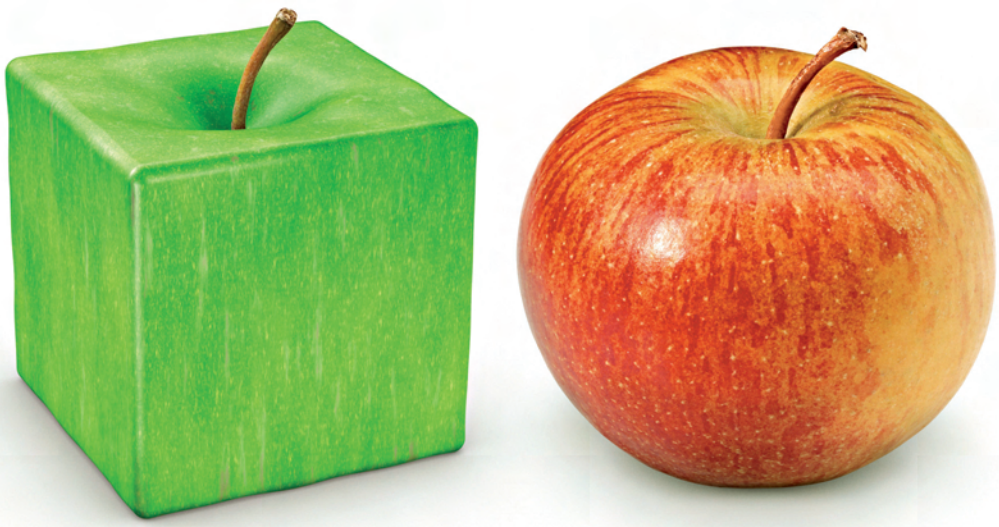
MICHIEL TEMPELAAR

Organizing for Ambidexterity

Studies on the Pursuit of Exploration and Exploitation through Differentiation, Integration, Contextual and Individual Attributes



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Organizing for Ambidexterity: Studies on the pursuit of exploration and exploitation through differentiation, integration, contextual and individual attributes

Het organiseren van ambidexteriteit: onderzoek naar het nastreven van exploratie en exploitatie door differentiatie, integratie, contextuele en individuele attributen

Thesis

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born in *Groningen, The Netherlands*

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Preface

This thesis is about combining exploration and exploitation. At first glance, they seem different as apples and oranges. However, to reap the benefits you are required to think of exploration and exploitation as something more similar, perhaps only different in color and shape.

At the start of my PhD-trajectory I felt something akin to being an apple in an environment of oranges, a bit of a strange fruit. Having worked for a company for a couple of years after my studies, a lot of things in the academic world made little sense to me. Now, four years later, some of these things and I have become intimately acquainted, while some others seem to make even less sense than they did in the beginning… Still, I look back at this first period as a PhD as extremely motivating. It was a period of getting to know the 'colors and shapes' of academia. It has led me to believe that feeling out of your depth every now and then is very healthy and inspiring.

As the newness of that first period wore off, it was slowly replaced by other inspirational sources, some of which require special mention here. First of all, Frans and Henk, thanks for providing me with the platform to develop my ideas as well as guidance into the academic world. In line with Desiderius Erasmus' words: "If you keep thinking about what you want to do or what you hope will happen, you don't do it, and it won't happen", I have to thank you for helping me make it happen.

Thanks for making the past four years as pleasant as possible: Pep, Henri, Vares, Annelies, Jurriaan (JJ), Jane, Flore, Koen, Woody, "the PhD-boys", the secretariat and other colleagues at the department and RSM in general. In this respect, also a thank you to the good people I've met during conference visits, courses, and seminars, especially those I've come to think of as friends.

A special mention should go to Justin. Without the magic words: "Why don't you do something nice wih these data, you have 6 weeks until the submission deadline", I would not be where I am now. Also, I would've missed out on many heated, caffeine-fueled debates. I appreciate everything you have done for (and with) me.

PJ, we've spend most of the past four years in either a small office, small hostel-room, or a small tent (sorry about that one). The simple fact that, despite all this, we're still on excellent terms says enough. Even though, in many ways, we're as different as they come, we share an appreciation for the less obvious aspects of life.

One of the greatest experiences during my PhD must have been doing research in collaboration with a company. The fact that this company is organized in a way that resonates many of my ideas and viewpoints, makes it even more special. I would like to thank everyone there for their time, transparency, candor, and interest in my ideas. Wim, Ton, and Fokke, thanks for throwing the door wide open. I feel that our meetings were always fruitful and thought-provoking, and this is in no small part due to your engagement and open-mindedness. If your ideas on self-management and entrepreneurship would be adopted by every company, in my view, the corporate world would be far better off.

In spirit of the notion that "the truth is never told during the nine-to-five hours" (Hunter S. Thompson), I want to thank some people outside the office as well. To my friends in Amsterdam, and to those who erroneously decided to move or to never go there in the first place: thanks for being there for me. My experiences with you in music, sports, games and other get-togethers made many of my research ideas on social interaction seem more tangible and relevant. I also want to thank my (extended) family for their support and interest in my work (thanks dad, for the great feedback!). Finally, Marlies, your patience with me never ceases to amaze me. We shared a lot together, and I hope we'll get to share much more.

So there you have it, my dissertation, or, dare I say, the result of coloring and shaping myself into something more similar to an academic.

Michiel Tempelaar

Rotterdam, January 2010

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1 Introduction

My name is Ambidexter. I signifie one
That with both hands finely can play;
Now with King Cambises, and by-and-by gone.
Thus doo I run this way, and that way.

(Preston, T. (1569), 150)

Ambidexterity is a topic of interest to a wide variety of disciplines. Coming from the medieval-Latin 'ambidexter', translating into 'two right hands', it can have three meanings: using both hands with equal ease, being characterized by duplicity or double-dealing, or being unusually skillful or versatile (Merriam-Webster 2009).

The first meaning, using both hands with equal ease, has puzzled neuroscientists for a long time. While there are motoric benefits to being ambidextrous, there has been some evidence that it may come with lower cognitive ability (Crow et al. 1998; Peters et al. 2006). Ambidextrous individuals fail to develop dominance of either the left- or right-hand side of the brain, leading to 'hemispheric indecision' (Crow et al. 1998). Cognitive tasks are associated with certain distinct domains within the brain (Annett 1993; Henschen 1924), and failure to establish dominance may lead to coordination problems when trying to appeal to those sections.

In medieval law practice, the term was used for lawyers that switched sides within the same litigation or accepted bribes from both plaintiff and defendant (Rose 2000). When found out, they were usually facing long-term imprisonment or even death penalty. Following this notion, in early English literature, it was used for duplicity, or 'double dealing' (Wentersdorf 1981). Ambidextrous characters are able to combine an honest face with insidious deeds behind the scenes in such a way that it is very difficult to discover their true intent. However, near the end such characters are usually uncovered, to their swift demise.

Regarding the final definition, both aforementioned examples do not preclude that the semantic definition of skillfulness and versatility and the consequential flexibility are the positive side of ambidexterity, rather, they point at the difficulty of developing and maintaining it. Both examples provide grounds for skepticism towards the cost-benefits ratio for ambidextrous individuals as ambidexterity involves combining antagonistic, contradictory elements. While ambidextrous individuals, both in the neuro-scientific and literary sense, are able to perform feats that their single-handed counterparts cannot, they struggle with trade-off

decisions that increase coordination costs or uncertainty of the outcomes of their actions. Table 1.1 summarizes these insights.

Table 1.1 Three meanings and consequences of ambidexterity

Area of interest	Meaning	Consequence	Insights
Neurosciences	Using both hands with equal ease	Coordination problems, resulting in lower cognitive ability	Tension calls for high coordinative skills
Law/literature	Characterized by duplicity or double-dealing	High chance of being found out, resulting in capital punishment	If not done right, low payoff
Semantic	Being unusually skillful or versatile	Flexibility	Potential benefits include adaptive ability

In research in management, ambidexterity has evolved into a major line of inquiry (Gupta et al. 2006; Raisch and Birkinshaw 2008). The conceptual origins of ambidexterity point towards the existence of trade-offs similar to those mentioned in table 1.1. These trade-offs challenge the realization of optimal outcomes (March 1991). This is in stark relief to the contemporary view where the trade-off is often viewed as a paradox that can be transcended to obtain superior outcomes (Poole and Van de Ven 1989). Organizational ambidexterity is considered not only beneficial but in the longer run even essential for organizations to survive (Tushman and O'Reilly 1996). Empirically, this notion has also received ample attention (Adler et al. 1999; Andriopoulos and Lewis 2009; Atuahene-Gima 2005; He and Wong 2004; Jansen et al. 2005a; Lubatkin et al. 2006). Given this development towards a synergistic, paradoxical view of ambidexterity, the central question in this introductory chapter is:

How did research in management come to perceive organizational ambidexterity as a synergistic phenomenon?

To put things in perspective and gain deeper understanding of the interplay between exploration and exploitation to achieve ambidexterity, we will try to pinpoint where the contemporary idea of organizational ambidexterity is similar or different from the original concepts that it refers to. Section 1.1 provides an overview of exploration and exploitation, constructs that are closely tied to the idea of organizational ambidexterity. Section 1.2 will describe how organizations are able to become ambidextrous by overcoming the underlying tensions that arise when putting exploration and exploitation to joint effect. To structure this section we will describe organizational ambidexterity as an input-process-output (IPO) model (Simsek 2009, see figure 1.1 for an illustration). In the input-phase (sub-

section 1.2.1), organizations seeking to become ambidextrous are mostly involved in structuring for resource allocation. The process phase (sub-section 1.2.2) is where organizational members create value from dispersed allocated resources to create synergistic, sustainable output (sub-section 1.2.3) that surpasses the sum of resources and actors involved.

Figure 1.1 An input-process-output model of organizational ambidexterity

(adapted from Simsek 2009)

Finally, in section 1.3, we will provide the contributions and research aim of the dissertation followed by an overview of the studies that make up the body of this dissertation.

1.1 The challenge of balancing exploration and exploitation

Firms that want to enjoy a superior ability to adapt to changing environmental conditions while at the same time being able to better act upon the existing business-environment, need to strike a balance between exploration and exploitation (O'Reilly and Tushman 2008; Raisch and Birkinshaw 2008). The concepts exploration and exploitation were introduced into the management literature by James March (1991). Exploration in his definition is about "…search, variation, risk taking, experimentation, play, flexibility, discovery, innovation." (1991: 71), whereas he describes exploitation as associated with "…refinement, choice, production, efficiency, selection, implementation, execution." (1991:71). Central to his argument is the idea that adaptive processes benefit from an interaction between exploration and exploitation. This idea was not new at the time. Research in evolutionary computation has been discussing the challenges and benefits of balancing exploration and exploitation for a while (Holland 1975). Interestingly, in this line of research the balancing of exploration and exploitation has been positioned as being a prisoner's dilemma (Holland 1992): a solution were the parties involved are benefitting most from a suboptimal choice (Axelrod 1984). Figure 1.2 illustrates this suboptimal payoff structure when balancing exploration and exploitation.

Figure 1.2 An illustration of the prisoners' dilemma when developing exploration and exploitation strategies

Strategy	Exploration cooperate	Exploration compete
Exploitation cooperate	3/3[a]	0/5
Exploitation compete	5/0	1/1

[a] numbers represent pay-off structure for joint strategies

(Adapted from Holland 1975)

The idea is that both exploration and exploitation contribute to the profit of a larger system. Exploratory and exploitative bodies within this system have the choice to compete or cooperate with each other. As is shown in figure 1.2, choosing a competitive stance has the potential to result in lower profits for the system than would a cooperative choice. However, for exploration and exploitation separately, cooperative payoff is significantly lower. This suboptimal payoff represents a trade-off between exploration and exploitation that is not only a choice for the better but also a choice out of necessity. Without cooperation, the pay-off would be higher, but when repeating the 'game' a beforehand unknown amount of times, the system would die out due to subsequently vastly inferior outcomes, owing to incentives to not seek out a cooperate between exploration and exploitation. Parties involved will start to compete instead of cooperate and receive the lowest outcomes.

The main reason to engage in both exploration and exploitation is to escape from path dependent forces that pushes systems towards an overall suboptimum (Kauffman 1993; Michalewicz and Fogel 2000). The paradox is that this can be achieved by actively seeking out suboptimal strategies that provide lower payoff for exploratory and exploitative bodies in a static situation (i.e. cooperation between exploration and exploitation, or 'balancing'), but yield additional benefits when incorporating a dynamic perspective.

A second important step in describing adaptive processes from an evolutionary perspective involves the creation and maintenance of so-called crossovers, interactions between separate strings, such as exploratory and exploitative ones, that create 'offspring', or a combination of the separate strings that will form the basis for following evolutionary steps (Holland 1992). It is through this interaction that a system can evolve and grow in ways that deviate from the initial evolutionary path of the system (De Jong 1988).

A final point can be made about the term ‘balancing’, which implies a trade-off. This trade-off lies within the fact that exploration and exploitation compete for scarce resources (March 1991; Uotila et al. 2009), be it time, space, funding, attention, effort and so forth. However, balancing does not imply that these resources should be evenly divided among exploration and exploitation. In fact, a major influence on evolution in evolutionary computation comes from the internal competition between the two alternatives at each evolutionary step (Holland 1992). This means that the optimal distribution of exploration and exploitation can change with each of those steps; it is dependent on situational, external factors. Table 1.2 captures the most salient insights from the evolutionary fundamentals of exploration and exploitation.

Table 1.2 Insights from evolutionary computation regarding the balancing of exploration and exploitation

Insight	Explanation
Balancing exploration and exploitation	Exploration and exploitation by themselves are less useful, it is through their balancing and interacting that they add value in helping a system adapt and change (De Jong 1988)
Environmental influence	Resource allocation between exploration and exploitation occur in accordance with external demands (Michalewicz and Fogel 2000)
Dynamic perspective	Without incorporating a dynamic perspective (i.e. taking a static point of view), either exploration or exploitation is a sound strategy (Holland 1992)

The trade-off where exploration and exploitation compete for resources, requires a cooperation strategy to make balancing exploration and exploitation work dynamically. In management science, however, this trade-off thinking has evolved into paradoxical or orthogonal thinking (Poole and Van de Ven 1989). Combining and integrating exploration and exploitation can create synergies that lead to superior long-term profitability (He and Wong 2004), which in economic terms is an optimal outcome. The ability of firms to combine high levels of exploration and exploitation in order to exploit their synergies is also known in the management literature as organizational ambidexterity (Tushman and O’Reilly 1996).

1.2 Becoming ambidextrous through differentiation and integration of exploration and exploitation

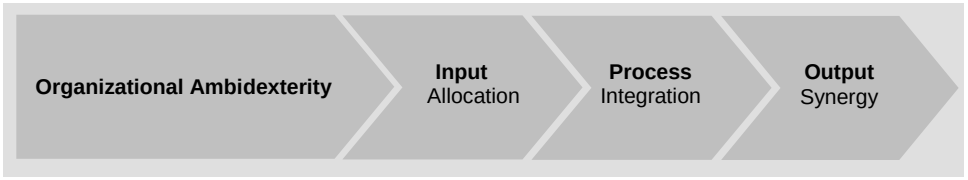
In the modern business world, firms seeking sustained performance and survival benefit from the development of ambidexterity (Gupta et al. 2006; O'Reilly and Tushman 2008; Raish and Birkinshaw 2008). Research has shown that ambidextrous organizations outperform firms with a single sided approach (He and Wong 2004; Lubatkin et al. 2006), owing to an increased pace of competition (Raisch and Birkinshaw 2008), and high environmental dynamism (Jansen et al. 2005a). The current business climate is such, that being able to adapt to environmental shifts in a timely fashion is not only beneficial, it has become a necessity (Volberda 1998). However, to realize ambidexterity, firms need to cope with a paradox: while exploration and exploitation differ in terms of organizing, culture, and outcome, they need to be combined to reap the benefits (Smith and Tushman 2005).

Exploration requires a loose form of organizing, a culture where creativity is stimulated, and the ability of appreciating longer-term and uncertain outcomes. Exploitation on the other hand, needs tight organization, an efficiency-minded culture, and a focus on short-term, predictable outcomes. When trying to combine them, a tension arises at the nexus of exploratory and exploitative activities (Andriopoulos and Lewis 2009).

Early research on organizational ambidexterity has acknowledged the need for organizations to develop versatility and skill to adjust to future environmental shifts combined with the ability to serve current demand. Yet it also appreciated the antagonistic nature of exploration and exploitation, and proposed to separate them over time, with coordination only at the shifts between exploratory and exploitative modes (Duncan 1976). More recent research on ambidexterity, however, has proposed and examined the ability of firms to pursue and integrate exploration and exploitation simultaneously (Tushman and O'Reilly 1996; Gibson and Birkinshaw 2004). Therefore, not only has research on organizational ambidexterity downplayed the notion that there is a potential risk that organizations end up 'stuck in the middle' (Porter 1980) when pursuing both exploration and exploitaton, it has also developed ideas revolving around reducing coordination costs by explicitly and concurrently integrating exploration and exploitation. Research that suggests exploration and exploitation are not orthogonal, and thus are the subject of a trade-off (Sidhu et al. 2007; Uotila et al. 2009), emphasizes resource allocation challenges within the firm. However, there is a difference in the input phase, where resource allocation and structuring are a main concern (O'Reilly and Tushman 2008), and the process and output phase, where the trade-off can evolve into synergy with exploration and exploitation

jointly contributing (Jansen et al. 2009). Figure 1.3 provides an overview of the evolution of research on organizational ambidexterity from its initial emphasis on the resource trade-off towards orthogonal, and, finally, synergistic thinking.

Figure 1.3 Studies on ambidexterity related to the process of creating ambidexterity, and trade-off versus orthogonal thinking[a]



Literature/approach	Trade-off thinking (emphasis on differentiation)	Orthogonal thinking (emphasis on integration)
Duncan 1976		
Burgelman 1983		
Adler et al. 1999		
Floyd and Lane 2000		
Benner and Tushman 2002		
Rivkin and Siggelkow 2003		
Gibson and Birkinshaw 2004		
He and Wong 2004		
Jansen et al. 2005a		
Atuahene-Gima 2005		
Lubatkin et al. 2006		
Atuahene-Gima and Murray 2007		
Lin et al. 2007		
Jansen et al. 2008		
Tiwana 2008		
Andriopoulos and Lewis 2009		
Jansen et al. 2009		
O'Reilly et al. 2009		

[a] Darkened areas represent a focus of the respective literatures on either trade-off thinking or orthogonal thinking. Also, the length of these darkened areas relate to the extent to which the studies describe input, process or output phases of ambidexterity.

Viewing the role of process as a value adding mechanism underlines an appreciation of the interaction and integration between organizational members

and units as a key driver for value that goes beyond the structuring and bundling of resources around the trade-off between exploration and exploitation (Gibson and Birkinshaw 2004). Through this process, tensions between exploration and exploitation can be transcended and bended towards synergy through differentiation and subsequent integration of exploration and exploitation (Jansen et al. 2009; Rivkin and Siggelkow 2003).

1.2.1 Input: Structural differentiation to increase local responsiveness and facilitate change

Earlier research on organizational structure has focused on structural differentiation, separating activities within the same organization, to shield them from tensions coming from other activities within the firm (Khandwalla 1977, Lawrence and Lorsch 1967, March and Simon 1958, Weber 1947). According to Blau (1970), differentiation can be on a functional basis, allowing each subdivision to concentrate on their respective task, or based on business areas, increasing each subdivision's responsiveness to their local task environment or client base. Furthermore, differentiation can be horizontal and vertical. The former implies co-specialization or structural separation in units, the latter decentralization or autonomy (Hage and Dewar 1973). By differentiating, organizations would be able to cope with a changing environment in a more efficient manner. Furthermore, Blau stated that predictable variations in differentiation would be a main component of reactions to change by organizations.

In a longitudinal test of Blau's theory of differentiation among universities, Cullen et al. (1986) found reactions to change unpredicted by Blau's theory. They conclude that structural differentiation is a theory of scale, in that it facilitates large scale operations, but not change *per se*. This indicates an overstatement of the importance of differentiation in early management research (Cullen et al. 1986).

1.2.2 Process: Integrating exploration and exploitation to achieve synergies

In a study of the automotive industry, Clark and Fujimoto (1991) emphasized the complementary nature of both production and development. They describe how successful organizations in the automotive industry succeeded in integrating activities across the traditional functional boundaries. Similar results were found in other contexts such as mainframe computing (Iansiti 1993), aircraft manufacturing (Adler 1995), and electronics (Kahn 1996). With these and other insights came the notion that the traditional strict separation of innovation, or R&D, and production

is perhaps not always the optimal solution to coordination challenges, or as Iansiti puts it: "Forget the old R&D pipeline. Companies that integrate new research with the existing manufacturing process can cut costs – and time" (1993: 138).

Such developments in research, coupled with a higher pace of competition in the business world, induced scholars to shift towards examining *combinations* of differentiation and integration (Dosi 1988, Hitt et al. 1993, Nelson 1986). Nowadays, old and new integration mechanisms are receiving much attention, such as knowledge management systems (Adler et al. 1999), social capital (Hansen 1999), incentive systems (Frow et al. 2005), cross-functional interfaces (Gupta and Govindarajan 2000), and the use of ICT as enabling tools for coordination (Malone and Crowston 1994). New organizational forms, such as the network-organization or the virtual organization, explicitly cut across or blur hierarchical boundaries, and place even more emphasis on integration mechanisms.

In the perspective of balancing exploration and exploitation as a prisoner's dilemma (section 1.1), coordination and communication can induce cooperation strategies (i.e. see Figure 1.1). Kogut and Zander (1992) describe how focal rules embedded in institutions provide powerful tools to come to an equilibrium in game theoretic sense. William Poundstone (1992) narrates how in New Zealand, even though newspaper boxes were left unlocked, no one stole them (the cooperative option in the prisoner's dilemma game). There seemed to be a widespread believe that stealing newspapers from those boxes would hurt the whole community when everybody would do so (mutual competition). Because this prisoner's dilemma game is simultaneous, there is a non-causal way of thinking involved in this reasoning. This is referred to as 'magical thinking' by Poundstone (1992), as it is not expressed in any formal or otherwise explicit form. This is an example of how a culture or context can induce values and behavior beneficial for a larger system (Axelrod 1997).

The same logic can be applied to the challenge of integrating exploration and exploitation. Through coordinating and integrating separate exploration and exploitation processes, organizations can create a context within which a balanced and synergistic approach may arise. By fostering among organizational members a focus on the overarching goals of the organization or integrative effort (Gittell 2002), and insight in the workings and challenges of the opposite exploratory or exploitative activities (Andriopoulos and Lewis 2009), they may develop the necessary mindset to overcome their differences (Smith and Tushman 2005). Only when this mindset is present, can integration lead to synergy (Lewis 2000). To conclude, integration is a crucial and necessary step in the pursuit of ambidexterity.

1.2.3 Output: transcendence of the exploration-exploitation paradox to create synergistic outcomes

Whereas the origins of exploration and exploitation point to the existence of a prisoner's dilemma (Holland 1975), management science has posited that in organizational practice, this need not be the case. Although exploration and exploitation appear at odds with each other in terms of organizing, mindset and knowledge requirements, superior synergistic outcomes can be achieved through combinations of exploration and exploitation. However, this requires firms and their members to be proficient in handling tensions between exploration and exploitation, which presents firms and their members with a paradox (Andriopoulos and Lewis 2009, Benner and Tushman 2003, Gupta et al. 2006, Smith and Tushman 2005). The term paradox refers to a very specific contradictory relationship:

> *"contradictory, mutually exclusive elements that are present and operate equally at the same time. Paradoxes differ in nature from other similar concepts often used as synonyms such as dilemma, irony, inconsistency, dialectic, ambivalence, or conflict. (…) Paradox differs from each of these concepts in that no choice need be made between two or more contradictions. Both contradictions in a paradox are accepted and present. Both operate simultaneously."* (Cameron 1986: 545)

A paradox, or an 'and-and situation' (Poole and Van de Ven 1989) differs markedly from a dilemma, the 'either-or-situation' where one alternative must be selected over another (Cameron 1986). Organizational researchers have applied the idea of paradox to a variety of subjects, such as organizational change (Cameron 2008), organizational effectiveness (Quinn and Rohrbaugh 1983), and financial performance (Schulte et al. 2009). The common denominators among these studies are the ideas that to apply paradoxes to create value, a balanced approach towards the contradictory elements may be beneficial and that the outcome of such an approach is superior to a one sided approach (Cameron 2008, Slaatte 1968).

