushman, 2003; Tushman & O'Reilly, 1996). Daarnaast zijn deze ambidexter organisaties beter in staat om vanuit verschillende organisatie-eenheden aan de complexiteit en variëteit van de marktomgeving te voldoen (Scott, 1981; Weick, 1982). Ten derde, de huidige studie draagt bij aan literatuur over absorptievermogen en ambidextrie door het ontwikkelen van nieuwe betrouwbare en valide meetschalen voor potentieel en gerealiseerd absorptievermogen (Zahra & George, 2002) en exploratieve en exploitatieve innovaties (Abernathy & Clark, 1985; Benner & Tushman, 2003). De betrouwbaarheid en validiteit van de nieuwe meetschalen zijn op meerdere manieren getest. Er zijn bijvoorbeeld extra vragenlijsten verzonden om per lokale Rabobank en per organisatie-eenheid meerdere respondenten te verkrijgen. Daarnaast zijn de nieuwe studievariabelen gecorreleerd met bestaande meetschalen en met objectieve data die tijdens het onderzoeksproject zijn verzameld. De ontwikkelde meetschalen kunnen in toekomstig onderzoek gebruikt worden om verschillende aspecten van ambidexter organisaties en het kennisabsorptievermogen verder te onderzoeken. Ten vierde, door de antecedenten van potentieel en gerealiseerd kennisabsorptievermogen te onderzoeken, draagt dit onderzoek bij aan nieuwe inzichten hoe verschillende aspecten van het kennisabsorptievermogen succesvol kunnen worden aangestuurd. De resultaten van het empirisch onderzoek laten zien dat de acquisitie en assimilatie van nieuwe kennis voornamelijk worden gestimuleerd door coördinatievaardigheden te implementeren, terwijl de transformatie en exploitatie van kennis voornamelijk worden gestimuleerd door systeem- en socialisatievaardigheden te implementeren.

Box 3: Belangrijkste bevindingen
‘Absorptievermogen: Antecedenten en Uitkomsten’

Organisatie-eenheden kunnen de acquisitie en assimilatie van nieuwe externe kennis stimuleren door de ontwikkeling en implementatie van coördinatievaardigheden (participatie van medewerkers in de besluitvorming, (tijdelijke) teams en job rotatie).

Organisatie-eenheden kunnen de transformatie en exploitatie van kennis stimuleren door de ontwikkeling en implementatie van systeem- en socialisatievaardigheden (regels en procedures, hechte sociale netwerken en gezamenlijke opleidingsprogramma's)

Organisatie-eenheden die exploitatieve innovaties willen ontwikkelen dienen de transformatie en exploitatie van kennis te stimuleren.

Organisatie-eenheden die exploratieve innovaties willen ontwikkelen, dienen zowel de acquisitie en assimilatie ('potential absorptive capacity') als de transformatie en exploitatie van externe kennis ('realized absorptive capacity') te stimuleren

Ten vijfde, dit onderzoek draagt bij aan voorgaande studies die hebben geopperd dat potentieel en gerealiseerd absorptievermogen verschillend van invloed zijn op exploratieve en exploitatieve innovaties (Zahra & George, 2002). Het empirisch onderzoek binnen de Rabobank Groep toont aan dat de transformatie en exploitatie van kennis (gerealiseerd absorptievermogen) in grote mate exploitatieve innovaties van organisatie-eenheden bepalen. Met andere woorden, indien organisatie-eenheden producten en diensten willen ontwikkelen die voortbouwen op bestaande kennis, volstaat het exploiteren van de huidige kennisbasis. Dienen echter meer exploratieve innovaties te worden voortgebracht, dan zullen organisatie-eenheden tevens in staat moeten zijn om nieuwe externe kennis te acquireren en te assimileren. Het tweede deel van het empirisch onderzoek op het niveau van organisatie-eenheden biedt daarmee nieuwe inzichten hoe organisatie-eenheden bepaalde organisatievaardigheden kunnen ontwikkelen en implementeren, het potentieel en gerealiseerd kennisabsorptievermogen managen, en de gewenste types innovaties voortbrengen.

Dit promotieonderzoek biedt verschillende nieuwe inzichten voor zowel onderzoekers als managers binnen middelgrote en grote organisaties. Het beaamt dat aspecten zoals ambidextrie en het absorptievermogen multi-dimensionaal zijn en laat zien hoe ambidexter organisaties een duurzaam concurrentievoordeel kunnen ontwikkelen door zowel op het organisatieniveau als het niveau van organisatie-eenheden exploratie en exploitatie succesvol te managen.