The approach of transcending paradoxes, rather than merely accepting or confronting tensions, is the preferred approach for putting paradoxes to positive effect (Lado et al. 2008). Transcendence of paradoxes requires members to critically examine their entrenched assumptions (Denison et al. 1995), because:

> *"critical self- and social reflection might help actors reframe their assumptions, learn from existing tensions, and develop a more complicated repertoire of understandings and behaviors that better reflects organizational intricacies. (..). Such reframing marks a dramatic change in the meaning attributed to a situation as paradoxical tensions become viewed as complementary and interwoven"* (Lewis 2000: 764).

In order to transcend the exploration-exploitation paradox, organizational members need to be able to develop a deep understanding of the workings and challenges of both exploratory or exploitative activities to be able to reflect on their own activities in a critical manner (Andriopoulos and Lewis 2009). Therefore, firms need to stimulate a positive learning environment, where information flows freely across exploratory and exploitative boundaries, and, rather than viewing exploration and exploitation as opposites, members are inclined to seek out common grounds and pursue collective goals (Gittell 2002).

This marks the importance of integration mechanisms in the process of achieving ambidexterity. The insights in exploration and exploitation from evolutionary computation (paragraph 1.1) provide the notion that through both balancing and interacting, a system can undertake steps that enable it to prolong its current evolutionary path while also being able to shift towards other paths. Also, this combination of balancing and interacting between exploration and exploitation is necessary because 'games' are dynamic. These ideas translate directly into managerial insights for organizational ambidexterity.

While differentiation by itself may help create operational capabilities within organizations that are beneficial for either exploration or exploitation (Gilbert 2006), it is through the integration of exploration and exploitation that value is created (O'Reilly and Tushman 2008). Research on dynamic capabilities acknowledges this by stating that dynamic capabilities are embedded in the way organizations integrate, build, and recombine competences across boundaries (Eisenhardt and Martin 2000; Jansen et al. 2009; Teece et al. 1997). This notion is fundamental to long term competitive advantage (Henderson and Cockburn 1994; Kogut and Zander 1992). Organizational ambidexterity, then, refers to

> *"the routines and processes by which organizations mobilize, coordinate and integrate dispersed exploratory and exploitative efforts, and allocate, reallocate, combine and recombine resources and assets across differentiated units"* (Jansen et al. 2009: 799).

How organizations shape both differentiation and integration, however, is incumbent upon contextual factors (Martinez and Jarillo 1989; Lawrence and

Lorsch 1976). There are two perspectives on how organizations can shape ambidexterity: structural and contextual ambidexterity (Raisch and Birkinshaw 2008). Research on structural ambidexterity places a heavy emphasis on the structural separation (i.e. the creation of subunits) of exploration and exploitation at the lower levels of an hierarchy and on limited integration at the top management level (O'Reilly and Tushman 2008; Tushman and O'Reilly 1996). By separating contradictory processes and architectures among groups or individuals, organizations are able to mitigate some of the tension that arises when seeking to become ambidextrous (Gupta et al. 2006).

Research on contextual ambidexterity proposes that exploration and exploitation can be jointly pursued within the same domain (i.e. an organizational subunit). It contends that high levels of exploration and exploitation can be achieved by creating a coercive context that stimulates organizational members to divide their attention among both exploration and exploitation (Gibson and Birkinshaw 2004). Effectively, contextual ambidexterity implies informal differentiation of exploration and exploitation among individuals.

A distinction between formal and informal mechanisms can also be applied to the integration of exploration and exploitation. Depending on circumstances, organizations may choose to create formal integration mechanisms such as group contingency reward systems (Wageman 1995), cross-functional interfaces (Hage and Aiken 1967), (de)centralization (Ghoshal et al. 1994), or procedural formalization (Duncan 1976). Or organizations can stimulate informal integration mechanisms such as behavioral integration (Lubatkin et al. 2006), connected internal networks (Borgatti and Foster 2003), trust (Leana and Pil 2006), or a shared vision (Jansen et al. 2008).

Such distinctions notwithstanding, ambidexterity, in whatever shape or form, requires careful management of allocation of resources through differentiation (input) and integration (process) to create superior, synergistic outcomes (output).

1.3 Research Aim and Outline of the Dissertation

1.3.1 Contributions and research aim

The preceding paragraphs provide some insights that warrant further investigation. Furthermore, some gaps in past research can be identified. Given these relevant insights and observed gaps, this dissertation intends to contribute the ambidexterity literature in the following ways (the intended contributions are summarized in table 1.3).

Firstly, there appears to be a both sufficient and necessary relationship between structural differentiation and integration mechanisms to create and sustain organizational ambidexterity. This dissertation provides further inquiry into the relationship between differentiation and integration in view of ambidexterity (contribution 1).

Secondly, while studies have examined relationships between hierarchical levels and type of integration mechanisms (Daft and Lengel 1986; Egelhoff 1991), there is some debate in ambidexterity research as to at what level and how exactly ambidexterity can manifest itself (Gibson and Birkinshaw 2004; O'Reilly and Tushman 2008). In this dissertation, a distinction is made among mechanisms at various organizational levels that work differentially towards ambidexterity (contribution 2).

Thirdly, a social context is of major influence on the ability to become ambidextrous (Gibson and Birkinshaw 2004), yet relatively few studies have actually studied this influence (*cf.* Adler et al. 1999, Atuahene-Gima 2005). This gap is addressed by highlighting the importance of informal, contextual mechanisms to become ambidextrous throughout this dissertation (contribution 3)

Fourthly, the need to balance exploration and exploitation at high levels is co-dependent on environmental factors (Jansen et al. 2005a). While research on ambidexterity has examined the influence of environmental factors on the relationship between organizational ambidexterity and performance (He and Wong 2004; O'Reilly et al. 2009), research to date has not examined the role of the external environment in *becoming* ambidextrous. In this dissertation, this aspect is incorporated by investigating the effects of a firm's permeability with the external environment on its ability to become ambidextrous (contribution 4).

Finally, while it is stated that there are multilevel interaction effects guiding ambidexterity and outcomes (Raisch et al. 2009), research in ambidexterity typically focuses on individual and unit level (Andriopoulos and Lewis 2009; Mom et al. 2009), top management level (Lubatkin et al. 2006; Smith and Tushman 2005), or firm level (Benner and Tushman 2002; He and Wong 2004)

Table 1.3 Contributions of the studies in this dissertation

Nr	Contribution	Description	Study	Prior research examples
1	Further examination of the relationship between differentiation and integration in light of ambidexterity	Previous research has emphasized the importance of structural differentiation, with integration having enhancing, positive effects. In this dissertation, it is proposed that the relationship between differentiation and integration is such that both play an equal role in becoming ambidextrous. Thus, integration is not merely enhancing, but necessary to achieve ambidexterity.	1	Benner and Tushman 2003 Golden and Ma 2003 Hage and Dewar 1973 Lawrence and Lorsch 1967 Tushman and O'Reilly 1996
2	Distinguishing between mechanisms at various organizational levels that work differentially towards ambidexterity	Previous research has asserted the workings of different mechanisms at different levels working towards ambidexterity. yet examine these mechanisms at single levels of analysis. In this dissertation, multiple mechanisms are tested simultaneously at their appropriate levels, allowing for comparison across levels.	1,3	Floyd and Lane 2000 Jansen et al. 2006 Mom et al. 2009 O'Reilly and Tushman 2008 Smith and Tushman 2005
3	Highlighting the importance of informal, contextual mechanisms to become ambidextrous	Previous research has shown the influence of contextual, informal mechanisms, even when structurally separating exploration and exploitation, Yet relatively few studies have explicitly studied informal mechanisms and social context as antecedents of ambidexterity. The studies in this dissertation compare informal to formal mechanisms, or extent our knowledge of specific informal and social context variables.	1,2,3	Adler et al. 1999 Gibson and Birkinshaw 2004 Atuahene-Gima 2005 Gupta et al. 2006 Raisch and Birkinshaw 2008
4	Investigating the effects of a firm's permeability with the external environment on its ability to become ambidextrous	Most studies on ambidexterity have indicated the influence of the environment in the relationship between ambidexterity and performance. However, research on innovation has also proposed an enhancing influence of external relationships on firm innovative ability. This notion is addressed by linking such relationships to the ability of firms to become ambidextrous.	2	Danneels 2003 Grant and Baden-Fuller 2004 He and Wong 2004 Jansen et al. 2005a Raisch et al. 2009
5	Understanding the multilevel and nested nature of the methods firms may employ to become ambidextrous	To date, no studies have empirically examined the impact of nested, multilevel antecedents of ambidexterity. Most studies on ambidexterity however, have addressed the importance of such an approach, or have developed multilevel conceptual models. This gap is delved into by testing a multilevel model of determinants of ambidexterity.	3	Gupta et al. 2006 March 1991 Raisch and Birkinshaw 2008 Siggelkov and Rivikin 2003 Simsek 2009

separately. In this dissertation, we intend to develop a more comprehensive approach. This is addressed by providing evidence on the workings of mechanisms that help create ambidexterity crossing multiple levels of analysis, thus contributing to our understanding of the multilevel and embedded nature of the methods firms may employ to become ambidextrous (contribution 5).

Given the different intended contributions, this dissertation aims to accomplish the following:

> *To gain insight in the way organizations may shape their pursuit of organizational ambidexterity, by managing differentiation and integration across multiple organizational levels and contexts, in accordance with both internal and external demands.*

1.3.2 Outline of the dissertation

The body of this dissertation consists of three studies. In this section, each study is concisely introduced and an overview is presented within which each study is positioned and compared.

The three studies in this dissertation appreciate the paradoxical nature of integrating exploration and exploitation to achieve ambidexterity, and propose and test antecedents that have distinct influences on the way firms can achieve integration of exploration and exploitation. Yet they differ in their level of analysis, focus or theoretical grounding. See figure 1.4 for a summary of the studies and their approach.

1.3.2.1 Study 1

In the first study, *"Structural Differentiation and Ambidexterity: The Mediating Role of Integration Mechanisms"*, we examine the role that both differentiation and integration play in creating a dynamic capability that governs the ability of firms to create and maintain ambidexterity. We refine conceptions of the interrelationship between differentiation and integration, by proposing and testing integration mechanisms as mediators of the differentiation-ambidexterity relationship. Furthermore, we distinguish between both the top management level and organizational level, and formal and informal integration mechanisms (see figure 1.5).

Figure 1.4 Three studies on ways of achieving ambidexterity

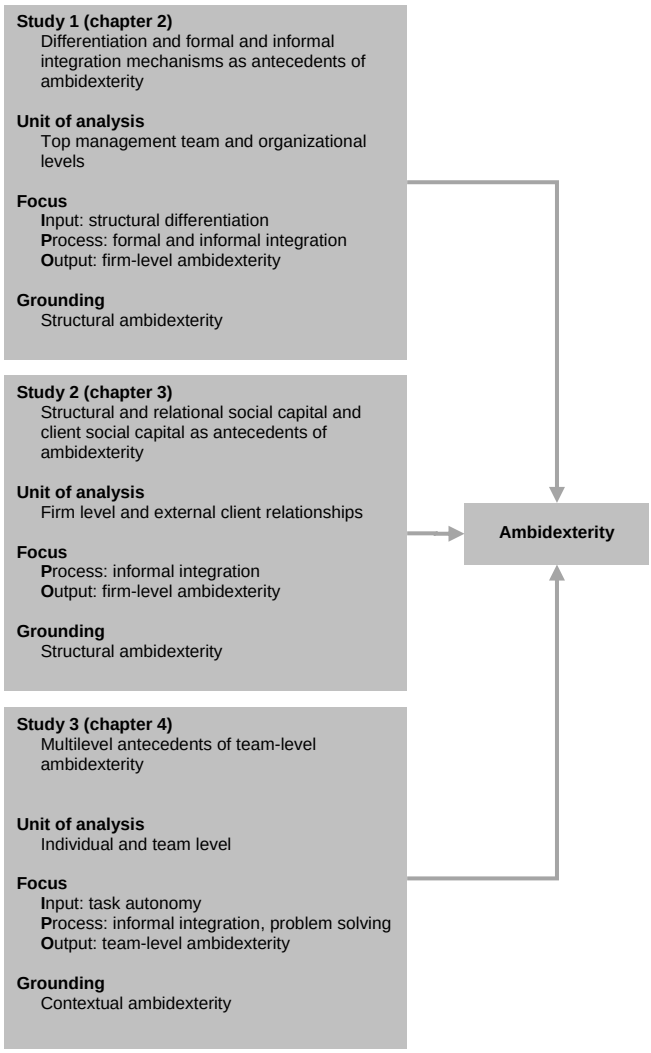


Figure 1.5 Construct type and levels of analysis in study 1

	Formal integration	Informal integration
Top management level	Group contingency rewards	Social Integration
Organizational level	Cross-functional interfaces	Connectedness

The central thesis in this study is that differentiation and integration are proportionally related to each other when organizations seek to become ambidextrous, meaning that each level of differentiation should be followed by a certain level of integration. The nature of this relationship constitutes a mediation model with integration mechanisms mediating the structural differentiation-organizational ambidexterity relationship. We find evidence for the in sub-section 1.3.1 mentioned relationship between hierarchical level and type of integration mechanisms (contribution 2): at the top-management level informal integration in the form of top management team social integration has a significant mediating influence, whereas at the organizational level, cross-functional interfaces positively mediate the relationship between structural differentiation and ambidexterity. We find no evidence for senior team group contingency rewards. Finally, we find a separate, non-mediating influence of connectedness on organizational ambidexterity.

1.3.2.2 Study 2

The deviating influence of connectedness on organizational ambidexterity in study 1 provided an avenue for further investigation. In study 2, *"Embeddedness and Ambidexterity: The Joint Effect of Internal and External Social Capital"*, we examine joint effects of relational and structural social capital (i.e. trust and connectedness) on organizational ambidexterity. In addition, we incorporate the perspective that the ability to strike a balance between exploration and exploitation may be contingent on external factors (see section 1.1), and we examine how the effects of internal social capital are moderated by client social capital types (see figure 1.6).

Figure 1.6 Internal or external focus and social capital type in study 2

	Structural social capital	Relational social capital
Internal	Connectedness	Trust
External	Client networks	Client trust

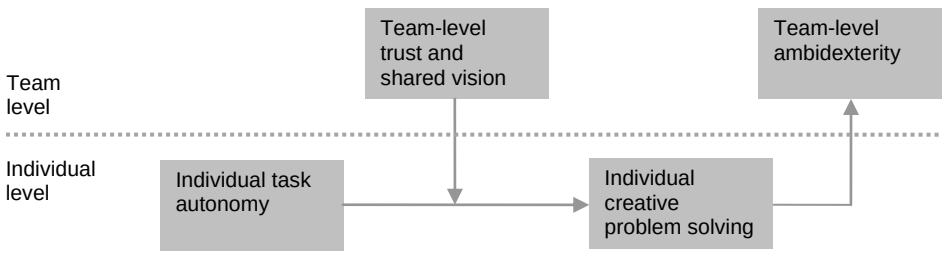
We conceptualize social capital as an organizational characteristic that is available to every individual organizational member (Adler and Kwon 2002). As such, it can have an influence on individuals across hierarchies and (structurally differentiated) organizational units. Furthermore, we forward that while the influence of client relationships as a source of innovation is a topic of debate (Danneels 2003; Fang 2008), this may be contingent on combinations of external and internal social capital types.

We find complementary relationships between different social capital types. For instance, internal trust is positively moderated by client structural capital. However, we also find a detrimental influence of client relational capital on the relationship between trust and organizational ambidexterity.

1.3.2.3 Study 3

The first two studies examine firm-level ambidexterity through integration mechanisms at the firm-level and top-management team levels of analysis. However, it would seem likely that there is a certain amount of interaction *between* levels next to interaction at the *same* level. Furthermore, organizational ambidexterity is not solely a firm- or top management team level phenomenon (Raisch and Birkinshaw 2008). In study 3, "*Ambidexterity in Self-Managing Teams: A Multilevel Analysis of Team and Individual Characteristics*", we therefore argue that both horizontal and vertical processes guide the ability to become ambidextrous (see also Mckelvey 2002), and conduct a multilevel study at the team and individual level. In this study, we argue that team-level context variables may shape individual-level abilities to engage in a certain level and an extent of creative problem solving that is beneficial to resolve the exploration and exploitation tensions at the team-level. This results in a model where both top-down and bottom-up influence are examined (see figure 1.7).

Figure 1.7 Multilevel relationships Between team and individual level in study 3



Furthermore, this study is done in a non-hierarchical environment, which provides for interesting avenues for discussion related to how transcendence of the exploration-exploitation paradox play out differently in such a context. For instance, we find a negative influence of trust on individual level variables. This highlights a distinction in context and in corresponding ways to realize ambidexterity, which will be touched upon at the end of this dissertation.

1.3.3 Data collection and statistical methods

The three studies in this dissertation represent different research questions that require different statistical methods and data sets. Study 1 and 2 pose general questions about ambidexterity, regardless of specific contexts. For these types of questions, a cross-sectional survey is appropriate. Study 3 however, attempts to develop a more fine-grained explanation of ambidexterity, crossing multiple levels of analysis, within a specific context. This demands a method that is sensitive towards the multilevel nature and data that facilitate such an analysis. In table 1.4 data collection procedures, employed statistical methods, and collected data characteristics are shown.

Table 1.4 Data collection, statistical methods, and data characteristics

Study	Data collection method[a]	Statistical methods	Data
1	Cross-sectional survey: Independent variables 2005 Dependent variable 2006	Ordinary Least Squares Structural Equation Modeling	230 firms • manufacturing (51.3%) • construction (16.5%) • financial services (7.8%), • other industries (24.3%)
2	Cross-sectional survey: Independent variables 2007 Dependent variable 2008	Ordinary Least Squares Structural Equation Modeling	343 firms • manufacturing (39.7%) • construction (18.4%) • financial services (13.1%) • other industries (28.9%)
3	Multilevel Survey: Independent variables 2008 Dependent variable 2009 Interviews	Ordinary Least Squares Hierarchical Linear Modeling	124 individuals in 30 self-managing teams within a consulting company 15 semi-structured interviews

[a] The years indicated refer to the data collection periods

1.3.4 Models, addressed aims, and main findings

Next to different methods, and data-sets, the studies also utilize different models, scopes and variables. For instance, study 1 utilizes a mediation model, whereas studies 2 and 3 examine moderation effects. In studies 1 and 2 the unit of analysis

is the firm, while study 3 spans both the team and individual level of analysis. Also, each study adresses a part of the general research aim of this dissertation. In table 1.5, these differences are summarized, jointly with the main findings.

1.4 Concluding Remarks

The ideas and aims presented in this introductory chapter provide a foundation for the body of this dissertation, which consists of chapters 2, 3 and 4. These chapters are self-contained, to the extent that they represent separate studies which are intended as individual contributions to the ambidexterity literature. As such, the introductory sections of each study may contain repetitions of the concepts and theoretical linkages presented in the previous chapter.

Finally, this dissertation will be concluded in chapter 5. In this chapter, the three studies will be put into perspective in a comprehensive discussion and evaluation of their contributions. Chapter 5 also provides some implications for practitioners, and some limitations and suggestions for further research.

Table 1.5 Overview of the three studies

Study	Model	Unit of analysis	Focus*	Adressed research aim	Variables	Main findings
1	Mediation of integration mechanisms in the relationship between differentiation and ambidexterity	Firm	IPO	Examining the relationships between differentiation and different types of integration mechanisms at different hierarchical levels of analysis	• Structural differentiation • Top-management team formal and informal integration • Organizational formal and informal integration	In the relationship between structural differentiation and organizational ambidexterity, informal integration mediates at TMT level, and formal integration at the organizational level.

2	Moderation of client social capital on the relationship between internal social capital and ambidexterity	Firm	PO	Examining the influence of the external environment on the ability to become ambidextrous	• Internal social capital
					  ○ Internal structural capital
					  ○ Internal relational capital
					• Client social capital
					  ○ Client structural capital
					  ○ Client relational capital
						Complementary and detrimental influence of client social capital on the relationship between internal social capital and organizational ambidexterity

3	Multilevel relationships between team-context, individual and task characteristics and team-level ambidexterity	Individual and team	IPO	Examining multilevel interaction between integration mechanisms to create ambidexterity at a lower level of analysis	• team-context variables
					  ○ Shared Vision
					  ○ Trust
					• Individual characteristics
					  ○ Task autonomy
						Negative moderation of trust due to groupthink and positive moderation of shared vision on the relationship between task autonomy and creative problem solving. Positive influence of individual level creative problem solving on team-level ambidexterity

[a] I= Input phase, P=Process phase, O=Output phase (see section 1.2)

2 Structural Differentiation and Ambidexterity: The Mediating Role of Integration Mechanisms[1]

Abstract

Prior studies have emphasized that structural attributes are crucial to simultaneously pursuing exploration and exploitation, yet our understanding of antecedents of ambidexterity is still limited. Structural differentiation can help ambidextrous organizations to maintain multiple inconsistent and conflicting demands; however, differentiated exploratory and exploitative activities need to mobilized, coordinated, integrated, and applied. Based on this idea, we delineate formal and informal senior team integration mechanisms (i.e. contingency rewards and social integration) and formal and informal organizational integration mechanisms (i.e. cross-functional interfaces and connectedness) and examine how they mediate the relationship between structural differentiation and ambidexterity. Overall, our findings suggest that the previously asserted direct effect of structural differentiation on ambidexterity operates through informal senior team (i.e. senior team social integration) and formal organizational (i.e. cross-functional interfaces) integration mechanisms. Through this richer explanation and empirical assessment, we contribute to a greater clarity and better understanding of how organizations may effectively pursue exploration and exploitation simultaneously to achieve ambidexterity

Keywords: Ambidexterity, dynamic capabilities, structural differentiation, formal and informal integration mechanisms, exploration and exploitation.

[1] This study has been published as: Jansen, J.J.P., Tempelaar, M.P., Van den Bosch, F.A.J., & Volberda, H.W. (2009). Structural Differentiation and Organizational Ambidexterity: The Mediating Role of Integration Mechanisms. *Organization Science*, Special Issue: Organizational Ambidexterity,Vol. 20(4), July-August

Firms are increasingly confronted with paradoxical challenges of exploiting existing competencies and exploring new ones (Vera and Crossan 2004). Not only do firms need to generate new knowledge associated with new products and services for emerging markets, they also need to leverage current competences and exploit existing products and services (Danneels 2002). Achieving long-term success requires a dynamic capability enabling firms to satisfy current demands while simultaneously being prepared for tomorrow's developments (Gibson and Birkinshaw, 2004). In this sense, prior literatures have argued that successful organizations are *ambidextrous* (Duncan 1976) - they generate competitive advantages through revolutionary *and* evolutionary change (Tushman and O'Reilly 1996), or exploratory *and* exploitative innovation (Benner and Tushman 2003; Jansen et al. 2006).

While most studies have focused on competitive benefits (Gibson and Birkinshaw 2004; He and Wong 2004), far less attention has been given to uncovering how firms achieve ambidexterity. Exploration and exploitation may require fundamentally different and inconsistent architectures and competencies that create paradoxical challenges. Whereas exploration has been associated with flexibility, decentralization, and loose cultures, exploitation has been related to efficiency, centralization, and tight cultures (Benner and Tushman 2003). Recently, studies are beginning to address organizational attributes such as structural differentiation (Gilbert 2005; Tushman and O'Reilly 1996) and organizational context (Gibson and Birkinshaw 2004) that enable firms to balance these conflicting demands and to achieve ambidexterity. However, there is little evidence about the role of structural differentiation and integration in ambidextrous organizations. Yet, scholars have emphasized that both attributes are core elements in the ability of firms to pursue exploratory and exploitative activities simultaneously (Siggelkow and Levinthal 2003; Tushman and O'Reilly 1996). In this study, we conceptualize organizational ambidexterity as an organizational-level dynamic capability and argue that structural differentiation and integration play a crucial role in a firm's ability to pursue exploratory and exploitative innovation concurrently.

This study adds to the emerging dialog on organizational attributes of ambidexterity in at least three important ways. First, by recognizing organizational ambidexterity as a dynamic capability we argue that it refers to the routines and processes by which ambidextrous organizations mobilize, coordinate and integrate dispersed contradictory efforts, and allocate, reallocate, combine and recombine resources and assets across differentiated exploratory and exploitative units (O'Reilly and Tushman 2007; Teece 2007). We argue that organizations need to develop such a dynamic capability that enables them to implement effective ways of achieving ambidexterity. Our study broadens the conceptual interpretation of organizational ambidexterity and suggests that it is difficult to achieve but rare and

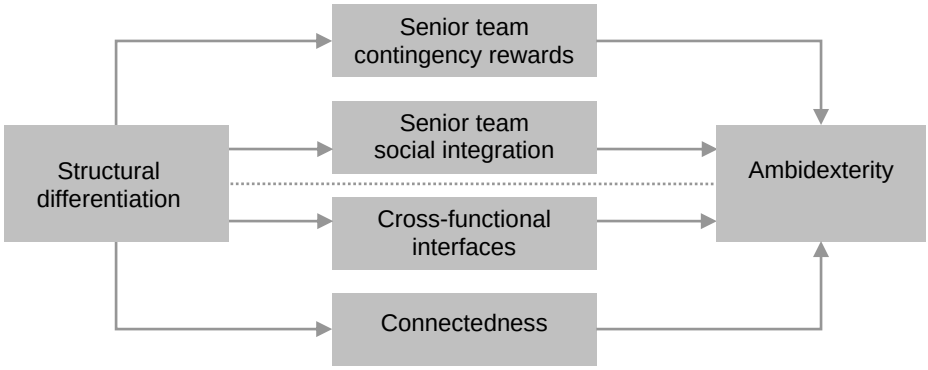
not easily imitated and provides organizations with competitive advantages over time (Barney 1991). In this way, we contribute to recent research linking the dynamic capabilities framework to organizational ambidexterity (O'Reilly and Tushman 2007; Venkatraman et al. 2007).

Second, we provide new insights into the interrelationship between structural differentiation, integration, and ambidexterity. Structural differentiation, or the subdivision of organizational tasks into different units (Hall 1977; Lawrence and Lorsch 1967), can help ambidextrous organizations to maintain multiple competencies that address paradoxical demands (Gilbert 2005). It protects ongoing operations in exploitative units from interfering with emerging competences being developed in exploratory units. It ensures that exploratory units are able to enjoy the required freedom and flexibility to develop new products and services. While structurally differentiating exploratory and exploitative activities is important to reduce resource and routine rigidity (Gilbert 2005), ambidextrous organizations also need to facilitate collective action (O'Reilly and Tushman 2004). Hence, integrative efforts are a necessary step into appropriating the potential value embedded in spatially separated activities (Sirmon et al. 2007). We argue that achieving ambidexterity requires the subsequent integration and application of differentiated exploratory and exploitative efforts without corrupting the internal structures and processes within each unit's area of operation (Gilbert 2006; O'Reilly and Tushman 2007). Accordingly, our study examines how integration mechanisms mediate the relationship between structural differentiation and achieving ambidexterity.

Third, scholars have acknowledged the importance of different types of integration mechanisms for becoming ambidextrous. For instance, previous research has suggested that ambidextrous designs involve differentiated organizational units and tight senior team integration (Benner and Tushman 2003; Tushman and O'Reilly 1996). Senior team integration contributes to balanced resource allocation and establishes cross-fertilization across exploratory and exploitative activities (Jansen et al. 2008; Smith and Tushman 2005). Other studies, however, have argued that ambidextrous organizations need to use formal and informal integration mechanisms to increase knowledge flows across differentiated exploratory and exploitative units (Gilbert 2006; Westerman et al. 2006). Such organizational integration mechanisms create permeability and enable organizations to obtain and apply strategically valuable combinations. Until now, the relative influence of senior team integration and organizational integration mechanisms is still unclear and scholars have called for more research in this area. Our study distinguishes between *senior team* and *organizational integration mechanisms* and investigates how these specific types of integration mechanisms mediate the relationship between structural differentiation and ambidexterity.

In the next section, we present the theoretical review and hypotheses underlying our research model as presented in figure 2.1. Then, we present the empirical findings using data from 230 organizations operating in various industries. We conclude with a discussion of the results, implications, and issues for further research.

Figure 2.1 Hypothesized model of the mediating role of integration mechanisms



2.1 Literature review and hypotheses

2.1.1 Exploration and exploitation in ambidextrous organizations

Studies have predominantly suggested that organizations pursuing exploration and exploitation simultaneously obtain superior financial performance (Gibson and Birkinshaw 2004, He and Wong 2004, Lubatkin et al. 2006). Combining exploration and exploitation not only helps organizations to overcome structural inertia that results from focusing on exploitation, but also refrains them from accelerating exploration without gaining benefits (Levinthal and March 1993). Although both types of activities are important for organizational survival, they create paradoxical challenges. Whereas exploration results from experimentation, flexibility, and divergent thinking, exploitation is associated with efficiency, refinement, and focus (March 1991). In this study, we apply the distinction between exploration and exploitation to learning and innovation, albeit of different types. Prior studies such as Benner and Tushman (2003), Danneels (2002), and He and Wong (2004) have explicitly embraced the idea that exploratory innovations are designed to meet the needs of emerging customers or markets. Exploratory

innovations require new knowledge or departure from existing knowledge and the pursuit of new technological and customer competences (Danneels 2002; Jansen et al. 2006). They offer new designs, demand new systems and procedures, and attract new sets of customers through new channels of distribution (Abernathy and Clark, 1985). Conversely, exploitative innovations meet the needs of existing customers or markets (Benner and Tushman 2003; He and Wong 2004). They deepen existing knowledge by refining established technological and customer competences (Danneels 2002; Jansen et al. 2006). Exploitative innovations improve established designs by applying existing skills and strengthening customer ties through an increase in the effectiveness of existing distribution channels (Abernathy and Clark 1985).

Based on an examination of prior literatures, Gupta, Smith, and Shalley (2006) suggested two primary contenders of realizing a balance between exploratory and exploitative innovations: punctuated equilibrium and ambidexterity. Punctuated equilibrium refers to the temporal separation of both types of innovation over time that involves a sequential pattern of longer periods of exploitation and short bursts of exploration (i.e. Burgelman 2002). Studies on the second contender, ambidexterity, consider exploration and exploitation to be orthogonal and refer to the simultaneous pursuit and combination of exploratory and exploitative innovation within organizations (i.e. Benner and Tushman 2003; Gibson and Birkinshaw 2004; Tushman and O'Reilly 1996). Ambidextrous organizations buffer exploratory efforts from exploitative activities by physically separating them across multiple yet loosely organizational units (O'Reilly and Tushman 2004). We contribute to this view on ambidextrous organizations by examining the idea that exploratory and exploitive activities should be differentiated yet subsequently integrated to generate value and achieve ambidexterity. We consider organizational ambidexterity as a dynamic capability that goes beyond moving from one competence configuration to another, but rather addresses and maintains multiple, inconsistent demands simultaneously (i.e. Gilbert 2006). Our approach allows us to uncover how ambidextrous organizations are able to successfully pursue multiple inconsistent innovation streams through generating integrative value across exploratory and exploitative units (Tushman et al. 2005).

2.1.2 Structural differentiation in ambidextrous organizations

Prior studies have suggested that ambidextrous organizations are composed of structurally differentiated exploratory and exploitative units (Benner and Tushman 2003; Tushman and O'Reilly 1996). Structural differentiation refers to 'the state of segmentation of the organizational system into subsystems, each of which tends to develop particular attributes in relation to the requirements posed by its relevant

external environment' (Lawrence and Lorsch 1967, p. 3-4). It establishes differences across organizational units in terms of mindsets, time orientation, functions and product/market domains (Lawrence and Lorsch 1967; Golden and Ma 2003). In ambidextrous organizations, structural differentiation results in spatially dispersed exploratory and exploitative units at different locations (Benner and Tushman 2003; Tushman and O'Reilly 1996). It creates 'pragmatic boundaries' (Carlile 2004) that safeguard experimental activities from dominant managerial cognitions and inertia present in the parent's mainstream activities (Benner and Tushman 2003). In this way, ambidextrous organizations allow the coexistence of inconsistent and paradoxical exploratory and exploitative efforts at different locations where motivation can be build entirely around emerging or mainstream business opportunities (Gilbert 2005). It provides a sense of freedom and ownership over specific work activities and generates structural flexibility to adapt to local conflicting task environments (Child 1984; Orton and Weick 1990).

2.1.3 Realizing integrative value across differentiated exploratory and exploitative units: organizational ambidexterity as a dynamic capability

The coordination and integration of exploratory and exploitative efforts across organizational units is a necessary step in achieving ambidexterity (Gilbert 2006; Smith and Tushman 2005; Tushman and O'Reilly 1996). As O'Reilly and Tushman (2007: 17) suggest "the crucial task here is not the simple organizational structural decision in which the exploratory and exploitative subunits are separated, but the processes by which these units are integrated in a value enhancing way". The pursuit of exploratory and exploitative activities in differentiated units may lead to distinct operational capabilities or competences at dispersed locations (Gilbert 2006). It enables organizations to effectively execute routine day-to-day activities and produce desired output (Winter 2003). However, for these differentiated competences to be useful, they must be effectively allocated, mobilized, and integrated to generate new combinations of exploratory and exploitative innovation (Sirmon et al. 2007). The implementation or deployment of such combinations and the achievement of ambidexterity requires new organizing logics and collective patterns of interaction (Helfat and Peteraf 2003). The dynamic capabilities framework recognizes this important aspect and argues that dynamic capabilities, which are embedded in distinct ways how organizations integrate, build, and recombine competences flexibly across boundaries, are fundamental to long-term strategic advantage (Eisenhardt and Martin 2000; Henderson and Cockburn 1994; Kogut and Zander 1992, Teece et al. 1997). Accordingly, we link research on ambidexterity to the dynamic capabilities framework. We propose that organizational ambidexterity refers to the routines

and processes by which organizations mobilize, coordinate and integrate dispersed exploratory and exploitative efforts, and allocate, reallocate, combine and recombine resources and assets across differentiated units. Organizational ambidexterity is a dynamic capability that creates valuable new configurations of exploratory and exploitative innovation by generating and connecting previously unconnected ideas and knowledge or recombining previously connected knowledge in new ways (Kogut and Zander 1992). For example, Iansiti and Clark (1994) argued that not the generation of detailed knowledge sources within different domains (i.e. operational capabilities at exploratory and exploitative units) is crucial, but rather the usage of architectural knowledge to generate new possibilities for meeting multiple contradictory customer demands. Thus, the mere co-presence of exploratory and exploitative activities in structurally differentiated organizational units does not ensure the simultaneous pursuit of exploratory and exploitative innovation. Achieving ambidexterity create paradoxical situations as the short-term, efficiency and control focus of exploitative units is at odds with the long-term, experimental focus and decentralized architectures at exploratory units (Floyd and Lane 2000). When differentiating exploratory and exploitative efforts, organizations need to subsequently establish certain integration mechanisms in order to coordinate and integrate operational capabilities developed at spatially dispersed locations. Hence, to resolve these paradoxical situations, the mobilization, integration, and deployment of operational capabilities at exploratory and exploitative units involve a necessary step in appropriating value and achieving ambidexterity.

Organizational ambidexterity as a dynamic capability is path-dependent in its emergence and idiosyncratic in detail; however it exhibits common features (Eisenhardt and Martin 2000: 1116; Jansen et al. 2005b). We indicate that these commonalties involve distinct integration mechanisms, such as senior team social integration and cross-functional interfaces, which each provide specific ways of dealing with structural differentiation in ambidextrous organizations (O'Reilly and Tushman 2004). We suggest four types of integration mechanisms along two dimensions: (1) senior team vs. organizational and (2) formal vs. informal integration mechanisms as common features of organizational ambidexterity. First, prior studies have pointed at the distinct roles of senior team and organizational integration mechanisms in achieving ambidexterity. Senior team integration mechanisms need to allow the allocation of scarce resources and the departure from existing competences and skills within exploratory units (Gilbert 2005; Hill and Rothaermel 2003), yet establish cross-fertilization and strategic synergies with ongoing businesses in exploitative units (Jansen et al. 2008; Tushman and O'Reilly 1996). Additionally, organizational integration mechanisms need to enable ambidextrous organizations to access and integrate knowledge sources flexibly across relatively autonomous exploratory and exploitative units (Galunic

and Eisenhardt 2001; Gilbert 2006; Henderson and Cockburn 1994). Second, based on the assumption that certain integration mechanisms are richer and provide higher information-processing capacity, prior literatures have distinguished between formal and informal integration mechanisms (March and Simon 1958; Tsai 2002; Van de Ven et al. 1976). Formal integration mechanisms can be used to coordinate and integrate differentiated activities through pre-established mechanisms and interfaces (Ghoshal et al. 1994). Informal integration mechanisms, on the other hand, refer to emergent social properties and have been found to be of influence on boundary-spanning across different units (Galbraith 1973; Tsai 2002). To uncover how organizations reconcile conflicting demands across exploratory and exploitative units and achieve ambidexterity, we examine how formal as well as informal senior team and organizational integration mechanisms mediate the relationship between structural differentiation and ambidexterity (Martinez and Jarillo 1989; Westerman et al. 2006).

2.1.4 The mediating role of senior team integration mechanisms

Senior teams in ambidextrous organizations typically face role conflicts that may diminish acceptance of decisions (Jansen et al. 2008; O'Reilly and Tushman 2004). Especially when senior team members are responsible for differentiated exploratory and exploitative units, the likelihood of conflict is further exacerbated (Eisenhardt et al. 1997; Tushman and O'Reilly 1996). Structural differentiation may enhance self-interested behavior in which senior team members perceive direct competition regarding the allocation of scarce resources (Bower 1970). Senior teams in ambidextrous organizations are therefore expected to recognize and translate different, ambiguous, and conflicting expectations across differentiated exploratory and exploitative units into workable strategies. Resolving this tension in senior management teams is a crucial element in their ability to create integrative and synergistic value across exploratory and exploitative activities and to achieve ambidexterity (Teece 2007). Hence, we examine the mediating role of two senior team integration mechanisms that are considered to be beneficial to combining strategic contradictions: formal senior team contingency rewards and informal senior team social integration (Lubatkin et al. 2006; O'Reilly and Tushman 2004; Siegel and Hambrick 2005; Smith and Tushman 2005).

Senior team contingency rewards. Contingency rewards, which reflect the degree to which benefits for individual team members depend on their team's outcome, are favorable to senior teams confronted with pressures for mutual adjustment (Harrison et al. 2002; Shaw et al. 2002; Wageman and Baker 1997). They create an outcome interdependency within senior management teams (Slavin 1996;

Wageman, 1995) and urge members to direct attention and behavior towards interdependent rather than individual activities (Siegel and Hambrick 2005). In this sense, they generate commitment to organizational goals (Bloom 1999; Harris and Bromiley 2007) and foster collaboration across senior team members responsible for differentiated exploratory and exploitative units. Additionally, team contingency rewards encourage senior team members to mobilize and integrate operational capabilities across differentiated units through identifying ways to encourage new combinations (Smith and Tushman 2005). In this sense, senior team members transcend their unit's direct interests and establish new ways to achieve ambidexterity. Moreover, contingency rewards establish norms that motivate senior team members to advance thinking and participate in clarifying problems and proposing solutions to complex issues (Wageman 1995). This reduces interpersonal competition and facilitates negotiation and mutual adjustment (Pfeffer 1995) that are necessary for reconciling conflicts related to allocating resources to differentiated exploratory and exploitative efforts. Hence,

Hypothesis 1: Senior team contingency rewards mediate the relationship between structural differentiation and ambidexterity.

Senior team social integration. Social integration is a multifaceted phenomenon that reflects the "attraction to the group, satisfaction with other members of the group, and social interaction among the group members" (O'Reilly et al. 1989: 22). Socially integrated senior teams are associated with increased negotiation, compromise, and collaboration (Barkema and Shvyrkov 2007; Michel and Hambrick 1992). Members of socially integrated senior teams are not only expected to work harder to recognize and seize opportunities, but also to leverage operational capabilities across differentiated exploratory and exploitative units. Social integration increases collaborative problem solving (De Cremer et al. 2008) and facilitates senior executives to build realistic understandings of key preferences and conflicting roles in senior teams (Eisenhardt et al. 1997). In this sense, it provides comfortable and familiar platforms that routinize consideration of conflicting strategic agendas (Jehn et al. 1997). Hence, it stimulates critical debate that allows senior team members to evaluate and redesign potential combinations of knowledge sources at differentiated units. In this sense, senior team social integration contributes to the mobilization and integration of operational capabilities at differentiated units in order to arrive at new combinations of exploratory and exploitative activities. It mediates the relationship between structural differentiation and ambidexterity as social integration triggers alternative ways to reconciling conflicting goals across spatially distributes units and to generating portfolios of knowledge resources underlying new products and services.

Hypothesis 2: Senior team social integration mediates the relationship between structural differentiation and ambidexterity

2.1.5 The mediating role of organizational integration mechanisms

Where senior team integration mechanisms enable balanced resource allocation and strategic coherence in ambidextrous organizations, organizational integration mechanisms facilitate knowledge exchange and combination between differentiated exploratory and exploitative units (Kogut and Zander 1992; Tsai and Ghoshal 1998). Through combination and integration of differentiated skills and experiences, ambidextrous organizations are able to add or remove product subsystems or change linkages between subsystems underlying exploratory and exploitative innovations. Thus, they are able to synchronize, maintain, and further build portfolios of exploratory and exploitative innovation simultaneously (Tushman et al. 2006). Organizational integration mechanisms not only generate new value creation through linking previously unconnected knowledge sources (Cohen and Levinthal 1990), but also provide opportunities to leverage common resources and obtain synergies across exploratory and exploitative units (O'Reilly and Tushman 2007). Integrative efforts are vital to ambidextrous organizations as existing knowledge sources in exploitative units may need to be revisited, reinterpreted, and applied in exploratory units due to changes in the organization's strategy or environment (Garud and Nayar 1994; Postrel 2002). We consider two organizational integration mechanisms that have been associated with knowledge combination and integration: formal cross-functional interfaces (Lawrence and Lorsch 1967; Martinez and Jarillo 1991) and informal social relations or connectedness (Jaworski and Kohli 1993; Jansen et al. 2006; Tsai and Ghoshal 1998).

Cross-functional interfaces. Ambidextrous organizations may use cross-functional interfaces such as liaison personnel, task forces, and teams (Gupta and Govindarajan 2000) to enable knowledge exchange across exploratory and exploitative units. Cross-functional teams and task forces bring together employees from organizational units who have distinct expertise underlying innovation streams. They cut across exploratory and exploitative unit boundaries that are established by spatially separating fundamentally different learning modes. Knowledge sources underlying current products and services in units may be underexplored due to a lack of capabilities or complementary knowledge in exploratory units (Prabhu et al. 2005). Cross-functional interfaces facilitate organizational members from distinct units to reach a common frame of reference and to build understanding and agreement (Daft and Lengel 1986; Egelhoff, 1991).

Gilbert (2006), for instance, showed how a newspaper organization used cross-functional teams and task forces to overcome differences, interpret issues, and build understanding about paradoxical cognitive frames across their newspaper (i.e. exploitative) and internet publishing (i.e. exploratory) business units. Organizational members from both types of units are assembled in task forces or cross-functional teams, which represent a flexible formal arrangement since they can be disbanded after their specific task has been completed. In addition, liaison personnel are responsible for resolving differences across exploratory and exploitative units as a primary way to overcome disagreement and to reduce equivocality of organizational goals (Daft and Lengel 1986). Cross-functional interfaces provide platforms that keep multiple innovation streams connected by disseminating operational capabilities and learning about new ways of achieving ambidexterity. Thus, cross-functional interfaces facilitate the generation and recombination of knowledge sources yet retain the integrity of contradictory structures and processes in exploratory and exploitative units (Dougherty 2001; Gilbert 2006). Hence,

Hypothesis 3: Cross-functional interfaces mediate the relationship between structural differentiation and ambidexterity.

Connectedness. Connectedness concerns the overall pattern of a firm's social network in terms of density (Nahapiet and Ghoshal 1998; Sheremata 2000) and facilitates knowledge exchange (Jaworski and Kohli 1993). Connectedness is essential for the emergence of shared codes and language. It provides a common base of understanding through which organizational members with disparate experience, knowledge, and backgrounds can transfer and integrate new ideas (Hansen 2002). Dense social relations within ambidextrous organizations combat the polarization across exploratory and exploitative units. They reduce the likelihood of conflict regarding goals and implementation by maintaining the permeability of unit boundaries (Nelson 1989; Rindfleisch and Moorman 2001). Increased interaction fosters collaborative conflict resolution as members from differentiated exploratory and exploitative units have greater opportunities for creating win-win situations. Krackhardt and Stern (1988) made a strong case for the efficacy of cross-cutting social ties as a conflict reduction mechanism, arguing that the existence of dense social relations between organizational units reduce disruptive conflict. Nelson's (1989) study of intergroup ties in organizations indicates that frequent interactions between groups permit faster dispute resolution and prevent the accumulation of grievances and grudges. Informal social relations also serve as information bridges across exploratory and exploitative units and contribute to the search for new applications of exploratory or help those organizational members who want to advertise their exploitative efforts in new

areas (Nahapiet and Ghoshal 1998). Thus, connectedness can affect their ability and motivation to integrate and recombine differentiated knowledge sources across exploratory and exploitative units, thereby achieving ambidexterity.

Hypothesis 4: Connectedness mediates the relationship between structural differentiation and ambidexterity.

2.2 Methods

2.2.1 Research setting and data collection

We randomly identified a company sample (4000 firms) using a database from a commercial provider. The sample covered a broad range of industries and was restricted to private firms with at least 25 employees. We ensured that the informants were professionally interested, conscientious, and committed to providing accurate data by assuring them of confidentiality and by offering them a summary of the results. To deal with potential problems associated with single-informant bias and common method bias, we temporarily separated the measurement of our independent and dependent variables and collected data at two different points in time. In 2005, a survey assessing structural differentiation, senior team integration mechanisms and organizational integration mechanisms was administered to the executive director of our random sample of 4000 companies. Executive directors of 452 companies returned their questionnaire, representing a response rate of 11.3 percent. In 2006, approximately one year after the first survey, a second survey was mailed to the same 452 executive directors to assess their firm's exploratory and exploitative innovation. We received 230 usable surveys from executive directors, or 50.9 percent of the original response. The executive directors had a mean age of 47.56 years (s.d. = 8.58) and a mean company tenure of 13.64 years (s.d. = 10.18). Firms in the final sample had an average size of 519.74 (s.d. = 3183.12) full-time employees and an average age of 41.74 (s.d. = 35.52). The firms were operating in a wide range of industries covering manufacturing (51.3%), construction (16.5%), wholesale (6.5%), transportation (5.2%), financial services (7.8%), other professional services (12.2%) and other industries (0.4%). To test for nonresponse bias, we examined differences between respondents and nonrespondents for our final sample. T-tests showed no significant differences based on the number of full-time employees, total assets of branches, and prior performance. We also compared early and late respondents in terms of demographics and model variables. These comparisons did not reveal any differences ($p<.05$), showing that nonresponse bias was not a problem.

To offset individual respondent bias and to examine reliability issues associated with single-informant data, we surveyed additional management team members in 2005 and 2006. In 2005, this follow-up survey resulted in 38 responses, or 16.5 % of the firms from the 2006 sample, that were comparable in size, age, and prior performance to our final sample. In 2006, we conducted the same follow-up for a result of 58 responses, or 25.7 % of the 2006 sample. We calculated an interrater agreement score (r_{wg}) for data on study variables using the 2005 response for the independent and mediator variables and the 2006 response for the dependent variable. The average r_{wg} per variable (James et al. 1984) for structural differentiation (.89), senior team contingency rewards (.87), senior team social integration (.93), cross-functional integration (.91), connectedness (.95), and exploratory innovation (.94) and exploitative innovation (.94) suggests adequate agreement amongst respondents.

2.2.2 Measurement and validation of constructs

Although our study mostly used multi-item scales that were verified through various analyses, an appropriate scale for structural differentiation was not available (items of constructs are provided in the appendix). Based on a review of relevant of literatures we generated items to tap the domain of structural differentiation.

Dependent variable: ambidexterity. Following prior studies, we considered exploratory and exploitative innovation as orthogonal (Gibson and Birkinshaw 2004; Gupta et al. 2006; He and Wong 2004) and used a two-step approach to measure ambidexterity.