CURRICULUM VITAE

Justin J.P. Jansen (Numansdorp, November 28, 1976) received his M.Sc. degree in strategic management from the Rotterdam School of Management, Erasmus University Rotterdam, The Netherlands. Justin Jansen is currently an assistant professor of strategic management at the Rotterdam School of Management. His research interests include organizational learning and change, strategic management of innovation in SMEs, (corporate) entrepreneurship, and organizational ambidexterity. His research has been published or is forthcoming in *Academy of Management Journal*, *Management & Organisatie* (in Dutch), and *Schmalenbach Business Review*. One of his papers was awarded the best paper prize at the Annual Conference on Corporate Strategy. Moreover, he has presented his research at major international conferences, such as the Academy of Management, EGOS, LINK, and the Strategic Management Society. Justin Jansen currently serves as an ad-hoc reviewer for the *Academy of Management Journal*, *Journal of Management Studies*, and serves on the editorial board of the *International Journal of Technology Marketing*.

ERASMUS RESEARCH INSTITUTE OF MANAGEMENT (ERIM)

ERIM PH.D. SERIES
RESEARCH IN MANAGEMENT

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

Appelman, J.H., *Governance of Global Interorganizational Tourism Networks; Changing Forms of Co-ordination between the Travel Agency and Aviation Sector*, Promotors: Prof. dr. F.M. Go & Prof. dr. B. Nooteboom, EPS-2004-036-MKT, ISBN 90-5892-060-7, <http://hdl.handle.net/1765/1199>

Berens, G., *Corporate Branding: The Development of Corporate Associations and their Influence on Stakeholder Reactions*, Promotor: Prof. dr. C. B. M. van Riel, EPS-2004-039-ORG, ISBN 90-5892-065-8, <http://hdl.handle.net/1765/1273>

Berghe, D.A.F., *Working Across Borders: Multinational Enterprises and the Internationalization of Employment*, Promotors: Prof. dr. R.J.M. van Tulder & Prof. dr. E.J.J. Schenk, EPS-2003-029-ORG, ISBN 90-5892-05-34, <http://hdl.handle.net/1765/1041>

Bijman, W.J.J., *Essays on Agricultural Co-operatives; Governance Structure in Fruit and Vegetable Chains*, Promotor: Prof. dr. G.W.J. Hendrikse, EPS-2002-015-ORG, ISBN: 90-5892-024-0, <http://hdl.handle.net/1765/867>

Brito, M.P. de, *Managing Reverse Logistics or Reversing Logistics Management?* Promotors: Prof. dr. ir. R. Dekker & Prof. dr. M. B. M. de Koster, EPS-2004-035-LIS, ISBN: 90-5892-058-5, <http://hdl.handle.net/1765/1132>

Campbell, R.A.J., *Rethinking Risk in International Financial Markets*, Promotor: Prof. dr. C.G. Koedijk, EPS-2001-005-F&A, ISBN: 90-5892-008-9, <http://hdl.handle.net/1765/306>

Chen, Y., *Labour Flexibility in China's Companies: An Empirical Study*, Promotors: Prof. dr. A. Buitendam & Prof. dr. B. Krug, EPS-2001-006-ORG, ISBN: 90-5892-012-7, <http://hdl.handle.net/1765/307>

Daniševská, P., *Empirical Studies on Financial Intermediation and Corporate Policies*, Promotor: Prof. dr. C.G. Koedijk, EPS-2004-044-F&A, ISBN 90-5892-070-4, <http://hdl.handle.net/1765/1518>

Delpoort-Vermeiren, D.J.E., *Improving the Flexibility and Profitability of ICT-enabled Business Networks: An Assessment Method and Tool*, Promoters: Prof. mr. dr. P.H.M. Vervest & Prof. dr. ir. H.W.G.M. van Heck, EPS-2003-020-LIS, ISBN: 90-5892-040-2, <http://hdl.handle.net/1765/359>

Dijksterhuis, M., *Organizational Dynamics of Cognition and Action in the Changing Dutch and US Banking Industries*, Promoters: Prof. dr. ing. F.A.J. van den Bosch & Prof. dr. H.W. Volberda, EPS-2003-026-STR, ISBN: 90-5892-048-8, <http://hdl.handle.net/1765/1037>

Fenema, P.C. van, *Coordination and Control of Globally Distributed Software Projects*, Promotor: Prof. dr. K. Kumar, EPS-2002-019-LIS, ISBN: 90-5892-030-5, <http://hdl.handle.net/1765/360>