First, executive-directors provided information on the level of exploratory and exploitative innovation. The measure for *exploratory innovation* was adapted from Jansen et al. (2006). The resulting four-item scale for exploratory innovation (α = .86) captures the extent to which organizations depart from existing knowledge and pursue radical innovations for emerging customers or markets. A four-item scale (α = .70) measured firm-level *exploitative innovation* (Jansen et al., 2006) and captures the extent to which organizations build upon existing knowledge and pursue incremental innovations that meet the needs of existing customers (Abernathy and Clark 1985; Benner and Tushman 2003; Smith and Tushman 2005). To provide evidence of convergent and discriminant validity for exploratory and exploitative innovation, we performed various analyses. Exploratory factor analysis clearly replicated the intended 2-factor structure with each item loading clearly on their intended factor (all factor loadings were above .71 with cross-loadings below .21) and all factors having eigenvalues greater than one. In addition, we compared the scores on exploratory and exploitative

innovation with a separate overall five-item scale of innovativeness (Zahra 1996; α = .91). Our expectation that both types of innovation would be related to the overall measure of innovativeness was corroborated by significant positive correlations (r = .60, p < .01; r = .28, p < .01). Finally, we validated the scales of both types of innovation with separate measures through which we asked to indicate the percentage of revenues in the last three years that is attributable to (1) products and services that are totally new to the firm and (2) products and services that have been improved extensively. Correlations between the scores for exploratory and exploitative innovation, and both percentages were much stronger (r = .17-.36; p < .01) than cross-correlations (-.03-.04; p > .10) between domains, providing evidence for convergent and discriminant validity of both measures.

Second, prior studies have constructed measures for ambidexterity in distinct ways: subtracting (He and Wong 2004), multiplying (Gibson and Birkinshaw 2004), and adding (Lubatkin et al. 2006) exploratory and exploitative innovation. To develop a measure for ambidexterity, we followed the procedures recommended by Edwards (1994) and sought the most interpretable approach for combining our measures of exploratory and exploitative innovation (*see also* Lubatkin et al. 2006). Given the close link between ambidexterity and performance (Gibson and Birkinshaw 2004; He and Wong 2004), we ran four regression analyses with a seven-item measure for performance as dependent variable (i.e. Li and Atuahene-Gima 2001; α=.81). The first unconstrained model treats exploratory and exploitative innovation as separate independent variables. Then, we ran three constrained regression equations in which exploration and exploitation were combined into a single index, first by subtracting exploitation from exploration, second by multiplying exploration and exploitation, and third by summing the two. Following Edwards (1994), we calculated F-values based on R^2 differences of the three models and the unconstrained model. The additive model proved to be superior to the other two approaches, the F-test showed no significant loss of information compared to the unconstrained model and its R^2 (.22) is slightly higher than for the multiplicative model (.20). The subtractive model, however, appeared to have the lowest explanatory power that resulted into a significant loss of explanatory power. Given these results from Edward's test, we measured ambidexterity by adding exploratory and exploitative innovation.

Independent and mediating variables: Based on a literature review, we developed a six-item scale for *structural differentiation* (α = .78) that taps into the extent organizations segment their organizational system into spatially dispersed units, each of which tends to develop a particular attribute in relation to its relevant environmental requirements (Lawrence and Lorsch 1967: 3-4). The scale for structural differentiation captures various aspects of differences across units, such

as different mindsets, time orientations, functions and product/market domains (Lawrence and Lorsch 1967; Golden and Ma 2003).

We used two measures for capturing formal and informal senior team integration: senior team contingency rewards and senior team social integration. *Senior team contingency rewards* (α = .76) refers to the extent to which senior management team incentives, such as bonuses and profit sharing, were tied to overall firm performance. We adapted a four-item measure for contingency rewards from Collins and Clark (2003). The four-item measure for *senior team social integration* (α = .73) was adapted from prior studies (O'Reilly et al. 1989; Smith et al. 1994). It captures the attraction to senior management members, satisfaction, and social interaction among team members. Regarding formal and informal organizational integration mechanisms, our study adapted existing measures for cross-functional interfaces and connectedness. Based on Hage and Aiken (1967) and Gupta and Govindarajan (2000), *cross-functional interfaces* (α = .72) were measured through a five-item scale. It captures the extent to which firms use cross-functional boundary spanning integration mechanisms, such as cross-functional teams, projects and liaison personnel. *Connectedness* (α = .74) was measured with a four-item scale adapted from Jaworski and Kohli (1993). It refers to the extent to which employees were networked to various levels of the hierarchy in their organization.

An integrated confirmatory factor analysis on all items pertaining to structural differentiation, formal and informal integration mechanisms, and exploratory and exploitative innovation (with each item constrained to load only on the factor for which it was the proposed indicator) yielded a model that fitted the data moderately well (χ^2/d.f.=1.65, IFI = .90, CFI = .90, RMSEA = .053). Item loadings were as proposed and significant ($p < .01$). We also performed three additional confirmatory factor (CFA) analyses in which we grouped items to get better parameter to degree of freedom ratios. The first CFA-model contains structural differentiation, exploratory innovation, and exploitative innovation. The second CFA-model grouped senior team integration mechanisms and included senior team contingency rewards and senior team social integration. The third CFA-model grouped organizational integration mechanisms and contained cross-functional interfaces and connectedness. The fit indices were as follows; Model 1: χ^2/d.f.=2.18, IFI=.93, CFI= .93, RMSEA=.072; Model 2: χ^2/d.f.=1.74, IFI=.98, CFI= .98, RMSEA=.057; Model 3: χ^2/d.f.=2.07, IFI=.95 CFI= .94, RMSEA=.068. Furthermore, all factor loadings were significant ($p < .01$). These additional results confirm the convergent and discriminant validity of our scales.

Control variables. In our empirical study, we controlled for possible alternative explanations by including relevant control variables. First, as larger organizations may have more resources yet may lack the flexibility to achieve ambidexterity, we

included the natural logarithm of the number of full-time employees within organizations to account for *firm size*. Second, it is known that incumbent firms are naturally more inclined towards exploitative efforts (Gilbert 2005), so we included *firm age* measured by natural logarithm of the number of years from the firm's founding. Third, senior team size could affect the heterogeneity of senior teams, and accordingly, impact the achievement of ambidexterity. Following prior studies, we measured *senior team size* through the number of senior executives who are responsible for strategy formulation and implementation (e.g. Siegel and Hambrick 2005). Fourth, context or industry effects may influence the extent to which organizations pursue exploratory and exploitative innovation (He and Wong 2004; Sidhu et al. 2007). Accordingly, we included seven industry dummies based on SIC-codes: *manufacturing*, *construction*, *wholesale*, *transportation*, *financial services*, *professional services* and *other*. Fifth, environmental attributes such as dynamism tend to affect organizations in pursuing exploratory and exploitative innovation (Floyd and Lane 2000). We therefore included a three-item scale for *environmental dynamism* (α = .70) that tapped into the rate of change and the instability of the external environment (Jansen et al., 2006).

2.3 Analysis and results

Table 2.1 presents descriptive statistics and correlations for the study variables. Table 2.2 presents the results of the regression analyses for ambidexterity. To examine multicollinearity, we calculated variance inflation factors (VIF) for each of the regression equations. The maximum VIF within the models was 1.43, To assess the effects of structural differentiation and integration on ambidexterity, we followed a four step procedure (Baron and Kenny 1986). First, we examined the relationship between structural differentiation and ambidexterity. As shown in model 2, the coefficient for structural differentiation is positive and significant (β=0.23, $p<.01$). Second, the mediating senior team integration variables (i.e. senior team contingency rewards and senior team social integration) and organizational integration variables (i.e. cross-functional interfaces and connectedness) need to be significantly related to ambidexterity.

Table 2.1 Means, standard deviations, and correlations[a]

	M	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1) Ambidexterity	9.57	1.51	--																
(2 Structural differentiation	4.18	1.23	.26	(.78)															
(3) Contingency rewards	4.01	1.47	.24	.40	(.76)														
(4) Senior team social integration	5.23	0.88	.27	.19	.12	(.73)													
(5) Cross-functional interfaces	4.21	1.18	.32	.37	.30	.17	(.72)												
(6) Connectedness	5.48	0.83	.27	.12	.09	.32	.23	(.74)											
(7) Firm size[b]	3.39	0.89	-.06	-.03	-.09	.02	.00	.02	--										
(8) Firm age[b]	4.48	1.27	.05	.23	.33	.00	.21	-.06	.14	--									
(9) Senior team size	4.84	2.35	.14	.17	.24	-.04	.19	.02	.03	.29	--								
(10) Manufacturing	0.51	0.50	.17	-.02	.10	.00	.07	-.12	.22	.15	.02	--							
(11) Construction	0.17	0.37	-.15	-.07	-.19	-.07	-.11	.15	.09	-.20	-.13	-.46	--						
(12) Wholesale	0.07	0.25	-.01	-.01	-.06	.06	-.02	.00	.02	-.11	-.06	-.27	-.12	--					
(13) Transportation	0.05	0.22	-.21	-.04	-.07	-.06	-.07	-.08	.00	-.01	-.03	-.24	-.10	-.06	--				
(14) Financial services	0.08	0.27	.06	.10	.05	.04	.01	.02	-.15	.11	.05	-.30	-.13	-.08	-.07	--			
(15) Other professional services	0.12	0.33	.02	.07	.11	.04	.10	.06	-.29	.01	.15	-.38	-.17	-.10	-.09	-.11	--		
(16) Other	0.00	0.07	-.01	.02	.06	-.05	-.13	.00	-.11	-.07	-.08	-.07	-.03	-.02	-.02	-.02	-.02	--	
(17) Environmental dynamism	4.30	1.27	.23	.13	.22	.03	.16	.17	-.17	.03	.05	-.07	-.03	-.08	-.16	.11	.21	.00	(.70)

[a] n = 230. Numbers in parentheses on the diagonal are Cronbach's alphas of the composite scales. All correlations above |.10| are significant at $p < .05$.

[b] Natural log

Table 2.2 Results of hierarchical regression analyses: structural differentiation, integration and ambidexterity[a]

Variables	Organizational ambidexterity		
	Model 1	Model 2	Model 3
Control variables			
Firm size	-0.03	-0.07	-0.08
Firm age	-0.05	-0.05	-0.06
Senior team size	0.13	0.10	0.09
Manufacturing	0.24**	0.24**	0.24**
Wholesale	0.08	0.08	0.07
Transportation	-0.10	-0.10	-0.08
Financial services	0.11	0.09	0.09
Professional services	0.05	0.05	0.02
Other	0.01	-0.01	0.02
Environmental dynamism	0.20**	0.18**	0.12
Independent variable			
Structural differentiation		0.23**	0.11
Mediator variables			
Senior team integration mechanisms			
Senior team contingency rewards			0.06
Senior team social integration			0.15*
Organizational integration mechanisms			
Cross-functional interfaces			0.15*
Connectedness			0.17**
Adjusted R^2	0.09	0.14	0.23
Δ Adjusted R^2	0.09***	0.05**	0.09***

[a] Standardized regression coefficients are reported

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

As shown in Model 3, however, senior team contingency rewards are not significantly related to ambidexterity (β=0.06, n.s.). Senior team social integration is positively related to ambidexterity (β=0.15, p<.05). The two indicators for organizational integration mechanisms, cross-functional interfaces (β=0.15, p<.05) and connectedness (β=0.17, p<.01) are both positively related to achieving ambidexterity. Third, the significant relationship between structural differentiation and ambidexterity needs to become insignificant when the mediating variables are introduced in the regression model. As shown in Model 3, the relationship between structural differentiation and ambidexterity becomes insignificant when the four mediating variables are added (β=0.11, p>.10). Fourth, structural differentiation needs to be significantly related to the mediating variables. We ran additional regression analyses with the four mediation variables as dependent variables and structural differentiation as independent variable with all control variables included. The regressions analyses results indicated that structural differentiation was significantly related to the mediating variables, differentiation and contingency rewards (β=0.30, p<.001), differentiation and social integration (β=0.20, p<.01), differentiation and cross-functional interfaces (β=0.32, p<.001), except for connectedness: differentiation and connectedness (β=0.12, n.s.).Overall, the mediating analysis provides various interesting outcomes. First, it does not provide support for hypothesis 1 about the mediating role of senior team contingency rewards. Although structural differentiation is positively related to senior team contingency rewards, 'common fate' incentive systems appear to be not related to achieving ambidexterity. Senior team social integration, however, fully mediates the relationship between structural differentiation and ambidexterity. Our findings support previous assertions concerning the importance of informal senior team integration in ambidextrous organizations. Hypothesis 2 is supported. Second, hypothesis 3, which proposed a mediating effect of cross-functional interfaces on the relationship between structural differentiation and ambidexterity, is supported. Cross-functional interfaces provide formal integration mechanisms that contribute to establishing linkages between exploratory and exploitative organizational units. Finally, our findings indicate that connectedness does not mediate the relationship between structural differentiation and ambidexterity. Rather, informal social relations within organizations have a direct effect on pursuing exploratory and exploitative innovation simultaneously.

2.3.1 Post hoc analysis

To further verify our research findings, we conducted various additional analyses. First, we used structural equation modeling to assess the fit of the hypothesized

model and verify the indirect effect of structural differentiation on ambidexterity. Given our sample size of 230, we used item-averaged composite variables as observed variables (Bagozzi and Yi 1988; Kenny 1979). We fixed the path from each latent construct to its measured variable equal the square root of the reliability coefficient alpha (α) of the measured composite variable, while the amount of error was set to (1 – α). The resulting model fitted the data adequately (IFI = 1.00, CFI = 1.00, SRMR = .025). Moreover, findings replicated the results of the regression analyses. The direct path from structural differentiation towards ambidexterity was nonsignificant ($p>0.10$). In addition, findings show that senior team social integration ($p<.01$) and cross-functional interfaces ($p<.01$) mediate the relationship between structural differentiation and ambidexterity. Second, given the results of the Edward's test as explained earlier (and the insignificant difference between the additive and multiplicative model), we conducted additional regression analyses with the multiplicative interaction of exploratory and exploitative innovation as an alternative measurement of ambidexterity (Gibson and Birkinshaw 2004; He and Wong 2004). We repeated the tests of the hypotheses using this alternative measurement as dependent variable, and found similar results. The findings regarding the mediating role of senior team and organizational integration mechanisms replicated the earlier findings with the additive as measurement for ambidexterity. Hypothesis 1 (senior team contingency rewards) was not supported; hypothesis 2 was supported (senior team social integration), hypothesis 3 was supported (cross-functional interfaces), and hypothesis 4 was not supported (connectedness). Overall, our post-hoc analysis provides strong support for our research findings.

2.4 Discussion and conclusion

An important stream of studies investigates specific organizational attributes, which influences a firm's ambidexterity, or effectiveness, in pursuing seemingly contradictory activities simultaneously that is difficult to achieve in practice (Raisch and Birkinshaw 2008). Conceptual arguments assert that achieving ambidexterity imposes considerable challenges on organizations, because of the necessity to allow integration and application of spatially dispersed exploratory and exploitative efforts (Smith and Tushman 2005). Yet, our understanding of antecedents of ambidexterity remains rather unclear.

Our study underscores previous assertions that structural differentiation provides an important yet insufficient structural attribute for achieving ambidexterity. Structural differentiation helps organizations to buffer experimentation and the development of new competences and capabilities from ongoing operations (i.e. Gilbert 2006; Tushman and O'Reilly 1996). It generates

structural flexibility to adapt to local environmental demands. Yet exploratory and exploitative activities need to be mobilized, integrated, and applied across inconsistent organizational units. Accordingly, our study affirms the importance of structural differentiation within ambidextrous organizations; however, it suggests that ambidextrous organizations need to resolve conflicting tensions in senior teams, and to integrate diverse knowledge sources across differentiated exploratory and exploitative units (Kogut and Zander 1992; Smith and Tushman 2005). We argue therefore that ambidextrous organizations require a dynamic capability that enables them to mobilize, coordinate and integrate dispersed contradictory efforts, and to allocate, reallocate, combine, and recombine resources and assets across dispersed exploratory and exploitative units (O'Reilly and Tushman 2007; Teece 2007). Our findings move research on the relationship between structural differentiation and ambidexterity beyond main effects (i.e. Gilbert 2006), and suggest that future research needs to examine distinct integration mechanisms as important contenders for the dynamic capability to pursue exploratory and exploitative innovation simultaneously. Our study leads us to suggest that the previously asserted effect of structural differentiation on ambidexterity is indirect, operating through both informal senior team integration (i.e. senior team social integration) and formal organizational integration (i.e. cross-functional interfaces) mechanisms. In this sense, our study contributes to previous literatures that theorized for subsequent integration of differentiated exploratory and exploitative activities (Siggelkow and Levinthal 2003; Westerman et al. 2006). Ambidextrous organizations should enact upon differentiated exploratory and exploitative activities by managing resource and routine reconfiguration (Zahra et al. 2006). Our study argues that only when organizations are able to structure their technology portfolios, and subsequently integrate differentiated activities to capitalize on them, they are able to create value for both new and existing customers. In finding support for this notion, our study provides new insights about which specific integration mechanisms within organizations are required to coordinate, implement and apply exploratory and exploitative activities in dispersed organizational units and to achieve ambidexterity.

Interestingly though, our study fails to support the hypothesis that senior team contingency rewards contribute to the achievement of ambidexterity. Although prior studies have suggested that 'common fate' incentive systems reduce interpersonal competition and foster a firm wide view and collaboration (Edmondson et al. 2003; Wageman 1995), our study shows that they do not contribute to alleviating potential problems associated with spatially separating exploratory and exploitative efforts. A possible explanation for the positive but insignificant relationship could be that the creation of outcome interdependency through senior team contingency rewards does not encourage senior team members to reconcile conflicting interests across differentiated exploratory and

exploitative units. In this vein, Wageman (1995) showed that task (i.e. stemming from the process by which the work is carried out) rather than outcome interdependency resulted in greater cooperation, high-quality group processes, and member satisfaction. While group reward systems are known to stimulate cooperative effort and motivation, this effort may not necessarily result in balanced decision making and managing strategic contradictions in senior teams (Wageman and Baker 1997; Smith and Tushman 2005). Our study hints that overcoming multiple conflicting strategic agendas and reinforcing integrative thinking in ambidextrous organizations requires senior team integrative mechanisms that go beyond establishing outcome interdependency. Although senior team contingency rewards may be beneficial to achieving ambidexterity under certain organizational and industrial conditions (i.e. Jansen et al. 2008; O'Reilly and Tushman 2004), future studies should examine how interdependency affects the impact of senior team contingency rewards on the achievement of ambidexterity across spatially dispersed exploratory and exploitative units.

Although our study indicated that common fate incentive systems do not provide necessary integrative value across differentiated exploratory and exploitative units, it shows that senior team social integration mediates the relationship between structural differentiation and ambidexterity (i.e. O'Reilly and Tushman 2004). Social integration engenders social mechanisms such as trust and reciprocity in senior teams (Lubatkin et al. 2006) that encourage team members to openly discuss and debate conflicting demands, goals and aspirations of their associated exploratory and exploitative units. Such critical debate helps to overcome strategic contradictions and resolve conflicting situations arising from integrating and implementing spatially dispersed exploratory and exploitative activities. Our study increases our understanding of the importance of senior team social integration in ambidextrous organizations.

Regarding the mediating role of organizational integration mechanisms, our study contributes to prior literatures concerning the importance of formal linkages across differentiated exploratory and exploitative organizational units in ambidextrous organizations (Gilbert 2006). By providing formal integration devices, our findings indicate that cross-functional interfaces are effective integrative mechanisms in differentiated ambidextrous organizations. Boundary spanning mechanisms contribute to the development of a common language and ensure the capture, interpretation, and integration of knowledge sources across differentiated exploratory and exploitative units (Carlile 2004; De Luca and Atuahene-Gima 2007). An important feature of cross-functional interfaces is their ability to deepen flows of knowledge between exploratory and exploitative units without interrupting their internal processes (Gilbert, 2006). Our study's finding on the mediating effect of cross-functional interfaces adds to the emergent dialog on the hierarchical level at which integration of exploratory and exploitative

efforts need to happen. It indicates that the idea that differentiated exploratory and exploitative efforts are integrated at the senior team level has to be expanded by incorporating lower-level cross-functional linkage devices as well (Gilbert 2006; Westerman et al. 2006). Our study contributes to these recent conceptual assertions that – in addition to senior team social integration – formal organizational integration mechanisms are needed to provide necessary horizontal linkages across differentiated exploratory and exploitative units in ambidextrous organizations.

With respect to informal social relations, our study reveals that connectedness does not mediate the relationship between structural differentiation and ambidexterity but rather contributes to achieving ambidexterity directly. A possible explanation could be that it becomes more difficult to develop and maintain informal social relations between organizational members across differentiated exploratory and exploitative units. Given our finding that senior team social integration fully mediates the relationship between structural differentiation and ambidexterity, it may be the case that structural differentiation is only detrimental to informal social relations at lower hierarchical levels. Future research should shed more light on this potential differential effect of structural differentiation on senior team social integration and connectedness. Notwithstanding this potential effect, our study shows that ambidextrous organizations need to implement more formal organizational integration devices, such as liaison personnel and teams, rather than informal social relations to integrate and apply differentiated exploratory and exploitative efforts at lower hierarchical levels. As organizational members with a larger pool of informal relations may be able to exploit or explore to their advantage (Lin et al. 2007), our study may also suggest that connectedness contributes to establishing a conducive context for achieving ambidexterity directly rather than indirectly by generating resource and knowledge flows across differentiated units. Specific features of dense social relations, such as discipline, trust and support, have been shown to directly affect the achievement of contextual ambidexterity as they encourage organizational members to make their own judgments as to how best divide their time between conflicting demands (Gibson and Birkinshaw 2004). Further exploratory research is necessary to explore this possibility and understand how connectedness enables the achievement of contextual ambidexterity within organizations.

Our study reveals that ambidextrous organizations should carefully design and implement specific types of integration mechanisms at different hierarchical levels. At the corporate level, ambidextrous organizations should encourage (informal) social integration among senior team members. At lower hierarchical levels, however, ambidextrous organizations should establish more formal cross-functional interfaces that deepen knowledge flows across differentiated units yet

remain the contradictory processes and time orientation within exploratory and exploitative units. This distinction echoes prior research stating that as one comes closer to senior management, integration efforts become more broad, less clear-cut and of a complex nature (Egelhoff 1991; Floyd and Lane 2000). At the senior level, managers face both high differentiation as well as high interdependency, requiring frequent adjustments and more informal means of integration (Daft and Lengel 1986). The lower levels in ambidextrous organizations still face high differentiation but lower interdependency, calling for more formal integration mechanisms (Daft and Lengel 1986). Through this richer explanation and empirical assessment, we contribute to a greater clarity and better understanding of how organizations may effectively pursue exploratory and exploitative innovation simultaneously to achieve ambidexterity.

2.4.1 Limitations and future research suggestions

Our study presents a first step toward uncovering the interrelationship between differentiation, integration and achieving ambidexterity, and study limitations suggest the need for additional research. First, future studies may include additional senior team and organizational attributes. For instance, previous research has argued that leadership behaviors such as transformational and transactional leadership (Vera and Crossan 2004) may foster an organizational context suitable for hosting contradictory forces. Additionally, future research may capture multiple levels of analysis and uncover how unit-level *and* firm-level characteristics contribute to achieving ambidexterity. Second, our study focused on spatially separating exploratory and exploitative activities in different organizational units as an important way for achieving ambidexterity. Organizations may however utilize other structures or systems to reconcile conflicting tensions such as temporal separation, a system in which organizations focus on exploratory innovation at one point in time followed by a focus on exploitation at subsequent points in time (Gupta et al. 2006). Future research may uncover differential effects of structural attributes for spatial and temporal separation of exploratory and exploitative innovation. Third, although we took great care in separating collection of data on the independent and dependent variables as well as the use of multiple respondents that provide valuable methodological contributions, future longitudinal research is necessary to investigate how structural differentiation and integration are developed and impacted over time.

3 Embeddedness and Organizational Ambidexterity: The Combined Effect of Internal and External Social Capital[2]

Abstract
Research has stipulated the paradox organizations face when pursuing ambidexterity. To pursue exploratory and exploitative activities simultaneously, organizations have been suggested to transcend incompatible frames and create synergistic combinations of both activities. This study examines how internal and external social relations contribute to the emergence of an organizational context conducive to transcending the paradox associated with achieving ambidexterity. We suggest four types of social relations along two dimensions: (1) internal vs. external and (2) structural vs. relational as important antecedents of organizational ambidexterity. Results show that internal social capital may facilitate the achievement of ambidexterity; however, its impact is contingent upon attributes of external social networks. Our study contributes to recent assertions on the complementary nature of internal and external social capital and its distinct role in achieving and maintaining organizational ambidexterity.

Keywords: Organizational ambidexterity, internal and external social capital, exploration and exploitation, paradoxical frames.

[2] Earlier versions of this study were presented at the Strategic Management Society Conference 2008, Cologne, and at the Annual Meeting of the Academy of Management 2009, Chicago, as 'Tempelaar, M.P., Jansen, J.J.P., Van den Bosch, F.A.J., Volberda H.W. (2009). Transcending the Paradox within Ambidexterity: The Joint Effect of In- and External Social Capital'. A final version is in the process of submission to a top journal in the field.

An increasing body of research is devoted to the concept of ambidexterity, or the ability to simultaneously pursue exploratory and exploitative innovations (Tushman and O'Reilly 1996; Gibson and Birkinshaw 2004; Benner and Tushman 2003). To achieve superior performance by maintaining this ability to explore new products and services while at the same time exploiting existing competences, ambidexterity requires to generate synergistic combinations of exploratory and exploitative activities (Gibson and Birkinshaw 2004; He and Wong 2004; Jansen et al. 2009). Ambidextrous organizations excel because they are able to recognize opportunities, linkages, and synergies between exploratory and exploitative activities (Smith and Tushman 2005). However, the pursuit of exploratory and exploitative activities creates paradoxical challenges as integrating both activities inherently creates incompatible cognitive frames (Kaplan and Henderson 2005, Smith and Tushman 2005).

Exploitation has been related to efficiency, centralization, convergence, and tight cultures, whereas exploration has been associated with flexibility, decentralization, divergence, and loose cultures (Benner and Tushman, 2003; Jansen et al. 2006). Building on their separate cognitive frames, exploitative and exploratory members take on different roles which can be increasingly difficult to combine (Floyd and Lane 2000). Such members seeking to collaborate will need to handle their different behavioral expectations, as exploration and exploitation yield different results and require different ways of goal-setting. The outcomes of exploration are usually fuzzy and long-term, whereas exploitative output is usually more easily measurable and achievable in the short-term (Benner and Tushman 2003). To overcome these differences in order to create integrative value, members need to develop a paradoxical cognitive frame (Smith and Tushman 2005): a mental template in which organizational members recognize and accept the simultaneous existence of contradictory forces. Such paradoxical cognition is seen as a primal source of increased performance, as it enables members to consider both inertia and adaptability, or stability and change (Kaplan 2003), therewith transcending the paradox when combining exploration and exploitation. While some studies have addressed paradoxical challenges associated with ambidexterity (*cf.* Gibson and Birkinshaw 2004, Andrioupolos and Lewis 2009), our understanding of the ability of organizations to transcend paradoxes and achieve ambidexterity is still limited. Studies on paradoxes have highlighted the influence of a social context on the ability of individuals to transcend the paradox they are presented with (Benford and Snow 2000; Kaplan 2008). Accordingly, we examine the influence of social capital on ambidexterity. This study contributes to prior literatures in at least three ways.

Firstly, research on ambidexterity has mainly focused on attributes influenced by, or embedded within, formal organizational mechanisms, such as decentralization (Tushman and O'Reilly 1996), and business unit contextual traits

(Gibson and Birkinshaw 2004). Few researchers however have focused on the relationship between social capital and ambidexterity (*cf.* Jansen et al. 2005a; Lin et al. 2007). This relative lack of attention is surprising, especially because social embeddedness may have profound effects on the ability of an organization to become ambidextrous. For instance, Adler, Goldoftas and Levine (1999) showed how trusted relationships between partners contribute to information sharing, learning and flexibility, and thereby enhancing the ease with which organizations could pursue efficiency (i.e. exploitation) and flexibility (i.e. exploration) modes. Furthermore, Tiwana (2008) found evidence of a complementary influence of strong and bridging ties on the ability of these alliances to behave ambidextrously. Evidently, combinations of social capital can stimulate creativity and innovation as well as cooperation and coordination. In our study, we focus on the role of informal social relations cutting organizational boundaries. Through these ties, social capital can stimulate a paradoxical cognitive frame, as it helps organizational members to develop a clear understanding of the different perspectives, roles and languages throughout the organization (Uzzi 1997). Moreover, social capital can induce members to seek out common ground when trying to collaborate (Borgatti and Foster 2003), making the development of a paradoxical frame more likely.

Secondly, we suggest four types of social relations along two dimensions: (1) internal vs. external and (2) structural vs. relational as important antecedents of organizational ambidexterity. We build on the view that social capital types can complement each other when organizational members need to engage in collaboration and knowledge sharing. Theoretical studies postulated such embedded complementary effects (Adler and Kwon 2002; Inkpen and Tsang 2005; Simsek et al. 2003; Singh 2005; Walter et al. 2007). However, while prior studies have extensively examined a variety of performance consequences of structural and relational dimensions of social relations separately (*cf.* Burt 2007; Hansen 1999; Uzzi 1997; Van de Bunt et al. 2005), less empirical research has been concerned with complementarities between the two types of social capital (*cf.* Atuahene-Gima and Murray 2007; Inkpen and Tsang, 2005; Kang et al. 2007; Tsai and Ghoshal, 1998), or consider relational and structural social capital to be supplementary (*cf.* Reagans and McEvily 2003; Tsai and Ghoshal 1998). We examine both structural and relational social capital. In general, relational social capital increases information sharing within groups and the development of a common language, fostering the development of a shared perspective on contradictory forces within the organization. This increases the chance of convergence when members seek each other out to integrate their exploratory and exploitative activities, and makes the integration effort more efficient.

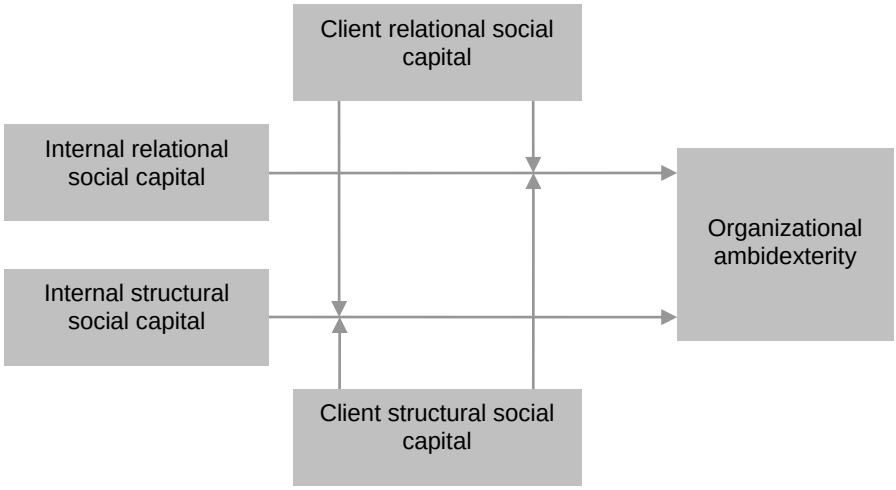
Structural social capital can create open-mindedness within organizational members as it facilitates ongoing communication between members, which

exposes them to different ideas and information on a frequent, continual basis. This exposure increases the likelihood that divergent ideas and perspectives take hold in the mind of individual members. This will help members to identify synergies within exploration-exploitation collaborations in a more effective manner.

Combining both types of social capital may further enhance integration efforts, since both efficiency and effectiveness may be stimulated simultanuously. This combination of efficiency and effectiveness reflects research on paradoxes and the contradictory elements that make up the preferred method of handling these paradoxes (Andriopoulos and Lewis 2009; Cameron 2008; Lewis 2000). Past research has highlighted the potential positive effects on ambidexterity when combining mechanisms that stimulate collective and individualistic action, and convergent and divergent thinking, also known as centripetal and centrifugal mechanisms respectively (Mom et al. 2009; Sheremata 2000). We extend this line of reasoning by investigating how combinations of structural and relational social capital may stimulate the aforementioned contradictory yet beneficial influences on the ability of firms to become ambidextrous.

Thirdly, we expand the complementarity perspective beyond organizational boundaries, by examining how external (client) social capital types moderate the relationship between internal social capital types and ambidexterity (see figure 3.1 for the complete model). A firms' client base represents a primary source of market knowledge (Danneels 2002). The inclusion of market knowledge when trying to integrate exploration and exploitation, will increase the attention firms pay to both exploratory and exploitative activities (Atuahene-Gima 2005; Raisch and Birkinshaw 2008). We argue that depending on internal configurations, client structural and relational social capital can be complementary or detrimental. While internal social capital can foster paradoxical cognition beneficial for balancing high levels of exploration and exploitation, client social capital may enhance this by either extending or deepening organizational members' understanding of possible avenues for application of the integrative effort. This means *either* influencing the ability of members to extend their integration effort through diverse and broad relationships with clients, or structural capital, with perspectives that deviate (divergence), *or* deepening their integration process through strong and frequent relationships, or relational capital, with an emphasis on pragmatism, applicability and the organizations' current path (convergence).

Figure 3.1 **Conceptual framework of the impact of internal and external structural and relational social capital on organizational ambidexterity**



This may further stimulate a balanced approach towards exploration and exploitation if internal and external social capital are complementary: they need to provide a combined focus on both divergence and convergence (Sheremata 2000). However, if client social capital fosters similar effects to the dominant internal social capital configuration, integration between exploration and exploitation may become more difficult, because of a heavy emphasis on either divergence or convergence. In this way, organizations may overemphasize either exploration or exploitation respectively.

In the next section, we present the theoretical review and derive our hypotheses. Then, we discuss the methods used and present the empirical findings using quantitative data from 343 Dutch companies from various industries. We conclude with a discussion of the results, implications, and issues for further research.

3.1 Literature review and hypotheses

3.1.1 Organizational ambidexterity: integrating exploration and exploitation

Exploratory innovations are radical and designed for new product/market combinations (Benner and Tushman 2003). These innovations address emerging customer demands and are associated with experimentation, flexibility, divergent thinking and knowledge generation (Atuahene-Gima 2005; Jansen et al. 2006). On the other hand, exploitative innovations improve existing competencies and meet the needs of existing product/market combinations (Benner and Tushman 2003). They are typically associated with efficiency, refinement, and focus, convergent thinking, and the application or improvement of existing knowledge sources (Zahra and George 2002).

To reap the benefits from simultaneously exploring and exploiting however, organizations need to achieve integration between exploration and exploitation (O'Reilly and Tushman 2008). Moreover, not only are there positive, synergistic benefits in integrating exploration and exploitation, without integration either separate process can become a liability (Jansen et al. 2009). For instance, without know-how involving the shaping of ideas and concepts into applicable products, which mostly lies in the exploitation domain, exploratory activities risk becoming incompatible with the organization and its potential markets. Likewise, exploitative activities may become 'too set in their ways' to follow a future shift in customer demand without some degree of knowledge about possible future avenues for answering this shift. Thus, the separate insights from exploration and exploitation must be considered jointly and combined to open up new avenues of exploratory and exploitative innovation that create value beyond their respective processes and capabilities (Sirmon et al. 2007). Integration of exploration and exploitation therefore, is a necessity to create and maintain ambidexterity. As a dynamic capability (O'Reilly and Tushman 2008), ambidexterity then revolves around "the routines and processes by which organizations mobilize, coordinate and integrate dispersed exploratory and exploitative efforts, and allocate, reallocate, combine and recombine resources" (Jansen et al. 2009: 799). By facilitating integrative efforts among organizational members, ambidextrous organizations consciously align themselves around adaptation (Gibson and Birkinshaw 2004).

3.1.2 Integrating exploration and exploitation through paradoxical cognitive frames

Attempting to integrate exploration and exploitation leads to a paradoxical situation, which is related to the pressure to both differentiate and integrate at the

same time (Denison et al. 1995; Lewis 2000): next to the deepening and development of their own exploitative or exploratory tasks, organizational members are presented with the challenge to seek out fruitful combinations of incongruent bodies of knowledge, roles and outcomes (Floyd and Lane 2000).

In this light, it has been suggested that integrating exploration and exploitation requires members to overcome incompatible cognitive frames (Smith and Tushman 2005). Cognitive frames are distinct mental templates that allow individuals to give meaning to their environment (Smith and Tushman 2005; Walsh 1995; Kaplan and Henderson 2005). Studies have emphasized the influence of cognitive frames on concepts such as organizational growth (Witt 2000), the effectiveness of incentive regimes (Kaplan and Henderson 2005), strategic outcomes (Kaplan 2008), and organizational renewal (Barr et al. 1992).

Members in ambidextrous organizations need to develop 'paradoxical' cognitive frames in which they acknowledge and act upon the differences between them (Gilbert 2006). They take the contradicting forces underlying exploration and exploitation, and create a synergy that transcends outcomes from the separate exploratory and exploitative activities (Nonaka and Toyama 2002). This synergy may be fostered by the integrative actions of exploratory and exploitative organizational members, if attention, effort and understanding are balanced towards both separate contradictory activities (Cameron 2008; Slaatte 1968). To arrive at this point, members need to move beyond slight alterations to their past logic and behavior (Lewis 2000). Whenever integration between exploration and exploitation is to be achieved, the members involved will need to critically examine their own entrenched assumptions to construct a more accommodating perception of opposites (Lewis 2000), either an exploratory or exploitative mindset. Exploitation requires a mindset that involves efficiency thinking, reducing variance, convergent thinking, and focus. Its outcomes are predictable, short-term, and easily measurable. Exploration requires an experimental attitude, increased variance, divergent thinking, and flexibility. Its outcomes are often fuzzy, long-term and difficult to measure. Because of these differences, a framing challenge (Kaplan 2008) is likely to occur when organizational members seek to integrate exploratory and exploitative activities.

Integrating exploration and exploitation therefore requires reframing: explicitely reclassifying entrenched cognitions in order to break free from them, thus allowing for a new view to emerge (Tsoukas 2009). As such, reframing induces members to formulate and/or accept shared goals. When such shared goals are established, members are motivated to move beyond their individual goal optimizations and to act with respect to the overall integration process (Gittell 2002). This stimulates a complementary view of exploratory and exploitative activities among the organizational members involved, thus enabling a positive, collaborative climate to arise (Smith and Tushman 2005). Also, by engaging in a

framing process which includes previously unconnected actors and ideas (Snow et al. 1986), exploratory and exploitative members actively seek to lift the integration process out of their respective cognitive domains (Watzlawick et al. 1974). This helps them to transcend the paradox when combining exploration and exploitation, allowing them to create the superior performance benefits attributed to organizational ambidexterity. Research indicates that such a framing process not only resides within the cognition of the individual, but is also the outcome of a process of negotiated shared meaning which is in large part dependent on social factors (Benford and Snow 2000; Kaplan 2008; Pinkley and Northcraft 1994). In a study at Lego Company, Lüscher and Lewis (2008), describe how Lego was able to work through several paradoxes that arose during an extensive restructuring process. Facilitating a continuous 'sparring' effort enabled employees to resolve each paradox through dialogue and interaction. In doing so, Lego was able to expose alternative perspectives, reduce defensiveness among members, and facilitate exploration of difficult issues. In a similar vein, Garud and Karnøe (2001) narrate how 3M Corporation developed Post-it Notes from an accidentally discovered weak form of glue. Through a process of reframing, collective mobilizing, and bringing together different areas of expertise, employees at 3M were able to create a product that was based on a 'glue that doesn't glue' within a firm that was all about 'glues that stick'. So, the extent to which organizational members are able to form paradoxical cognitive frames starts with their willingness to 'step out of the box' (divergence) or seek out interaction with co-members (convergence), and their exposure to alternative views that help them do so. Then, those views need to be combined and recombined towards ideas that accommodate for an ambidextrous approach.

To achieve ambidexterity, matters of resource allocation and flows may be addressed through structural and organizational means (Gibson and Birkinshaw 2004; Tushman and O'Reilly 1996). However, given these structural preconditions, reframing towards a paradoxical cognitive frame is typically a socially embedded process (Lewis 2000; Smith and Tushman 2005). We build on this view and suggest internal social capital as a driving force for the development of a paradoxical (i.e. paradox-sensitive) cognitive frame in the context of organizational ambidexterity.

3.1.3 Internal social capital and organizational ambidexterity

Adler and Kwon (2002: 23) define social capital as "… the goodwill available to individuals or groups. Its source lies in the structure and content of the actor's social relations. Its effects flow from the information, influence, and solidarity it makes available to the actor." In this study, we view social capital as an organizational trait of which the advantages (or disadvantages) are available to

individual organizational members. Social capital has been linked to organizational development (Maurer and Ebers 2006), innovation (Obstfeld 2005), R&D productivity (Reagans and Zuckerman 2001), knowledge sharing (Hansen 1999; Nahapiet and Ghoshal 1998) and organizational performance (Lin et al. 2007). Where formal relations are subject to change as collaborations come and go, informal relations (i.e. representing social capital) tend to be more persistent as they continue to exist separated from formal interactions (Podolny and Baron 1997). Furthermore, social capital can function as a mechanism to overcome differences (Ibarra et al. 2005). As such, informal relations have been shown to be superior to formal relationships when crossing functional borders (Gittell 2002; Ibarra 1993; Kellogg et al. 2006, Tsai 2002).

With respect to ambidexterity, internal social capital helps create an understanding and acceptance of the exploration-exploitation paradox: it can help reframing towards a paradoxical cognitive frame by providing the opportunity to learn from each other (Uzzi and Lancaster 2003). Through their informal relationships, members learn who knows what, therewith easing the search for relevant knowledge and experiences (Borgatti and Cross 2003). We examine the structural dimension of social capital, which we conceptualize as the overall pattern of a social network in terms of connectedness (Nahapiet and Ghoshal 1998; Sheremata 2000; Tsai and Ghoshal 1998; Uzzi 1997), as well as the relational dimension, which is the content of the relationships and often conceptualized as trust (Van de Bunt et al., 2005; Kang et al. 2007). In the remaining part of this and the next sub-section, we examine how structural and relational social capital may contribute to the reframing processes, and hypothesize their influence on organizational ambidexterity.

Achieving paradoxical frames through structural social capital. Structural social capital increases accessibility to knowledge sources within the organization across organizational units or subsystems (Jaworksi and Kohli 1993). In this study, structural social capital is conceptualized and operationalized as connectedness, which refers to the connectivity of an internal social network crossing hierarchical and functional boundaries. It increases the amount of communication among people in different parts of the firm (Ghoshal et al. 1994; Tsai, 2002). In this way, connectedness is advantageous for facilitating cooperation among organizational members (Adler and Kwon 2000; Walker et al. 1997) and increases the information sharing capacity of organizations (Galbraith 1973).

Connectedness can have a positive influence on overcoming incompatible cognitive frames, thereby facilitating the emergence of paradoxical cognitive frames, because members situated in connected social networks are exposed to diverse mindsets throughout the organization. Such exposure and interaction

contributes to the socialization of organizational members to formulate new shared perspectives (Tsai and Ghoshal 1998).

Connectedness extends internal social networks across hierarchical and structural boundaries and increases knowledge about diverse tasks and outcomes. Social ties cutting across unit boundaries help formulating applications for exploratory actions or puts exploitative efforts in a new context (Nahapiet and Ghoshal 1998). This in turn motivates and helps organizational members to think more clearly about possible synergistic outcomes from integrating knowledge and possible applications of exploratory and exploitative activities, thus creating a collaborative atmosphere where shared goals or intent are formulated in a clear-cut manner that is congruent with the interdependencies underlying exploration and exploitation.

Through these effects, connectednes facilitates opportunities to collaborate (Cross et al. 2002), enables cross-fertilization (Griffin and Hauser 1996), and creates a platform for discussion (St John and Rue 1991). This increased exposure to new ideas, different means to achieve goals, and interaction with diverse individuals, stimulates divergent thinking and the development of new applications of knowledge (Reagans and McEvily 2003). In this respect, connectedness increases boundary spanning behaviors that have been shown to contribute to finding solutions to ambiguous challenges (Cross and Sproull 2004). Thus, when integrating exploratory and exploitative activities and achieving ambidexterity, highly connected members are more likely to extend their own experience with various other cognitive frames. This increases the likelihood that effective ways of overcoming differences are found, as connected members are more likely to acknowledge and act upon the discrepancy between exploratory and exploitative mindsets and embrace a paradoxical perspective that is beneficial for ambidexterity. Thus, we hypothesize as follows:

Hypothesis 1: Internal structural social capital (connectedness) has a positive influence on organizational ambidexterity.

Achieving paradoxical frames through relational social capital. Relational social capital refers to the content or strength of ties, and is often conceptualized as trust. Trust is the result of "strategic and instrumental behaviour to manage contingencies arising from interdependencies and information asymmetries" (Van de Bunt et al. 2005: 345). It has been shown to increase the volume of information shared within groups (Dirks, 1999), and openness in communication (Smith and Barclay 1997; Zand 1972). Strong relationships such as trustworthy ones have been shown to have a positive influence on the extent to which organizational members are able to redefine assumptions to adjust to unforeseen situations (Cross and Sproulli 2004). Such relationships ease information interpretation (Ghoshal et

al. 1994): trust lowers barriers to knowledge sharing and helps developing a shared language, or a relation-specific heuristic (Uzzi 1997). Therefore, trust will help develop a specific and deep understanding of the challenges involved when integrating exploration and exploitation, and stimulates exploitative and exploratory members to seek out common ground between seemingly contradictory cognitive frames.

As employees develop trustworthy relationships, they develop an implicit understanding of the knowledge underlying each others' tasks, and a higher willingness to share information (Reagans and McEvily 2003). As such, close relationships tend to increase the likelihood that perceptions are shared and transferred (Sampson 1968). An organization that is characterized by high levels of trust is expected to foster a clear and deep understanding among its members about each others' roles, behavior and goals. Because of this understanding, when members are expected to combine their distinct exploitative and explorative behavior, they will resolve their differences more quickly and reframe to accommodate for the paradox with which they are confronted.

Because of these capabilities, members embedded in environments characterized by high levels of trust are more willing to participate in integration efforts, and contribute in a open-minded, meaningful manner. This will make it more likely that members seeking to integrate exploration and exploitation will receive ready support, both from each other and other organizational members. Moreover, members that trust other members are more willing to expend additional effort to aid each other (Adler and Kwon 2002). Trust will induce convergence among the involved exploitative and exploratory members, as they are more likely to transfer ideas and perceptions. It may result in a system where members share social characteristics: they become social referents to each other (Ibarra et al. 2005).This will make the process of reframing more efficient, as there are lower barriers to seek out common ground, and information is allowed to flow more freely between exploratory and exploitative members. Effectively, trust makes organizational members more able to engage in a reframing process towards a paradoxical cognitive frame. Thus, we expect trust to have a positive influence on ambidexterity, and we hypothesize as follows:

Hypothesis 2: Internal relational social capital (trust) has a positive influence on organizational ambidexterity.

3.1.4 The moderating effect of external social capital

Many studies have shown that market orientation, including client relations, competitors, and alliances, contributes to innovation and performance (Rowley et al. 2000; Morgan and Berthon 2008; Yli-Renko et al. 2003). Market knowledge

can provide leverage for a continual process of competence building and innovation without running the risk of losing sight of latent and explicit market demands (Danneels 2002). Thus, balancing high levels of exploration and exploitation to create synergistic outcomes is stimulated by the inclusion of this knowledge type. As clients are a primal source of market knowledge (Jaworski and Kohli 1993), we postulate that the knowledge flowing from client relations influences the ability of the firm to achieve ambidexterity by pursuing and integrating exploration and exploitation simultaneously.

Whether this knowledge emphasizes an organizations' current domain, or more distant domains however, is heavily dependent on the type of relationships the focal firm has with these external sources (Walter et al. 2007). Therefore, we examine the influence of both client structural and relational social capital on the relationship between internal social capital and organizational ambidexterity.

Past research on client relations has been divided on the effect of relationships with clients on innovation. Some argue that building close relationships (i.e. relational social capital) can result in the firm being the victim of the clients' every whim, leading to a myopic one-way track (Danneels 2003). Others have argued that the high levels of in-depth and applicable knowledge that close client relations yield is crucial for the development of innovations (Treacy and Wiersema 1993).

Regarding client structural social capital, researchers have argued that knowledge breadth coming from a broad and diverse client network can be detrimental to innovative capacity, as breadth can also equal lack of focus. This results in incomplete information-sharing, which will hinder the process of generating concrete products (Fang, 2008). Others have argued that the diversity in knowledge from a broad client network allows organizations to recombine and generate ideas to create innovations (Griffin and Hauser 1993; Uzzi 1997).
Literature on complementary social capital types has indicated that combinations of relational and structural capital may yield differential effects (Simsek et al. 2003; Reagans and McEvily 2003). Therefore, we take an intermediary position and argue that whether relational or structural client social capital result in positive or negative effects on ambidexterity is contingent on internal social capital types.