Fleischmann, M., *Quantitative Models for Reverse Logistics*, Promoters: Prof. dr. ir. J.A.E.E. van Nunen & Prof. dr. ir. R. Dekker, EPS-2000-002-LIS, ISBN: 3540 417 117, <http://hdl.handle.net/1765/1044>

Flier, B., *Strategic Renewal of European Financial Incumbents: Coevolution of Environmental Selection, Institutional Effects, and Managerial Intentionality*, Promoters: Prof. dr. ing. F.A.J. van den Bosch & Prof. dr. H.W. Volberda, EPS-2003-033-STR, ISBN: 90-5892-055-0, <http://hdl.handle.net/1765/1071>

Fok, D., *Advanced Econometric Marketing Models*, Promotor: Prof. dr. P.H.B.F. Franses, EPS-2003-027-MKT, ISBN: 90-5892-049-6, <http://hdl.handle.net/1765/1035>

Ganzaroli, A., *Creating Trust between Local and Global Systems*, Promoters: Prof. dr. K. Kumar & Prof. dr. R.M. Lee, EPS-2002-018-LIS, ISBN: 90-5892-031-3, <http://hdl.handle.net/1765/361>

Gilsing, V.A., *Exploration, Exploitation and Co-evolution in Innovation Networks*, Promoters: Prof. dr. B. Nooteboom & Prof. dr. J.P.M. Groenewegen, EPS-2003-032-ORG, ISBN 90-5892-05-42, <http://hdl.handle.net/1765/1040>

Graaf, G. de, *Tractable Morality: Customer Discourses of Bankers, Veterinarians and Charity Workers*, Promotors: Prof. dr. F. Leijnse & Prof. dr. T. van Willigenburg, EPS-2003-031-ORG, ISBN: 90-5892-051-8, <http://hdl.handle.net/1765/1038>

Hermans, J.M., *ICT in Information Services, Use and deployment of the Dutch securities trade, 1860-1970*. Promotor: Prof. dr. drs. F.H.A. Janszen, EPS-2004-046-ORG, ISBN 90-5892-072-0, <http://hdl.handle.net/1765/1793>

Heugens, P.M.A.R., *Strategic Issues Management: Implications for Corporate Performance*, Promotors: Prof. dr. ing. F.A.J. van den Bosch & Prof. dr. C.B.M. van Riel, EPS-2001-007-STR, ISBN: 90-5892-009-7, <http://hdl.handle.net/1765/358>

Hooghiemstra, R., *The Construction of Reality*, Promotors: Prof. dr. L.G. van der Tas RA & Prof. dr. A.Th.H. Pruyn, EPS-2003-025-F&A, ISBN: 90-5892-047-X, <http://hdl.handle.net/1765/871>

Jansen, J.J.P., *Ambidextrous Organizations*, Promotors: Prof.dr.ing. F.A.J. Van den Bosch & Prof.dr. H.W. Volberda, EPS-2005-055-STR, ISBN 90-5892-081-X

Jong, C. de, *Dealing with Derivatives: Studies on the Role, Informational Content and Pricing of Financial Derivatives*, Promotor: Prof. dr. C.G. Koedijk, EPS-2003-023-F&A, ISBN: 90-5892-043-7, <http://hdl.handle.net/1765/1043>

Kippers, J., *Empirical Studies on Cash Payments*, Promotor: Prof.dr. Ph.H.B.F. Franses, EPS-2004-043-F&A. ISBN 90-5892-069-0, <http://hdl.handle.net/1765/1520>

Koppius, O.R., *Information Architecture and Electronic Market Performance*, Promotors: Prof. dr. P.H.M. Vervest & Prof. dr. ir. H.W.G.M. van Heck, EPS-2002-013-LIS, ISBN: 90-5892-023-2, <http://hdl.handle.net/1765/921>

Langen, P.W. de, *The Performance of Seaport Clusters; A Framework to Analyze Cluster Performance and an Application to the Seaport Clusters of Durban, Rotterdam and the Lower Mississippi*, Promotors: Prof. dr. B. Nooteboom & Prof. drs. H.W.H. Welters, EPS-2004-034-LIS, ISBN: 90-5892-056-9, <http://hdl.handle.net/1765/1133>

Le Anh, T., *Intelligent Control of Vehicle-Based Internal Transport Systems*, Promotors: Prof.dr. M.B.M. de Koster & Prof.dr.ir. R. Dekker, EPS-2005-051-LIS, ISBN 90-5892-079-8

Liang, G., *New Competition; Foreign Direct Investment And Industrial Development In China*, Promotor: Prof.dr. R.J.M. van Tulder, EPS-2004-047-ORG, ISBN 90-5892-073-9, <http://hdl.handle.net/1765/1795>.

Loef, J., *Incongruity between Ads and Consumer Expectations of Advertising*, Promotors: Prof. dr. W.F. van Raaij & Prof. dr. G. Antonides, EPS-2002-017-MKT, ISBN: 90-5892-028-3, <http://hdl.handle.net/1765/869>

Mandele, L.M., van der, *Leadership and the Inflection Point: A Longitudinal Perspective*, Promotors: Prof. dr. H.W. Volberda, Prof. dr. H.R. Commandeur, EPS-2004-042-STR, ISBN 90-5892-067-4, <http://hdl.handle.net/1765/1302>

Meer, J.R. van der, *Operational Control of Internal Transport*, Promotors: Prof. dr. M.B.M. de Koster & Prof. dr. ir. R. Dekker, EPS-2000-001-LIS, ISBN:90-5892-004-6, <http://hdl.handle.net/1765/859>

Miltenburg, P.R., *Effects of Modular Sourcing on Manufacturing Flexibility in the Automotive Industry: A Study among German OEMs*, Promotors: Prof. dr. J. Paauwe & Prof. dr. H.R. Commandeur, EPS-2003-030-ORG, ISBN 90-5892-052-6, <http://hdl.handle.net/1765/1039>

Mol, M.M., *Outsourcing, Supplier-relations and Internationalisation: Global Source Strategy as a Chinese Puzzle*, Promotor: Prof. dr. R.J.M. van Tulder, EPS-2001-010-ORG, ISBN: 90-5892- 014-3, <http://hdl.handle.net/1765/355>

Mulder, A., *Government Dilemmas in the Private Provision of Public Goods*, Promotor: Prof. dr. R.J.M. van Tulder, EPS-2004-045-ORG, ISBN: 90-5892-071-2, <http://hdl.handle.net/1765>

Muller, A.R., *The Rise of Regionalism: Core Company Strategies Under The Second Wave of Integration*, Promotor: Prof. dr. R.J.M. van Tulder, EPS-2004-038-ORG, ISBN 90-5892-062-3, <http://hdl.handle.net/1765/1272>

Oosterhout, J. van, *The Quest for Legitimacy: On Authority and Responsibility in Governance*, Promotors: Prof. dr. T. van Willigenburg & Prof.mr. H.R. van Gunsteren, EPS-2002-012-ORG, ISBN: 90-5892-022-4, <http://hdl.handle.net/1765/362>

Peeters, L.W.P., *Cyclic Railway Timetable Optimization*, Promotors: Prof. dr. L.G. Kroon & Prof. dr. ir. J.A.E.E. van Nunen, EPS-2003-022-LIS, ISBN: 90-5892-042-9, <http://hdl.handle.net/1765/429>

Popova, V., *Knowledge Discovery and Monotonicity*, Promotor: Prof. dr. A. de Bruin, EPS-2004-037-LIS, ISBN 90-5892-061-5, <http://hdl.handle.net/1765/1201>

Puvanasvari Ratnasingam, P., *Interorganizational Trust in Business to Business E-Commerce*, Promotors: Prof. dr. K. Kumar & Prof. dr. H.G. van Dissel, EPS-2001-009-LIS, ISBN: 90-5892-017-8, <http://hdl.handle.net/1765/356>

Romero Morales, D., *Optimization Problems in Supply Chain Management*, Promotors: Prof. dr. ir. J.A.E.E. van Nunen & Dr. H.E. Romeijn, EPS-2000-003-LIS, ISBN: 90-9014078-6, <http://hdl.handle.net/1765/865>

Roodbergen, K.J., *Layout and Routing Methods for Warehouses*, Promotors: Prof. dr. M.B.M. de Koster & Prof. dr. ir. J.A.E.E. van Nunen, EPS-2001-004-LIS, ISBN: 90-5892-005-4, <http://hdl.handle.net/1765/861>

Schweizer, T.S., *An Individual Psychology of Novelty-Seeking, Creativity and Innovation*, Promotor: Prof. dr. R.J.M. van Tulder, EPS-2004-048-ORG, ISBN: 90-5892-07-71, <http://hdl.handle.net/1765/1818>

Six, F.E., *Trust and Trouble: Building Interpersonal Trust Within Organizations*, Promotors: Prof. dr. B. Nooteboom & Prof. dr. A.M. Sorge, EPS-2004-040-ORG, ISBN 90-5892-064-X, <http://hdl.handle.net/1765/1271>

Slager, A.M.H., *Banking across Borders*, Promotors: Prof. dr. D.M.N. van Wensveen & Prof. dr. R.J.M. van Tulder, EPS-2004-041-ORG, ISBN 90-5892-066-6, <http://hdl.handle.net/1765/1301>