We posit that client relationships can enhance internal framing processes. While internal reframing towards paradoxical frames is sufficient to overcome differences and integrate, a 'balancing act' between organizations' internal and client networks can have a significant influence on the development of applications of the ambidextrous collaboration. Indeed, past research has underscored the interplay of different types of social relationships as differentiators between gaining information and truly grasping the nature of a problem in order to create value (Cross and Sproulli 2004; Kang et al. 2007; Tsai and Ghoshal 1998). This taps into research on the combined influence of

contradicting mechanisms on ambidexterity (Andriopoulos and Lewis 2009; Sheremata 2000). Centripetal mechanisms create a focus on collective goals and convergence towards them, while centrifugal mechanisms stimulate the individual to come up with divergent, unique solutions (Sheremata 2000). A combination of both creates a balancing tendency in the mind of the individual member where individualistic action is constantly contrasted with the goals of the larger organization. As exploration is more benefitted by divergent, variance increasing ways of thinking, and exploitation by convergent, variance decreasing ways of thinking (March 1991; Smith and Tushman 2005), a focus on both constitutes an enhancement of the ability of members to attain paradoxical frames and subsequently integrate their exploratory and exploitative ideas. We suggest that complementary client relationships may help organizational members strike a balance between exploration and exploitation by either coercing the framing process towards convergence or bending it towards a more divergent approach.

However, if client social capital is combined with similar capital types internally, members seeking to integrate exploration and exploitation may focus too much on either divergence or convergence, which will emphasize exploration or exploitation respectively. In the next part we will examine these differential effects more closely.

The moderating role of client relational social capital. Relational social capital can help generate commitment to particular client relationships (Brockner et al. 1997). It leads to higher information accuracy and a willingness to share information (Dirks 1999), and frequent interaction between organizations and their clients helps building a common language (Buckley and Casson 1976). Typically, a close relationship makes it easier to engage in in-depth interactions, absorption of knowledge, and high knowledge transfer (Grant and Baden-Fuller 2004). On the other hand, close relationships with clients can result in an unhealthy focus on specific customer-relations. When this is the case, firms will have difficulties in generating, absorbing and applying knowledge that deviates from the market knowledge that comes from these relations (Danneels 2003). However, high relational social capital with clients can be beneficial when it is of a complementary nature to internal social capital.

When client relational capital is internally complemented by connectedness, it can stimulate a balanced reframing process among organizational members. When engaging in reframing, the diversity in perspectives, mindsets and knowledge provided by connectedness may be channeled through high levels of client relational social capital. Close relationships with clients may foster members to keep in mind the possible applications of diverse bodies of knowledge. In other words, it allows for combinations of divergent and convergent thinking, inducing a balanced approach towards combining and recombining exploratory and

exploitative insights (Sheremata 2000). This way, high client relational social capital can provide the necessary focus to ensure that paradoxical cognitive frames will be developed more quickly and efficiently.

If client relational capital is combined with internal relational capital however, this may result in an unbalanced focus on existing market demands, current and local knowledge domains, and current applications. While internal trust may guide members involved in integration towards convergence that resolves differences more quickly and makes the process more efficient, the addition of strong relationships with clients may drive them to overshoot in terms of convergence. Because of the tie strength and trust embedded in high client relational capital, clients will provide the organization and its members with in-depth and high volumes of knowledge regarding their demands, which will induce more focus on convergence towards fulfilling these demands. Combined with internal relational social capital, this may result in a situation, where the focus on these clients and their information is dictating action within the firm. Efforts that attempt to break away from these clients' demands may then be frowned upon. This may guide the reframing process towards favoring exploitative outcomes over exploratory outcomes. In other words, client relational social capital will have a negative effect on the development of a paradoxical cognitive frame, and results in myopic reactions to shifts in market conditions (Danneels 2003). Therefore we hypothesize as follows:

Hypothesis 3: Client relational social capital (a) positively moderates the relationship between internal structural social capital and organizational ambidexterity and (b) negatively moderates the relationship between internal relational social capital and organizational ambidexterity.

The moderating role of client structural social capital. Client structural social capital refers to having relationships with many clients, many diverse clients, or enjoying a central position in the client network. Essentially, it is an ego-network (Wasserman and Faust 1994) of the firm with clients. A broad network provides access to diverse sources of knowledge (Rowley et al. 2000; Yli-renko et al. 2001), which enables a firm to broaden market knowledge (McEvily and Zaheer 1999). This leads to increased learning, resulting in higher product introduction rate (Zahra et al. 2000). Other research however, has posited that high diversity in external relations can lead to fragmentation of knowledge, which makes it hard to integrate (a necessary step in applying knowledge and creating tangible output) (Fang 2008). Whether this is the case, we argue, depends on how it is combined with internal social capital.

Without channeling effects of internal relational capital, an informal structure can reach a state of 'network overload' (Gnyawali and Madhavan, 2001; Maurer

and Ebers, 2006), where diversity is degenerating towards fragmentation. In this situation, there is not enough cohesion to hold the network together in terms of knowledge flows (Cross et al. 2002). Integration is highly inefficient and application of knowledge difficult because of the extreme amount of perceptions and bodies of knowledge involved. When a firm that is highly connected internally is also positioned in a broad and diverse client network, we propose that this overload situation may arise. Embedded in a broad and diverse client network, organizations enjoy exposure to a variety of demands, ideas and sources of market knowledge. Without the channeling effect of internal relational social capital however, it will be difficult for organizational members to make the translation to applications of this knowledge. In this situation, members may be stimulated to explore on a continual basis, resulting in the exploration trap (March 1991). In such a situation, the integration process between exploration and exploitation can be more difficult to conclude, because organizational members may be inclined to engage in excessive divergent thinking. This makes the integration process highly inefficient (Sheremata 2000), as members may favor an exploratory mindset over a paradoxical one, and lose sight applicability of their integrative efforts.

If client structural capital is combined with internal relational capital however, the fragmented ideas coming from diverse clients can be put in perspective by organizational members. Because of the shared perspectives, shared language, and shared purpose embedded in trustworthy relations, members are inclined to keep in mind the organizational goals and possibilities (Gittell 2002), or lack thereof, when confronted with this these diverse ideas. This will ensure a focused attention to the potential embedded in client relations. Essentially, members are pushed towards convergence through their strong internal relationships, while the inclusion of client structural social capital introduces complementary divergence that ensures a more effective integration process, as it provides more and diverse opportunities for application. This will ensure that reframings strike the right balance for creating an paradoxical frame suitable for integration of exploration and exploitation. It follows, then, that:

Hypothesis 4: Client structural social capital (a) negatively moderates the relationship between internal structural social capital and organizational ambidexterity and (b) positively moderates the relationship between internal relational social capital and organizational ambidexterity.

3.2 Methods

3.2.1 Research setting and data collection

In 2007, we randomly constructed a company sample (9000 firms) using a database from the Dutch Chamber of Commerce. We used a cut-off of 25 employees to ensure company size was minimally appropriate for our questions. In the survey, we asked the CEO of each firm to fill in one questionnaire and let a second one be completed by a qualified management team member. We assured them confidentiality and offered them a summary of the results. We received 1087 usable questionnaires from executive directors, for a response rate of 12.1 percent. Then, in 2008, we administered a second questionnaire to the same 1087 companies. This survey resulted in a response of 343 usable questionnaires, a response rate of 31.6% of the original response.

The executive directors had a mean age of 48.10 years (s.d. = 9.12) and a mean company tenure of 14.39 years (s.d. = 10.57). The firms in the final sample had an average size of 197.18 (s.d. = 632.03) full-time employees and an average age of 44.43 (s.d. = 111.88). The firms were operating in a wide range of industries covering manufacturing (39.7%), construction (18.4%), financial services (13.1%), and other industries (28.9%).

To test for nonresponse bias, we examined differences between respondents and nonrespondents for our final sample. T-tests showed no significant differences based on the number of full-time employees, total assets of branches, and prior performance. We also compared early and late respondents in terms of demographic characteristics and model variables. These comparisons did not reveal any significant differences ($p<.05$), indicating that nonresponse bias was not a problem.

To offset individual respondent bias and to examine reliability issues, we used the responses of a second management team member. This resulted in 56 responses, or 16.3 % of the firms from our sample of 343. We calculated an interrater agreement score (r_{wg}) for data on these variables (James et al. 1993). The median interrater agreements were above the cut-off value of 0.7, suggesting adequate agreement. Intra-class correlations revealed a strong level of interrater reliability: correlations were consistently significant at the .001 levels (Jones et al. 1983).

3.2.2 Measurement and validation of constructs

Organizational Ambidexterity. We used a two-step approach to develop a measure for organizational ambidexterity that captures both exploratory and exploitative efforts. First, executive-directors provided information concerning their firm's level of exploratory and exploitative innovation. The measure for *exploratory*

innovation was adapted from Jansen et al. (2006). The seven-item scale for exploratory innovation (α = .90) captured the extent to which branches depart from existing knowledge and pursue radical innovations for emerging customers or markets. A six-item scale (α = .86) measured firm-level *exploitative innovation* (Jansen et al., 2006) and captured the extent to which branches build upon existing knowledge and pursue incremental innovations that meet the needs of existing customers (Benner and Tushman 2003; Smith and Tushman 2005). To provide evidence of convergent and discriminant validity for exploratory and exploitative innovation, we performed exploratory factor analysis. The analysis clearly replicated the intended 2-factor structure with each item loading clearly on their intended factor (all factor loadings were above .57, with crossloadings under .37) and both factors having eigenvalues greater than one. Second, to develop a measure for a firm's level of organizational ambidexterity, we followed previous research and computed the additive of exploratory and exploitative innovation. The computation of the additive reflects previous arguments that both types of activities are non-substitutable and interdependent (*cf*. Lubatkin et al. 2006).

Internal Social Capital. Our measures of internal social capital represent an overall pattern of internal relationships of an organization. *Trust* (α = .76) was measured with a five-item scale based on Leana and Pil (2006), Van de Bunt et al. (2005) and Jaworski and Kohli (1993). It measures whether employees will not harm others or take advantage should the opportunity arise, whether they perceive each other as competent in their area of expertise (Dooley and Fryxell 1999), and the extent to which they enjoy empathic, and close relationships (Van de Bunt et al. 2005). *Connectedness* (α = .70) was measured with a four-item scale adapted from Jaworski and Kohli (1993). They developed a scale for connectedness that measured the extent to which employees were networked to various levels of the hierarchy in their organization. Exploratory factor analysis of both measures yielded a two-factor solution with all loadings above .65 and crossloadings below .35.

External Social Capital. Our measures for client relationships represent an organizations' ego-network with their clients. A four-item measure for *client relational social capital* (α = .74) was compiled and adapted from Kale and Singh (2000), Morgan and Hunt (1994), McEvily and Marcus (2005) and Yli-Renko et al. (2001). It refers to the extent to which a company enjoys a close relation with its clients, feels they aren't misleaded by clients, and respects its clients. *Client structural social capital* (α = .74, four items) refers to the extent to which an organization has a broad, diverse client network, and whether it fulfills a central role in this network. One item was based on earlier work (Yli-Renko et al. 2001), and three items were of our own device. We conducted exploratory factor analysis

to ensure that all four variables would represent separate entities. The analysis produced a two-factor solution with factor loadings above .51, crossloadings under .32, and all factors having an eigenvalue greater than one.

Control variables. We controlled for possible alternative explanations by including relevant control variables. As larger organizations may have more resources and yet lack the flexibility to pursue exploratory and exploitative activities simultaneously (Ahuja and Lampert 2001), we included the natural logarithm of the number of full-time employees within organizations to account for *firm size*. Furthermore, it is known that inertia improves with age as incumbent firms are naturally more inclined towards exploitative efforts (Gilbert 2005), so we added the years past since a companies' founding in the form of *firm age*. Furthermore, internal organizational structure might be of influence on the relationships between social capital and ambidexterity. The more structurally separated an organization is, the more likely it is that it benefits of an intra-organizational informal network that overcomes the formal barriers (Gittell, 2002), and the easier it can become ambidextrous (Gupta et al. 2006). An informal network spanning units is more likely to provide access to diverse mindsets, behaviors and output requirements. Therefore, we included a five-item measure for *structural differentiation*, which measures to what degree the organization is divided into subunits that perform distinct tasks or have distinct goals (Lawrence and Lorsh 1967). Furthermore, as the amounts and effects of social capital are known to be influenced by the extent to which members depend on each other to fulfill their tasks, we adapted a scale by Gattiker and Goodhue (2005) to control for *interdependency*.

Next to these internal organizational control variables, we included a four-item measure for *environmental dynamism* (Jansen et al. 2005a), since the level of exploration or exploitation and the relevance of accurate, timely and in-depth knowledge through informal networks may differ depending on the level of competition.

Finally, results in terms of exploitation or exploration may be industry-specific (He and Wong 2004), thus we recoded industry codes for each responding organization into four different industry dummy variables: *manufacturing*, *construction*, *financial services* and *other industries.*

3.3 Analysis and Results

Table 3.1 presents descriptive statistics and correlations for the study variables. We calculated variance inflation factors (VIF) for each of the regression equations to examine multicollinearity. The maximum VIF within the models was 2.94,

which is well below the rule-of-thumb cut-off of 10 (Neter et al. 1990). Table 3.2 presents the results of the regression analyses for organizational ambidexterity. The baseline model 1 contains control variables. Model 2 introduces effects of internal social capital on organizational ambidexterity. We discuss the results of the final model in table 2, i.e. model 3 with all variables.

Hypothesis 1, the positive influence of connectedness on organizational ambidexterity was supported (β=0.12, $p<.05$). The hypothesized positive relationship between trust and organizational ambidexterity however, was not (hypothesis 2, β=-0.05, n.s.). These results suggest that connectedness plays a pivotal role when developing exploratory and exploitative innovations simultaneously. From the moderations, hypothesis 3a, which proposed a positive influence of client relational capital on the relationship between connectedness and organizational ambidexterity was supported (β=0.22, $p<.01$): having close relationships with clients complements a connected internal informal structure. Figure 3.2, which depicts the interaction effects of client relational social capital and connectedness, clearly shows an increase in organizational ambidexterity, especially when combining high levels of connectedness with trust in client relationships.

Hypothesis 3b, a negative influence of client relational social capital on the relationship between trust and organizational ambidexterity, was also supported (β=-0.24, $p<.01$). Figure 3.3 shows that under the influence of client relational social capital, the slope of the relationship between trust and ambidexterity becomes even more negative.

Hypothesis 4a, the negative influence of client structural social capital on the relation between connectednes and ambidexterity was not supported (β=-0.08, n.s.). Hypothesis 4b was supported, being connected with many and diverse clients has positive influence on the relationship between trust and ambidexterity (β=0.17, $p<.05$). As figure 3.4 shows, the inclusion of client structural social capital makes the slope of the relationship between trust and ambidexterity shift from slightly negative to slightly positive.

There are several methods to calculate ambidexterity (Gibson and Birkinshaw 2004; He and Wong 2004; Lubatkin et al. 2006). Yet these methods share the same conceptual underpinnings. Therefore we also conducted a post-hoc analysis with the multiplicative of exploration and exploration (Gibson and Birkinshaw 2004) and found similar results. Hypothesis 1 was supported (β=0.12, $p<.05$), Hypothesis 2 rejected (β=-0.07, n.s.). Hypothesis 3a (β=0.19, $p<.01$) and hypothesis 3b were supported (β=-0.21, $p<.05$), while hypothesis 4a was not supported (β=-0.07, n.s.) and 4b was (β=0.18, $p<.05$).

Table 3.1 Means, standard deviations, and correlations[a]

	M	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) Organizational ambidexterity	9.50	1.96	--													
(2) Connectedness	5.36	0.82	.12	(.70)												
(3) Trust	5.41	0.82	.06	.53	(.76)											
(4) Client structural social capital	5.17	0.97	.23	.30	.28	(.73)										
(5) Client relational social capital	5.31	0.93	.11	.31	.38	.48	(.74)									
(6) Firm size[b]	1.83	0.47	.15	-.06	-.12	.02	-.04	--								
(7) Firm age[b]	1.42	0.41	-.08	-.01	-.04	-.07	-.02	.12	--							
(8) Structural differentiation	3.88	1.22	.25	-.02	.02	.10	.09	.12	-.09	--						
(9) Interdependency	5.21	0.66	.08	.08	.17	.05	-.04	-.08	.01	.08	--					
(10) Environmental dynamism	4.39	1.32	.34	-.02	.06	.19	.18	.02	-.09	.10	.08	--				
(11) Manufacturing	0.40	0.49	.07	-.06	-.11	-.17	-.04	.12	.32	.09	-.07	-.05	--			
(12) Construction	0.18	0.39	-.10	.04	.04	.01	-.08	.05	.03	-.10	.03	-.02	-.38	--		
(13) Professional services	0.13	0.34	-.01	-.07	.05	-.01	.09	-.08	-.11	.02	.03	.01	-.31	-.18	--	
(14) Other industries	0.29	0.45	.02	.08	.05	.18	.05	-.11	-.29	-.03	.03	.06	-.52	-.30	-.25	--

[a] n = 343. Numbers in parentheses on the diagonal are Cronbach's alphas of the composite scales. All correlations above |.10| are significant at $p < .05$.

[b] Natural log

Table 3.2 Results of hierarchical regression analyses: internal and external structural and relational capital and organizational ambidexterity[a]

Variables	Organizational ambidexterity		
	Model 1	Model 2	Model 3
Control variables			
Firm size	0.13**	0.14**	0.13*
Firm age	-0.07	-0.07	-0.08
Structural differentiation	0.18***	0.18***	0.16**
Interdependency	0.06	0.05	0.07
Environmental dynamism	0.31***	0.32***	0.28***
Construction	-0.10	-0.11*	-0.13*
Professional Services	-0.04	-0.03	-0.03
Other	-0.04	-0.05	-0.09
Independent variables			
Trust		-0.04	-0.05
Connectedness		0.16**	0.12*
Moderator variables			
Client relational social capital			-0.05
Client structural social capital			0.16**
Interactions			
Client relational x trust			-0.24**
Client structural x trust			0.17*
Client relational x connectedness			0.22**
Client structural x connectedness			-0.08
Adjusted R^2	0.17	0.19	0.22
Δ Adjusted R^2		0.02*	0.03**

[a] Standardized regression coefficients are reported

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

Figure 3.2 **Interaction of connectedness and client relational social capital in relation to organizational ambidexterity**

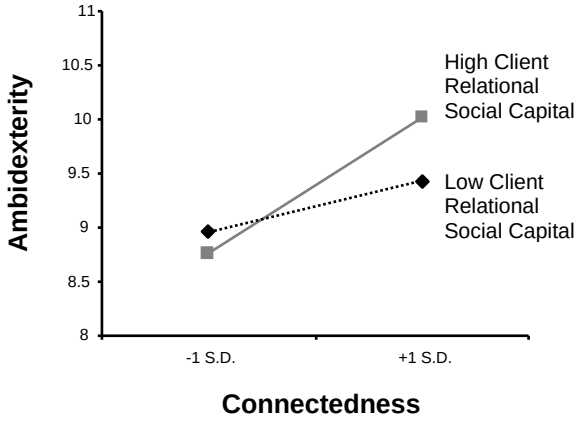


Figure 3.3 **Interaction of trust and client relational social capital in relation to organizational ambidexterity**

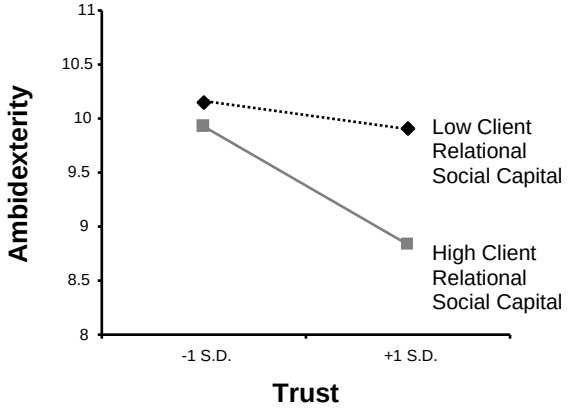
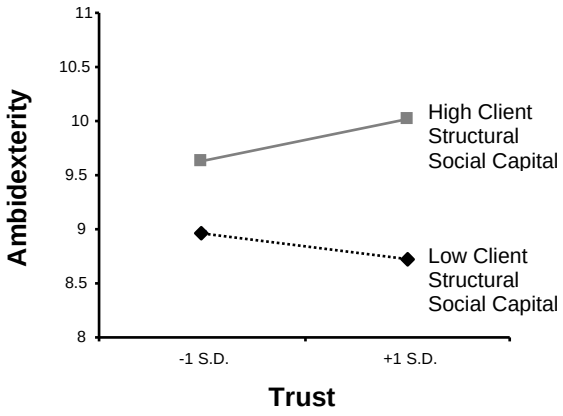


Figure 3.4 Interaction of trust and client client structural social capital in relation to organizational ambidexterity



3.4 Discussion and conclusion

Research on ambidexterity has emphasized the role of coercive structures and social relations as main tools for overcoming the contradictions between exploratory and exploitative activities (Gibson and Birkinshaw 2004; Benner and Tushman 2003). Exploration and exploitation require distinct, inconsistent architectures and cultures. To achieve ambidexterity however, these differences need to be reconciled. This presents firms with a paradox.

According to our research, organizations pursuing ambidexterity need to facilitate a social context that stimulates organizational members to transcend the paradox between exploratory and exploitative activities. Once this is achieved, they will enjoy superior adaptability combined with the stability to better serve current product/market domains. We theorized that internal structural and relational social capital (connectedness and trust) may encourage organizational members to move beyond incompatible cognitive frames, and reframe their exploratory or exploitative mindsets towards a paradoxical cognitive frame. This taps into the idea that reframing processes are influenced by social interactions between members (Kaplan 2008; Pinkley and Northcraft 1994). Furthermore, we conceptualized that such reframings towards paradoxical cognitive frames are further enhanced by complementary client

relationships. Research has indicated the influence of combinations of divergence and convergence when seeking ambidexterity (Andriopoulos and Lewis 2009; Mom et al. 2009). While either divergence or convergence may provide members with ways to handle the tension between exploration and exploitation and achieve a paradoxical perspective, this process can be made more efficient or effective by relational and structural client social capital respectively. The results in this study provide some additional insights in this regard.

Structural social capital, or connectedness, enables organizations to achieve ambidexterity. The diversity in relationships and knowledge that high elvels of connectedness provide, helps members to discover 'who knows what' (Borgatti and Foster, 2003). The divergence that structural social capital stimulates, helps members to transcend the exploration-exploitation paradox by showing them alternate solutions to the tension they are presented with when integrating exploration and exploitation. This creates a platform for discussion, and stimulates boundary-spanning behavior (Reagans and McEvily 2003). Such behavior increases organizational members' capacity to frame the integrative effort in light of what and who they know within the organization, allowing them to more effectively utilize this knowledge and find bridging solutions to overcome incompatible cognitive frames and successfully create synergistic value. This result is in line with previous research on structural social capital, which states that the diversity of knowledge coming from such a capital type benefits the innovative capacity of organizations (Behrens et al. 2000; Tsai and Ghoshal 1998; Uzzi 1997). Organizations seeking ambidexterity should pay careful attention to their internal network structure, as it can make reframing more effective, thus making ambidexterity more easily attainable.

However, we found no significant influence of relational social capital (trust) on ambidexterity. While trust encourages members to share perspectives and norms, embrace overarching goals, and develop a shared identity, it does not help create synergistic value from separate exploratory and exploitative activities. This might be because of the necessity to 'step out of the box' in order to overcome incompatibilities in cognitive framing (Watzlawick et al. 1974). The workings of trust are such that it creates common ground and a shared identity, but can also lead to less willingness to incorporate ideas that challenge this shared identity (Langfred 2004). While this is not so great an effect that it stifles efforts that create ambidexterity, it also doesn't create opportunities for it. In some ways, this result deviates from previous research. For instance, Adler et al. (1999) found trust to have a positive influence on the ability in the context of a joint-venture between Toyota and GM to move between exploration and exploitation modes. However, this venture pursued exploration and exploitation in a sequential fashion. In such a context trust functions as a collider for the transition

between both stages. Thus, the non-significant influence of trust in our study may very well be due to a different context or different type of ambidexterity (as we examine the simultaneous pursuit of exploration and exploitation). On the other hand, in a study of 450 Chinese business ventures, Atuahene-Gima and Murray (2007) found a non-significant influence of trust on exploratory learning and a positive significant influence on exploitative learning. Our result then, may underline the assertion that the organizations seeking ambidexterity need to put extra effort in the creation and maintainance of exploration, as exploitation tends to crowd out exploratory activities (Levinthal and March 1993). Further research is however required to delve into these potential differentiating factors and specific effects.

This result notwithstanding, we have shown that client relational and structural social capital may have detrimental or complementary effects (respectively) on the relationship between trust and organizational ambidexterity. We found a positive moderation of client relational capital on the relationship between connectedness and ambidexterity. Having close relationships with clients allows connected organizations to make the most of their internal structural ties. This relationship underscores the importance of accuracy in information regarding 'the market'. It is actually a case for *customer intimacy* (Treacy and Wiersema 1993), which requires a firm to focus on developing close customer-relations. As a result, the organization gains intimate knowledge of their customers' emerging and existing needs, and high customer loyalty, which secures a durable form of competitive advantage (Day 2000). The thorough knowledge of the customer extracted from the relationship, gives an organization information on existing product-market combinations, on which improvements can be made, and on how they should serve the customer. In the case of a lacuna in the organization's offer from the customer's perspective, this knowledge can serve as a basis to create new product-markets. By nature, knowledge coming from close, personal relationships is more tacit to that relationship, in terms of context and language, than knowledge from more distant and diverse sources (Uzzi, 1997). Yet, close relationships yield more knowledge depth and specificity, than distant relationships. So, it takes more effort to translate this knowledge and communicate it to organizational members. Having a connected social structure allows for extensive ongoing communication. The in-depth knowledge coming from such relationships enhances the ability of organizational members to integrate and apply knowledge from both exploratory and exploitative activities, by creating both divergence and convergence in their reframing process towards possible applications of the integrative process.

On the other hand, the negative moderation of client relational capital on internal trust and ambidexterity indicates the potential downside of cohesive external

networks. As is plotted in figure 3.3, this combination actually decreases an organization's ability to achieve ambidexterity. Combining close relationships externally with trust leads to a myopic situation where both internal processes and external ones accelerate each other towards creating solutions for existing markets, resulting in the exploitation trap (Danneels 2003; March 1991). Cognitively, this means that in light of serving important, familiar clients, exploratory mindsets are frowned upon. Instead of a paradoxical cognitive frame, an exploitative cognitive frame is more likely to be developed. In conclusion, for organizations characterized by high levels of trust, the exploitation trap is looming. These organizations should pay careful attention to their relationships with clients, lest they fall victim to their whims.

We found no significant moderation by client structural social capital on connectedness. We hypothesized a negative moderation, a situation of network overload, since a lack of focus in knowledge flows can destabilize an organization (Walter et al. 2007), and connected organizational members may overextend their search for knowledge guiding their reframing process. The non-significant interaction between client structural capital and connectedness may indicate an actual lack of connection. Past research has indicated networks that have too little connections to be insufficient to support stable flows of knowledge (Jansen et al. 2005b; Hansen 1999). We argue that such a situation may arise when combining high levels of client structural social capital and internal structural social capital. Thus, while the sign of the relationship is negative and only slightly removed from being significant, its influence is not great enough to warrant attention for firms seeking to become ambidextrous.

A positive effect is discernable when internal trust is combined with a broadly connected client network. Figure 3.4 shows that the effect of internal trust on ambidexterity becomes slightly positive under the influence of client structural capital. Client structural capital provides firms that are characterized by high levels of trust with the necessary diversity to ensure that both exploration and exploitation receive sufficient attention when trying to integrate them.

In any case, the differences in moderation by relational and structural client social capital highlights that, depending on internal configurations, an organization's external relationships require configuration. To maintain a steady stream of customer knowledge beneficial for ambidexterity, the external structure needs to complement the internal one in order to effectively diffuse knowledge and allow members to act upon it. If a firm has relatively few but close relationships with clients, management should stimulate informal contact where knowledge regarding these clients is shared freely. In contrast, when a firm has a broad and large client network, it should pay attention to the knowledge that it allows to flow within their ranks, i.e. knowledge

could be considered in a centralized fashion. This means that a firm must keep attuning its relationships with its customers and put the knowledge coming from these relationships to work spread throughout the organization (Batt and Purchase 2004).

3.4.1 Limitations and future research suggestions

While our study presents some interesting results in terms of combinations of internal and external social capital and their influence on organizational ambidexterity, there are several limitations and future directions for research that warrant attention.

Firstly, while organizational ambidexterity requires reframing (Smith and Tushman 2005), we did not measure the reframing process directly. Our study sheds light on contextual factors influencing the reframing process and outcomes. However, it would be interesting to examine this reframing process in greater detail. This would require delving deeply into individual processes and interactions between members trying to integrate. Because of the intertwined nature of context, individual action and higher-level outcomes such as ambidexterity, a multilevel approach would seem appropriate.

Secondly, we did not include cognitive social capital. This would be of particular interest since prior research has shown that forms of capital, especially with regard to the cognitive dimension, influence each other. For instance, a densely connected internal network and strong cognitive are related in the sense that they enforce a form of 'cognitive similarity' or like-mindedness which can stifle divergent initiatives (Simsek et al., 2003). In our research, interactions between structural and relational capital within the same domain were not found in the full model. However, to check for possible explanations, we ran regressions with the internal social capital measures and the client social capital measures separately. We found that significant internal social capital interactions without the presence of client networks were present (β=0.06, $p<.05$), and client social capital interactions without the inclusion of internal social capital weren't (β=-0.003, n.s.). While beyond the scope of this research, it gives rise to an interesting avenue for research regarding the nature of internal and external social capital, and their distinct influence on each other.

In conclusion, our research presents a model which moves the social capital antecedents of ambidexterity beyond organizational borders. We have shown that different dimensions of social capital have different influences on each other and organizational ambidexterity. Managers and marketeers should carefully tailor their client relations and internal relations to achieve optimal complementary configurations to stimulate behavior beneficial for organizational members to reframe their entrenched cognitions towards transcendence of the paradox within ambidexterity.

4 Ambidexterity in Self-Managing Teams: A Multilevel Analysis of Team and Individual Characteristics[3]

Abstract
Research on ambidexterity is burgeoning, however, most scholars have studied ambidexterity at single levels of analysis. We apply the concept of ambidexterity at the team-level of analysis and investigate how it is influenced by individual creative problem solving. We propose a contingency perspective with cross-level moderation effects of shared vision and trust at the team level and task autonomy at the individual level. We test this model based on a sample of 124 organizational members, operating in 30 self-managing teams. We find that individual creative problem solving has a positive influence on team ambidexterity, and creative problem solving is positively influenced by task autonomy. Team level shared vision and trust however, have differential cross-level interaction effects on the relationship between individual characteristics and creative problem solving, suggesting a trade-off for ambidextrous teams.

Keywords: Ambidexterity, exploration, exploitation, multilevel, creative problem solving

[3] Earlier versions of this study have been presented at the EGOS Colloquium 2009, Barcelona and at the Strategic Management Society Conference 2009, Washington DC, as 'Tempelaar, M.P. and Jansen J.J.P (2009). Knowledge Sharing and Ambidexterity in Self-Managed Teams: A Multi-Level Analysis of Team and Individual Characteristics'. At the Washington conference it was a finalist for the *Strategic Management Society PhD Award.* A final version is in the process of submission to a top journal in the field.

Much attention has been given to firms that are able to achieve high levels of both exploration and exploitation, also known as ambidexterity (He and Wong 2004; Jansen et al. 2006; O'Reilly and Tushman 2008; Raisch and Birkinshaw 2008). However, much remains to be explained about the way organizations are able to achieve this combination of exploration and exploitation, especially when exploration and exploitation are not formally or structurally separated, otherwise known as contextual ambidexterity. Traditionally, ambidexterity has been proposed to require either temporal or structural separation to handle both exploration and exploitation within the same firm (Duncan 1976, Tushman and O'Reilly 1996). Insights in contextual ambidexterity however, highlighted the possibilities of firms to generate and sustain high levels of exploration and exploitation within the same organizational domain (Gupta et al. 2006). Since Gibson and Birkinshaw (2004) first coined the term, very few studies have actually examined contextual ambidexterity empirically, despite its conceptual impact (Raisch and Birkinshaw 2008). In our research, we examine how self-managing teams within a firm can achieve ambidexterity by facilitating a coercive team-context and accomodating task design that stimulate beneficial processes for ambidexterity at the individual and team-level of analysis. Team-level ambidexterity has been shown to increase team effectiveness under environmental stress (Drach-Zahavy and Freund 2007), to lead to higher customer satisfaction and performance (Gilson et al. 2005), and to enable higher level exploration and exploitation demands (Litrico and Lee 2008). Despite these promising results and conceptual relevance (Gupta et al. 2006), team level ambidexterity remains relatively under-researched. We delve into this gap by examining how team-level ambidexterity can be facilitated through the interplay between team context, individual processes and individual task design.

We contribute to the existing literature in at least three ways. First, we examine the influence of individual attributes on the emergence of team-level ambidexterity. While the importance of the role of the individuals in achieving organizational ambidexterity has been duly noted by researchers (Raisch et al. 2009), few have actually examined their role explicitly (*cf.* Mom et al. 2007), particularlty in a team context. It has been posited that pursuing ambidexterity sends challenging and contradictory signals to individuals within a firm (Smith and Tushman 2005). Exploration revolves around distant, broad knowledge, tacit knowledge, and distant search, whereas exploitation is associated with in-depth market knowledge, explicit knowledge, and local search (Levinthal 1997; Morgan and Berthon 2008; Rosenkopf and Nerkar 2000).

Therefore, to accommodate for both exploration and exploitation, individuals will have to pay attention to diverse bodies of knowledge. Generating and applying new

and diverse knowledge requires individuals to be able to engage in 'out-of-the-box' or divergent thinking in order to "combine elements of previously unconnected or by developing novel ways of combining elements previously associated" (Nahapiet and Ghoshal 1998: 248), whereas exploitative, incremental, knowledge demands require covergent thinking that is based on "localized search and stable heuristics" (Nahapiet and Ghoshal 1998: 248), i.e. in accordance with an organizations' current domains. While challenging, through the right balanced mindset, individual members are able to handle both exploratory and exploitative demands, and contribute in a meaningful way to the process of achieving ambidexterity (Gibson and Birkinshaw 2004). Thus, we contribute to the literature by conceptualizing and testing how individuals can have a positive influence on their teams' ambidextrous abilities through a mindset that enables them to approach both exploration and exploitation demands even-handedly.

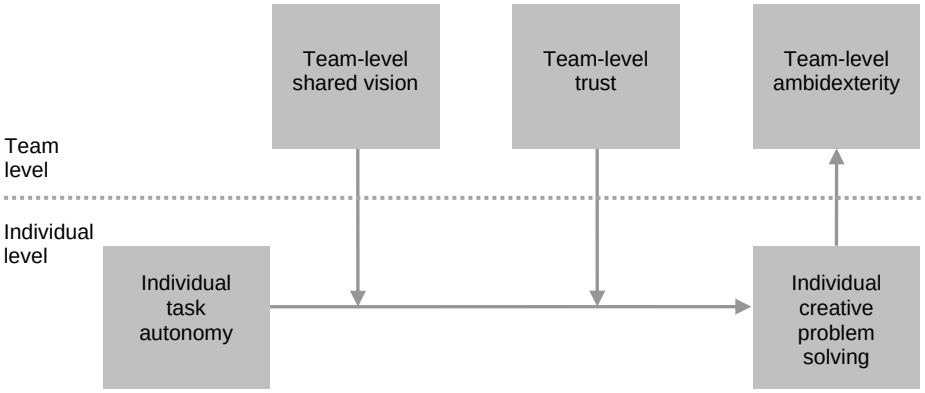
Second, the extent to which team members are able to balance both an exploratory as well as an exploitative mindset is not only dependent on individual attributes, but also on the context within which they operate (Gibson and Birkinshaw 2004, Raisch and Birkinshaw 2008). In accordance with this idea, we examine the cross-level interaction effects of team-context on the relationship between individual attributes and problem-solving. While most studies on ambidexterity either focus on organizational level, sub-unit level or individual level, we combine individual and team levels of analysis. This constitutes a contribution to the ambidexterity literature, as past studies have hinted at the nested nature of challenges involved in balancing exploration and exploitation (Gupta et al. 2006; March 1991; Raisch et al. 2009). By testing a multilevel model with team-context variables and individual attributes, we provide empirical evidence on such a nested system to achieve team ambidexterity.

Third, past research has proposed that teams seeking to become ambidextrous should apply contradicting mechanisms that drive individuals away from the organization and its norms and routines, as well as stimulate them to keep in mind the overarching goals and their organizational, collective environment and its goals (Mom et al. 2009, Andriopoulos and Lewis 2009). This combination of centrifugal and centripetal elements (Sheremata 2000) stimulates a balanced approach to challenges that may arise when confronted with contradictory exploration and exploitation demands. We examine how such elements may play out in the mind of individual team members, and stimulates them to act with sensitivity to the challenges of ambidexterity.

Figure 4.1 depicts our full model. We test this multilevel model using multi-source and cross-level data with a lagged design, within a consultancy organization which consists of 174 members organized in 34 self-managing teams. In the next

section, we provide theoretical background and formulate hypotheses regarding the team and individual level effects on knowledge sharing and ambidexterity.

Figure 4.1 Multilevel effects of team- and individual characteristics on team ambidexterity



4.1 Literature review and hypotheses

4.1.1 Ambidexterity as a nested phenomenon

Exploration and exploitation appear to be juxtaposed, and require seemingly contradictory processes, structures and mindsets.

Exploratory innovations are radical and designed for new product/market combinations (Benner and Tushman 2003). These innovations are built on a tacit knowledge base, deal with a latent customer demand (Lubatkin et al. 2006), and are associated with experimentation, flexibility, and divergent thinking (Jansen et al., 2006). Exploration involves a high amount of knowledge generation (Grant 1996), which requires deep immersion, transfer and absorption of new knowledge.

On the other hand, exploitative innovations to improve existing competencies, are incremental and meet the needs of existing product/market combinations (Benner and Tushman 2003). Exploitation requires an explicit knowledge base for the refinement of current customer demand (Lubatkin et al. 2006). It is typically more associated with

efficiency, refinement, and focus (Zahra and George 2002), and knowledge application (Grant 1996), which requires access to complementary knowledge in order to broaden and enhance existing knowledge and skills (Grant and Baden-Fuller 2004). The co-presence of exploitation and exploration within the same team leads to more incongruity between knowledge domains, as it includes both knowledge that is applicable to the current product/market domain as well as knowledge that is highly divergent.

Research on ambidexterity has, however, shown that exploration and exploitation can and must be combined to create synergies that may lead to superior performance in the longer run (Gibson and Birkinshaw 2004; He and Wong 2004). This requires organizational members to be proficient in handling the paradoxical situation that arises when trying to combine exploration and exploitation (Andriopoulos and Lewis 2009). Instead of perceiving exploratory and exploitative activities as contradictory and subject to a dilemma or trade-off, members must see the potential synergies between exploration and exploitation and seek out ways to integrate them. To create ambidexterity, firms must therefore employ mechanisms that stimulate such an integrative approach to both exploration and exploitation (Raisch and Birkinshaw 2008; Tushman and O'Reilly 1996). Past research on ambidexterity has indicated informal, contextual mechanisms such as top-management team behavioral integration (Lubatkin et al. 2006), combinations of strong and bridging relationships (Tiwana 2008), and formal mechanisms such as formalization (Jansen et al. 2006), and cross-functional interfaces (Mom et al. 2009).

We examine how teams may foster such a balanced approach among its members. The team-level of analysis is receiving increasing attention, as it is perceived an important source of organizational innovation (Hülsheger et al. 2009; Shalley et al. 2004; West 2002). Research on ambidexterity has largely neglected this level of analysis (notwithstanding top management teams (Jansen et al. 2008; Smith and Tushman 2005; Tushman and O'Reilly 1996)), thus it would be of interest to examine the ways teams may shape ambidexterity.

Furthermore, earlier work on the creation of organizational ambidexterity has focused on single levels of analysis. Yet, a lot of these studies imply that ambidexterity is a phenomenon that cuts across multiple levels of organizing and call for more research examining these cross-level notions (*cf.* Raisch and Birkinshaw 2008, Mom et al. 2007, Raisch et al. 2009). The challenge of balancing exploration and exploitation is nested within different levels of organization: at the individual, team and firm level (March 1991). We tap into this idea by testing a multilevel model that enables us to examine how team-level ambidexterity may be shaped through such nested phenomena.

We concur with Gibson and Birkinshaw (2004) that ambidexterity at teams or units starts with individual behavior. The individual ability to reconcile and combine both exploration and exploitation shapes the initial conditions for higher level combinations of exploration and exploitation (March 1991). These conditions involve the ability of teams to align and adapt their processes simultaneously towards exploration and exploitation (Smith and Tushman 2005). An important source of this ability is the creativity of individual team members (Sheremata 2000).

4.1.2 Individual creative problem solving and team ambidexterity

As an indicator of individual creativity, we examine individual creative problem solving, which refers to the extent that members link ideas to multiple sources, delve into unknown areas to find better or unique approaches to a problem, or seek out novel ways of performing a task (Gilson and Shalley 2004). Problem solving has been shown to be a particularly important skill for innovation (Müller et al. 2009), product development (Iansiti 1995), and in general, situations which requires organizational members to combine divergent thinking with a sensitivity to their task demands and goals (Sheremata 2000), also known as convergent thinking.

Being creative involves a skill in producing a novel and appropriate response, product, or solution to an open-ended task (Amabile and Mueller 2008). Creativity provides necessary first steps or preconditions for creative outcomes, improved performance, and is a driver for eventual innovation (Gilson and Shalley 2004; Kanter 1988; Woodman et al., 1993). For instance, creativity may stimulate a continuous stream of entrepreneurial action, organizational change, organizational effectiveness, solutions to ill-defined problems, and collective problem solving (Amabile 1996; Ames and Runco 2005; Gilson et al. 2005; Hargadon and Bechky 2006; Abou-Zeid and Cheng 2004). These insights underline that 'all innovation begins with creative ideas' (Amabile et al. 1996).

Creative personalities tend to be more adjusted, sociable, productive and open towards new experiences (McCrae 1987), and are more likely to share their ideas with co-workers (Oldham and Cummings 1996). These characteristics may induce them to keep in mind collective demands, goals, and act upon them. Creativity can be divided into two components (Jabri 1991). Creative individuals tend to be comfortable with and stimulated by independence, risk-taking, and an ability for taking new perspectives on problems, generate new knowledge, yet combine this with a disciplined work style and skills in applying ideas and knowledge (Amabile and Mueller 2008, Shalley et al. 1995). As new knowledge generation is associated with

exploration and knowledge application with exploitation, the combination of both fosters attention to exploratory and exploitative activities at the same time, thus enhancing individuals' ambidextrous abilities (Andriopoulos and Lewis 2009, March 1991, Smith and Tushman 2005).

Creative problem solving, then, can be described as both divergent and convergent behavior (Parnes 1967): members that are highly creative in their problem solving tend to look beyond the more obvious solutions and seek out combinations of local and more distant knowledge types (Hargadon and Bechky 2006, Schank and Abelson 1977). In the literature, it is this combination of local and distant knowledge that is seen as a key driver of effective and continuous knowledge generation and application (Cohen and Levinthal 1990; Grant 1996).

Creative problem solving across team members enhances the ability of teams to pursue exploration and exploitation simultaneously and achieve ambidexterity. Teams that are to a large extent composed of individuals who are creative in their problem solving generate new knowledge more readily, and combine these new sources with a sense of direction that stimulates the application of knowledge (Gilson and Shalley 2004). Teams that are highly creative in this respect are characterized by an atmosphere where new ideas flow freely, yet members remain pragmatic towards applications of these ideas (Scott and Bruce 1994). With this combination present within a team, its current exploitative path can be extended through a continuous stream of applicable new ideas, while new exploratory opportunities can be developed through divergent thinking of its members, tempered by a focus on collective demands and goals. In fostering both alignment and adaptation (Gibson and Birkinshaw 2004), individual creative problem solving stimulates the creation and maintenance of team level ambidexterity. Therefore, we hypothesize as follows:

Hypothesis 1: Individual creative problem solving has a positive influence on team ambidexterity

4.1.3 Individual task autonomy and creative problem solving

Individual-level creative problem solving may be accommodated by individual task design that stimulates divergent thinking and the creation of new ideas (Axtell et al. 2000). In this, it enables creative action and enhances the quality and quantity of outcomes (Sheremata 2000). As such, the amount and quality of ideas generated may also depend on job characteristics (Axtell et al. 2000). With this in mind, we examine the influence of individual task autonomy (Langfred 2005; Breaugh 1999).

Task autonomy gives members the freedom to shape their tasks, including decisions about how and when they perform certain tasks within their teams (Langfred 2000). It has been linked to creative processes (Amabile 1988, Mumford et al. 2002), and has been connected to an increase diverse and creative outcomes (Anderson et al. 2004, Runco 2004), entrepreneurial value creation and strategic renewal (Lumpkin et al. 2009), and innovative performance (Cohn et al. 2008).

Autonomous individuals are more inclined to allocate time towards new ideas, and to generate applicable knowledge from it (Haas 2006). The more autonomous an individual team members operate, the less they will be influenced by myopic external forces, such as co-workers seeking to gain influence. Autonomous individuals are generally seen as more capable, thus reducing incentives to influence their processes and outcomes (Langfred 2000).

In general, autonomous individuals will feel less inhibited to seek and try out new ideas. There are two reasons for this. First, autonomous individuals feel more responsible for their work (Hackman and Oldham 1976), and exhibit higher sense of control and authority. This increases goal-orientation in their work, i.e. autonomy motivates them to act with respect to their task and outcome demands (Lawler 1992). Autonomous team members are inclined to look for effective ways to perform their tasks, and interaction with other individuals and new bodies of knowledge may provide them with ideas to do so. Second, task autonomy comes with a lack of precise instructions on how to perform a task. Therefore, autonomous individuals may see greater need to share experiences and ideas with co-workers and other sources to fill this gap (Cabrera et al. 2006). This 'do it yourself' mentality (Ensor et al. 2001) increases the autonomous members' exposure to different methods, ideas and mindsets, thus enhancing his or her creative problem solving potential. Given these effects of individual-level autonomy, we hypothesize as follows:

Hypothesis 2: Individual task autonomy has a positive influence on individual creative problem solving

4.1.4 Cross-level moderation by team characteristics

Team-context is likely to influence the impact of autonomy on creative problem solving, as it can contribute to an atmosphere in which relevant knowledge is transferred to help create high levels of both exploratory and exploitative innovations. In line with a stream of team-based research (Amabile 1996, Anderson et al. 2004, Runco 2004), we assert that team-context can help create such a nurturing

environment. Research has highlighted the importance of a nurturing environment to make the most of individual autonomy and creativity (Amabile et al. 1996; Langfred 2000). Furthermore, researchers have postulated and tested models in which an organization's social context plays a significant role in explaining the ease with which organizations may achieve ambidexterity (Gibson and Birkinshaw, 2004; Gupta et al. 2006; O'Reilly and Tushman, 2008).

Such an environment should both be sensitive to the orthognality as well as the synergy between exploration and exploitation (Gibson and Birkinshaw 2004). Achieving such a balance requires contextual solutions that can be at odds with each other, such as formal versus informal integration mechanisms (Adler et al. 1999; Jansen et al. 2009) and centralized versus decentralized organizing (Duncan 1976; Tushman and O'Reilly 1996). Research has indicated communalities between these organizational tensions in the form of the centrifugal (outward push) or centripetal workings (inward pull) of the underlying mechanisms (Andriopoulos and Lewis 2009, Mom et al. 2009, Sheremata 2000). Decentralization for instance, fosters a focus on individual action, whereas centralization works towards collective action (Tsai 2002). By striking a balance between such forces, individuals are able to more efficiently distill applications from divergent thinking by combining it with a focus on convergence and collective goal-attainment (Sheremata 2000). Therefore, a combination of centripetal and centrifugal forces heightens the probability of successful creative problem solving, and it stimulates a balanced approach to problems that individuals face when confronted with contradictory exploratory or exploitative demands.

Thus, while task autonomy may be a sufficient precondition for creative problem solving to emerge (Abou-Zeid and Cheng 2004; Kabanoff and Bottger 1991), this linkage may be strenghtened by inclusion of team-level context variables that provide convergent thinking (i.e. centripetal forces). In this, team-level centripetal forces may leverage individual level task autonomy by stimulating a focus on collective action: they temper individual action with a sense of direction and goal-attainment, in a way that increases both the quality and efficiency of the creative problem solving process (Sheremata 2000).

To uncover such cross-level interaction effects, we examine two constructs that have been widely accepted as having a distinct influence on the way individual members behave in groups: shared vision, and trust (Dyer and Singh 1988; Inkpen and Tsang 2005; Jarillo 1988; Tsai 2002).