Speklé, R.F., *Beyond Generics: A closer look at Hybrid and Hierarchical Governance*, Promotor: Prof. dr. M.A. van Hoepen RA, EPS-2001-008-F&A, ISBN: 90-5892-011-9, <http://hdl.handle.net/1765/357>

Teunter, L.H., *Analysis of Sales Promotion Effects on Household Purchase Behavior*, Promotors: Prof. dr. ir. B. Wierenga & Prof. dr. T. Kloek, EPS-2002-016-ORG, ISBN: 90-5892-029-1, <http://hdl.handle.net/1765/868>

Valck, K. de, *Virtual Communities of Consumption: Networks of Consumer Knowledge and Companionship*, Promotors: Prof.dr.ir. G.H. van Bruggen, & Prof.dr.ir. B. Wierenga, EPS-2005-050-MKT, ISBN 90-5892-078-X

Verheul, I., *Is there a (fe)male approach? Understanding gender differences in entrepreneurship*, Prof.dr. A.R. Thurik, EPS-2005-054-ORG, ISBN 90-5892-080-1

Vis, I.F.A., *Planning and Control Concepts for Material Handling Systems*, Promotors: Prof. dr. M.B.M. de Koster & Prof. dr. ir. R. Dekker, EPS-2002-014-LIS, ISBN: 90-5892-021-6, <http://hdl.handle.net/1765/866>

Vliet, P. van, *Downside Risk and Empirical Asset Pricing*, Promotor: Prof. dr. G.T. Post, EPS-2004-049-F&A ISBN 90-5892-07-55, <http://hdl.handle.net/1765/1819>

Waal, T. de, *Processing of Erroneous and Unsafe Data*, Promotor: Prof. dr. ir. R. Dekker, EPS-2003-024-LIS, ISBN: 90-5892-045-3, <http://hdl.handle.net/1765/870>

Wielemaker, M.W., *Managing Initiatives: A Synthesis of the Conditioning and Knowledge-Creating View*, Promotors: Prof. dr. H.W. Volberda & Prof. dr. C.W.F. Baden-Fuller, EPS-2003-28-STR, ISBN 90-5892-050-X, <http://hdl.handle.net/1765/1036>

Wijk, R.A.J.L. van, *Organizing Knowledge in Internal Networks: A Multilevel Study*, Promotor: Prof. dr. ing. F.A.J. van den Bosch, EPS-2003-021-STR, ISBN: 90-5892-039-9, <http://hdl.handle.net/1765/347>

Wolters, M.J.J., *The Business of Modularity and the Modularity of Business*, Promotors: Prof. mr. dr. P.H.M. Vervest & Prof. dr. ir. H.W.G.M. van Heck, EPS-2002-011-LIS, ISBN: 90-5892-020-8, <http://hdl.handle.net/1765/920>

Ambidextrous Organizations

A Multiple-level Study of Absorptive Capacity, Exploratory and Exploitative Innovation, and Performance

Balancing and synchronizing exploration and exploitation is fundamental to the competitive success of firms in dynamic environments. Despite the importance of reconciling exploration and exploitation within organizations, however, relatively little empirical research has examined this challenge facing numerous organizations. This study develops a multi-level framework and explores how ambidextrous organizations can successfully cope with both types of innovations across organizational units. It not only examines performance implications of organizational ambidexterity, but also investigates how organizational units develop exploratory and exploitative innovations. Results indicate that the most effective ambidextrous organizations balance exploratory and exploitative innovation by separating both types of activities in different organizational units. Moreover, findings demonstrate that organizational units require different types of combinative capabilities to influence their absorptive capacity, and subsequently, their exploratory and exploitative innovations.

ERIM

The Erasmus Research Institute of Management (ERIM) is the Research School (Onderzoekschool) in the field of management of the Erasmus University Rotterdam. The founding participants of ERIM are RSM Erasmus University and the Erasmus School of Economics. ERIM was founded in 1999 and is officially accredited by the Royal Netherlands Academy of Arts and Sciences (KNAW). The research undertaken by ERIM is focussed on the management of the firm in its environment, its intra- and inter-firm relations, and its business processes in their interdependent connections.

The objective of ERIM is to carry out first rate research in management, and to offer an advanced graduate program in Research in Management. Within ERIM, over two hundred senior researchers and Ph.D. candidates are active in the different research programs. From a variety of academic backgrounds and expertises, the ERIM community is united in striving for excellence and working at the forefront of creating new business knowledge.