4.1.5 Team-level shared vision as a moderator of task autonomy and creative problem solving

A shared vision represents a pattern of team values that expresses the developmental path for an team's future (Wageman 2001). Common goals and shared values enhance the creation of a holistic view in teams (Tsai and Ghoshal 1998). As such, a team-level shared vision promotes a strong awareness of overarching goals (Orton and Weick 1990, Schippers et al. 2008), and induces team members to judge alternative methods in light of these goals. Shared vision is a centripetal force, because it helps to 'integrate dispersed information, knowledge and ideas into collective action' (Sheremata 2000: 398). It increases the perception of similarities and increases the acceptance of different work methods. Teams that have a strong shared vision embrace diversity in approaches and methods, and consider alternatives more readily (Brewer and Miller 1984; Gilson and Shalley 2004).

This will enhance the effects of individual-level task autonomy on individual creative problem solving, as members are even less prone to fall victim to myopic influences. It will strengthen autonomous team members in its goal-orientation, as a shared vision provides them with a clearly articulated goal. When autonomous members start acting in accordance with the team's shared vision, co-workers will be more accepting of deviating, creative methods and solutions developed by the autonomous members. This gives them greater sense of freedom and authority, and fosters an inclination towards knowledge gathering, yet helps them retain a sense of convergence with the direction of their team.

Furthermore, the higher acceptance of alternatives within teams with a strong shared vision will lower inhibitions of individual team members to share their ideas with co-workers. Members will feel that their actions are a serious candidate for working towards their teams' goals. As a result they are more likely to incorporate contributions of co-workers in their creative problem solving process, which creates interconnections and dependencies between them (Wageman and Gordon 2005). These cross-level interaction effects ensure that autonomy is more efficiently translated into creative problem solving. To summarize, we hypothesize as follows:

Hypothesis 3: The higher team-level shared vision, the higher the influence of individual task autonomy on individual creative problem solving.

4.1.6 Team-level trust as a moderator of task autonomy and creative problem solving

Team trust is the result of 'strategic and instrumental behavior to manage contingencies arising from interdependencies and information asymmetries' (Van de Bunt et al. 2005: 345). Teams that are characterized by high levels of trust tend to develop strong relationships and cohesion amongst themselves (Gulati and Singh 1998). Trustworthy relationships are characterized by a conviction that others have good intentions and are capable in their work (Zarraga and Bonache 2003). As a result, trust has a positive influence on the amount of information shared within teams and openness in communication (Reagans and McEvily 2003; Smith and Barclay 1997). Trust has been conceptualized as a centripetal force, in that it stimulates collective action (Ibarra 1995) and integration of information (McGrath and Krackhardt 2003).

Autonomous team members embedded in an environment that exhibits high levels of trust will be stimulated to put more effort in knowledge gathering and sharing. As trust creates an atmosphere of mutual respect for each others' expertise and capabilities (Leana and Pil 2006), it heightens the autonomous members' sense of control, authority and independence (Langfred 2005), and further reduces incentives of co-workers to exert influence over the autonomous member. Trustworthy relationships also lower barriers to interact with co-workers. Since trust helps create a non-threatening environment where learning and sharing is stimulated, members will feel their creative output is appreciated and treated with consideration (Edmonson 1999). This will strengthen autonomous team members to make the most of their sense of responsibility and retain an open mind towards inclusion co-workers and their ideas in their problem solving processes. Furthermore, trust can foster a shared identity among team members (Adler and Kwon 2002). This induces autonomous members to maintain discretion towards the ambitions of their teams, making them more likely to consider fruitful applications of their individual actions. These combined effects create both the incentive for team members to make the most of their autonomous position, while remaining critical of their actions in light of the collective ambitions of their teams. Therefore we hypothesize:

Hypothesis 4: The higher team-level trust, the higher the influence of individual task autonomy on individual creative problem solving.

4.2 Methods

Characterizing self-managing teams. We conducted our research within a consultancy company consisting of 174 members organized in 34 self-managing teams (Manz and Sims 1987). Each team is essentially a profit-center in which the members decide on the manner in which they perform their everyday tasks. One of the directors of the company said the following in an interview: "We *don't* need many rules. No competence management, no salary scales, no functions with prescribed areas of authority. We *do* however, have a strict policy regarding monthly [team-level] reporting and invoicing" (emphasis added). At the organizational level, attention is only given to the creation and maintenance of a strong organizational vision. In this vision, co-creation with its customers (Prahalad and Ramaswamy 2004) is heavily emphasized. As such, especially at the start, projects tend to be relatively uncertain in terms of procedures and methods. This requires teams to be highly proficient in switching between exploration and exploitation modes. However, action in self-managing environments is not contingent on top-down directives or distinct task descriptions. More so than in formal and hierarchical forms, action is contingent on organizational context, and individual initiatives and attributes (De Jong et al. 2005, Langfred 2007). Thus, little top-down directives or formalized procedures exist, and each team operates in concert with individual preferences. An employee stated in an interview: "We work together because we want to, in a way we like to [work together]. Team formation is based on these principles, there's no top down guidance." Therefore, we expect to see differences across teams in the way they create a context in which exploration and exploitation can be combined.

Applied Methods. We first conducted a series of interviews within the organization to gain perspective on the context and assure applicability of our method and theoretical foundations. After the interviews, we constructed a survey which was then pre-tested by 10 members of the organization to ensure proper wording, and appropriate questions. Then the survey was electronically spread amongst the 174 organizational members operating in 34 teams in 2008. We emphasized that results would be treated confidentially, and that a summary of the results would be provided. Then, in 2009 about a year later, we conducted a second questionnaire in which we measured our team-level dependent variables, as well as exploratory and exploitative innovation.

Of the 174 members, we received 124 usable questionnaires for a response rate of 71,26 %. The members had a mean age of 33.83 years (s.d. = 8.28) and a mean company tenure of 3.07 years (s.d. = 2.99), and were dispersed over 30 teams. First,

we test the relationship between individual creative problem solving and team-level ambidexterity. Because HLM does not provide for bottom-up processes, we follow Marrone et al. (2007) and aggregate creative problem solving (mean ICC=.71) at the team level by averaging teammembers' creative problem solving scores. Then, we conduct OLS with ambidexterity. Next, we conducted an hierarchical linear model test. First, we ran a null model for the dependent variable with no predictors. Then, we ran a model with first-level individual predictors. As a third step, we include the second-level team characteristics as moderators of the individual level relationships.

4.2.1 Measures and validation of constructs

Team ambidexterity. We used a two-step approach to develop a measure for organizational ambidexterity that captures both exploratory and exploitative efforts. First, members provided information concerning their team's level of exploratory and exploitative innovation. The measure for *exploratory innovation* was adapted from Jansen et al. (2006). The four-item scale for exploratory innovation (α = .90) captured the extent to which teams depart from existing knowledge and pursue radical innovations for emerging customers or markets. Items include: "our team regularly uses new distribution channels" and "we frequently utilize new opportunities in new markets"A four-item scale (α = .81) measured team-level *exploitative innovation* (Jansen et al. 2006) and captured the extent to which teams build upon existing knowledge and pursue incremental innovations that meet the needs of existing customers (Benner and Tushman 2003). Example items are: "we introduce improved, but existing products and services for our local market" and "we increase economies of scales in existing markets". Exploratory factor analysis clearly replicated the intended 2-factor structure with all factor loadings above .51 and crossloadings under .31. Second, to develop a measure for a team's level of ambidexterity, we followed previous research and computed the additive of exploratory and exploitative innovation (Jansen et al. 2009; Lubatkin et al. 2006).

Individual creative problem solving. The six-item measure for *individual creative problem solving* (α = .77) was adapted from Gilson and Shalley (2004), and measures whether individuals tend to be more creative or routine when solving problems. It includes items such as "I tend to link ideas that originate from multiple sources" and "I tend to search for novel approaches not required at the time". When we ran an exploratory factor analysis, it proposed a two factor solution with the exclusion of one item, all the loadings were above .68 and crossloadings under .31. This taps into the

idea that creative problem solving processes comprise of two dimensions. This resonates with earlier research that described creative problem solving as both divergent and convergent (Parnes 1967). The original concept by Jabri (1991) on which our scales are based, divides creativity into systematic, methodic and logical thinking and creative and intuitive thinking. In a study that uses Jabri's (1991) conceptualization, Scott and Bruce state that "further study on the implications of the various combinations of these two styles on innovative behaviour is needed" (1994: 601). We follow up on this idea and first construct separate variables for the two dimensions and then combine both by calculating the interaction term between the two. The inclusion of an interaction term reflects the notion that creative problem solving requires individuals to combine different types of thinking that can be at odds with each other to joint effect.

Individual and Team Characteristics. Individual task autonomy (α = .92) was based on Langfred (2005) and captures the extent to which individuals preceive autonomy in the way they perform their tasks. The six-item scale included items such as "I am able to to choose the way to go about my work in the team" and "I have some control over the sequencing of my activities in the team". *Team-level trust* (α = .95, mean ICC=.95) was measured with a five-item scale based on Leana and Pil (2006), Van de Bunt et al. (2005) and Jaworski and Kohli (1993). It measures whether employees will not harm others or take advantage should the opportunity arise, whether they perceive each other as competent in their area of expertise, and the extent to which they enjoy empathic, and close relationships (Van de Bunt et al., 2005). This scale includes items such as "The members of our team are reliable" and "We enjoy close, personal relationships within our team". The five-item measure for *team-level shared vision* (α = .97, mean ICC=.97) was adapted from Sinkula et al. (1997) and refers to the extent to which teams have collective goals and shared aspirations. It includes items such as "all team members are committed to the goals of our team" and "our team lacks a clearly defined collective vision" (reverse coded). Exploratory factor analysis yielded a five-factor solution with all loadings above .51 and crossloadings below .41.

Control Variables. We controlled for possible alternative explanations by including relevant control variables. We added a measure for *organizational tenure* as it is an important indicator for knowledge and expertise, yet can lead to habitual performance (Gilson and Shalley 2004). Following previous research, we included *gender* and *age* as they have been shown to have an influence on innovation (Anderson et al. 2004). For our team level regression analysis gender was transformed into the percentage of male team members. We treated tenure and age as disparity type diversity at the team

level, and consequently calculated the coefficient of variance for these variables (Harrison and Klein 2007).

The extent to which individuals are stimulated to engage in creative behaviour is co-dependent on the extent to which their task demands it of them (Axtell et al. 2000). Based on a validated 20 item scale on knowledge configuration (Cepeda and Vera 2007), we constructed a measure for task knowledge requirements by asking each member how important each knowledge type was for performing their tasks. Then we calculated the standard deviation to account for either focus or *task knowledge requirement breadth* (α=.80, mean ICC=.71). This incorporates the notion that broad knowledge requirements require members to be more creative and vice versa. Larger teams may may have more resources and yet lack the flexibility to pursue exploratory and exploitative activities simultaneously (Ahuja and Lampert 2001), we included the number of full-time employees within each team to account for *team size.* Because balancing exploitation and exploration is heavily dependent on leadership (Smith and Tushman 2005), we adapted a measure for team level *self-management leader behavior* (Manz and Sims 1987, α=.87, mean ICC=.85), and included it as a control variable. We included a measure for team level *task interdependence* (Gattiker and Goodhue 2005, α=.86, mean ICC=.85) to account for the notion that interdependency may be related to the quality of group processes (Wageman 1995). Finally, we added a measure for team level *formalization*, as it has been shown to have an influence on the ability to combine exploration and exploitation (Jansen et al. 2006, α=.80, mean ICC=.72).

4.3 Analysis and Results

Our first test concerns the relationship between individual creative problem solving and team-level ambidexterity. We examined variance inflation factors (VIF) for each of the regression equations to examine multicollinearity. The maximum VIF within the models was 4.83, which is below the rule-of-thumb cut-off of 10 (Neter et al. 1990).The baseline model 1 contains control variables. Model 2 introduces effects of the aggregated individual creative problem solving on team-level ambidexterity. We mean centered our convergent thinking and divergent thinking variables before calculating the multiplicative for constructing our variable for creative problem solving. Our ordinary least squares analysis of team-level effects revealed a significant positive relationship between creative problemsolving and team ambidexterity (β=0.88, p<.05, see table 4.1). Therefore, hypothesis 1 is supported.

For our HLM test, we first ran a null model for the dependent variable with no predictors to ensure that enough variance resides between groups. The test revealed that a significant amount of the variance in creative problem solving resided between groups (χ^2=44.09, p<.05). Therefore, HLM was appropriate. Another validity test before conducting cross-level moderations is the assessment of slope variance between the first level independent variable and dependant variable. In our case task autonomy exhibited a significant variance in slope (χ^2=152.75, p<.001), allowing us to conduct cross-level moderation. Table 4.2 shows our HLM model.

Model 1 consists of our control variables. Next, we ran a model with level 1 predictors and control variables (model 2). Here wel discuss the results found in model 3, which includes team-level shared vision and trust as cross-level moderators of the relationship between of individual task autonomy and creative problem solving. Individual task autonomy (γ=0.43, p<.01) had a significant positive influence on creative problem solving. Thus, hypothesis 2 supported. This indicates that individual task autonomy is an important tool for organizational members to be able approach problems in a effective yet creative manner.

Hypothesis 3 predicted a positive moderation by team level shared vision on creative problem solving. This hypothesis was supported (γ=0.63, p<.01). A shared vision among team members better enables individual members to make the most out of their autonomy by creating a focus on goal-attainment. Figure 4.2 plots the interaction between task autonomy and shared vision. It clearly shows the positive effect of shared vision in achieving high levels of creative problem solving through high task autonomy.

Table 4.1 Team-level hierarchical regression of creative problem solving predicting team-level Ambidexterity[a]

Variables	Team-level ambidexterity	
	Model 1	Model 2
Control Variables		
Team size (log)	0.44	0.39
Tenure (coefficient of variance)	-0.02	0.02
Gender (% male)	-0.14	-0.42
Age (coefficient of variance)	0.34	0.60*
Self-managing leadership behavior	0.30	0.42*
Interdependence	-0.20	-0.62
Formalization	0.05	0.29
Shared vision	0.31	-0.03
Trust	-0.61	-0.72*
Task knowledge requirement breadth	-0.52	-0.37
Task autonomy	0.43	0.73**
Main effect		
Aggregated convergent thinking		-0.59*
Aggregated divergent thinking		0.11
Aggregated creative problem solving (H1)		0.88*
(convergent thinking*divergent thinking)		
Adjusted R^2	0.26	0.54*
Δ Adjusted R^2		0.28*

[a] Standardized regression coefficients are reported

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

Table 4.2 HLM analyses predicting individual creative problem solving [a, b]

Variables	Individual creative problem solving					
	Model 1		Model 2		Model 3	
	γ	t	γ	t	γ	t
Individual level control variables (lvl 1)						
Gender	-0.10	-0.51	0.04	0.28	0.08	0.48
Tenure	-0.02	-0.46	-0.03	-1.07	-0.06	-1.68
Age	-0.05	-1.84	-0.04	-1.88	-0.03	-1.74
Task knowledge requirement breadth	1.11	2.98**	0.91	4.44***	0.83	4.73***
Team level control variables (lvl 2)						
Team level interdependency	0.17	0.87	0.19	0.95	0.20	0.93
Team level formalization	-0.22	-1.59	-0.24	-1.72	-0.24	-1.67
Team size (log)	-0.29	-1.25	-0.24	-1.17	-0.30	-1.71
Team level shared leadership	0.06	1.30	0.06	1.37	0.03	0.50
Individual level predictor (lvl 1)						
Individual task autonomy (H2)			0.43	2.64**	0.26	2.22*
Cross-level interactions						
Team level trust					0.30	1.35
Team level shared vision					-0.12	-0.81
Task autonomy *shared vision (H3)					0.63	3.34**
Task autonomy*trust (H4)					-0.73	-4.89***
χ^2	38.26*		46.53**		52.77***	

[a] N=124 organizational members (first level) in 30 teams (second level)
[b] Level 1 predictor variable was group-mean-centered for both level 1 effects and cross-level effects.

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

Figure 4.2 Interaction of individual task autonomy and team level shared vision

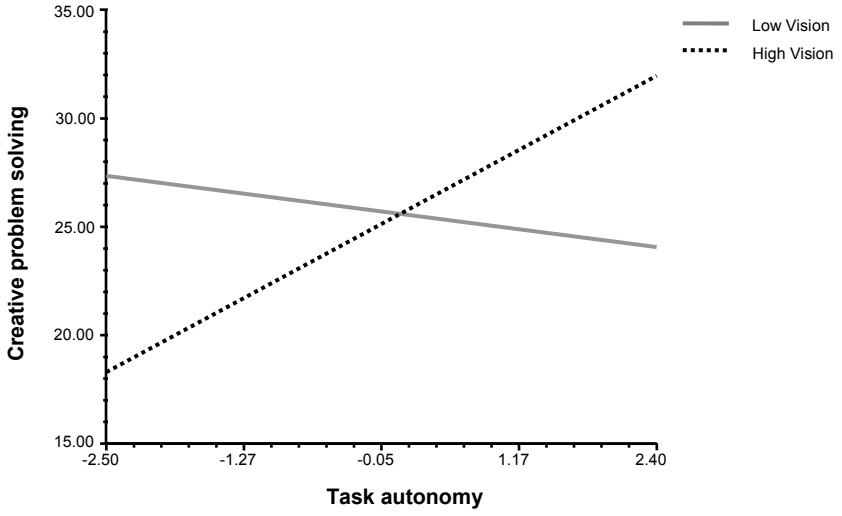
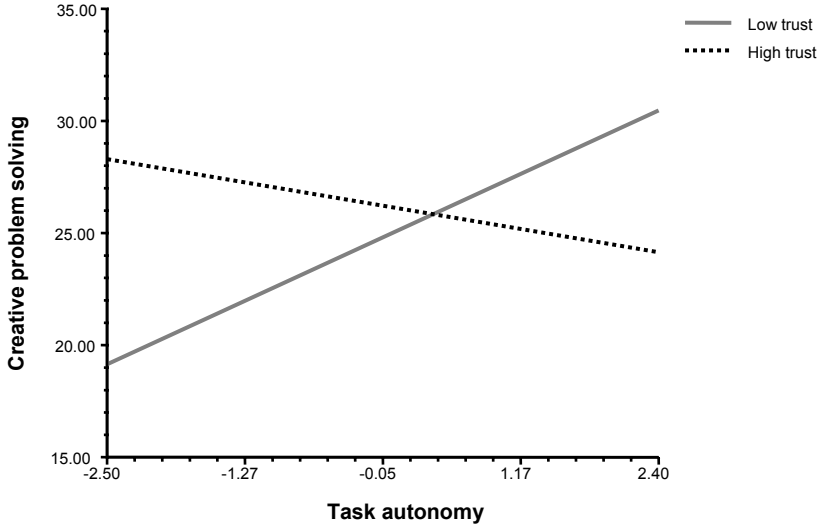


Figure 4.3 Interaction of individual task autonomy and team level trust



Hypothesis 4, which stated a positive moderating influence on task autonomy by team level trust, was not supported. Instead, a significant negative influence was found (γ=-0.73, p<.001). Rather than fostering an environment where information flows freely and team members gain support, trust in our model seems to stifle creative efforts by autonomous members. Figure 4.3 shows that teams that exhibit high levels of trust, are unable to achieve higher levels of creative problem solving amongst their autonomous members.

4.4 Discussion and conclusion

Past research has indicated that pursuing both exploration and exploitation requires complex, nested processes at several organizational levels (March 1991; Raisch et al. 2009; Simsek 2009). However, until now, research has mostly neglected the multilevel nature of organizational ambidexterity. In this study, we examined multilevel effects of team (trust and shared vision) and individual characteristics (task autonomy), and individual creative problem solving on team-level ambidexterity. The significant relationship between individual creative problem solving and team-level ambidexterity underlines the importance of taking the individual level of analysis into account when seeking ambidexterity. By examining the effect of individual creative problem solving, we emphasize the role of individuals in creating and sharing ideas for the simultaneous pursuit of exploration and exploitation. This taps into the idea that innovation starts at the individual level (Amabile 1996), and that it is heterogeneity at the individual level that creates value at higher levels (Felin and Hesterly 2007).

Within ambidextrous teams, individual creative problem solving is essential: ambidexterity requires team members to be considerate of a broad spectrum of knowledge types, assess them in an appropriate and effective manner, and retain the ability think creatively about possible applications of this knowledge. To be able to do this, members must be able to combine convergent thinking with divergent thinking (Parnes 1967). This highlights that individuals combining multiple ideas from multiple sources, pursue more distant knowledge, yet retain a sense of direction and sensitivity for their teams´ ambitions and needs, and will be effective in generating knowledge and actively share ideas with team-members. This links to the idea that a robust knowledge generation and sharing process benefits from a combination of local and distant knowledge (Rosenkopf and Nerkar 2001), where the distant knowledge ensures a fresh outlook on topics at hand and local knowledge ensures applicability of the

output. Only then can teams capture the synergies and advantages of both exploration and exploitation.

We found that individual task autonomy is an important precondition for individual-level creative problem solving. It provides for a task environment where members are inclined to critically examine their everyday processes, and are more willing and able to engage in divergent thinking (Lumpkin et al. 2009). Task autonomy will protect members from external myopic influences, as it creates an atmosphere of competence, and independence around autonomous members. Besides this influence, autonomous members' greater sense of authority and control over their work will stimulate them to actively seek out new knowledge and share their ideas with co-workers. This will foster an inclination to shape knowledge into applicable ideas. These effects will help increase the quality and effectiveness of the problem solving process, because they help members to both generate new ideas, as well as retain a focus on the outcomes of the process (Sheremata 2000).

We have examined cross-level moderation effects of team-level context on the relationship between task autonomy and individual creative problem solving. Here we found some interesting results. First of all, as predicted, we found a significant moderating role of shared vision on the relationship between task autonomy and creative problem solving. As a centripetal force, shared vision creates a sense of purpose that complements the positive effect of task autonomy on creative problem solving, in that it creates a focus towards efficiency within the mind of the individual. Shared vision creates a focus on goal-attainment in the mind of individual team members. We have shown that combinations of centripetal and centrifugal forces are beneficial. As autonomous members engage in knowledge gathering and generation, they are stimulated by a strong shared vision to keep in mind the goals and purpose of the team. This will result in less 'wasted' efforts and higher levels of applicable knowledge, making the creative problem solving process more efficient.

Contrary to our hypothesized positive influence, we found trust to have a negative cross-level moderating effect on the relationship between task autonomy and creative problem solving. Apparently, trust can be detrimental. Indeed, other studies have examined the negative effects of trust evolving into 'groupthink', a situation where deviant thinking and decisions are not taken into consideration (*cf.* Manz and Neck 1997). In such situations, change or divergence is very difficult, since individual members are not inclined to even consider such notions. The very myopic forces that are potentially less salient to the autonomous members when fulfilling their respective tasks can be replaced by high levels of trust. However, this may very well be contingent on our research-context. Since there is no formal leadership in the self-managing teams that are under examination in this study, most teams employ a form

of ‘management by consensus’. This may be due to the fact that teammembers value the continuing existence of their teams, and are willing to tolerate more in light of this goal. In an interview, an employee stated the following: “… some team members are less inclined to address mistakes made by other members, because they are afraid to ‘play’ the manager... ”. As a result, most individuals are stimulated to avoid and ignore conflict and deviance. This has a detrimental effect on the likelihood that individual members will behave creatively. Members will be more inclined to ‘follow the herd’, and pursuing avenues that deviate from the norm may be met with skepsis and criticism. This may be a down-side of self-management in general (see also Langfred 2007). However, further research within similar contexts and more formalized contexts is necessary to substantiate this claim.

4.4.1 Limitations and future research suggestions

While this study provides additional insights into the multilevel nature of ambidexterity, there are some limitations that should be considered. First, the results of this study give rise to additional questions regarding potential positive combinations of task and individual attributes. Indeed, other research has stipulated joined effects of task and personality traits (*cf.* Anderson et al. 2004). While studies have underlined the potential of organizational context to ignite creative processes (Amabile 1996; Runco 2004; Axtell et al. 2000), as we have also shown in our study, we have not included determining personality attributes in our model. It would be an interesting avenue for future research to examine the effects of team-level variables on combinations of individual task and personality characteristics in light of ambidexterity. Perhaps certain combinations of task and personality attributes enhance the influence of an organizational context on individual ability to balance exploration and exploitation.

Second, we conducted our research within a self-managing environment, a setting where social context plays a major role. This emphasis allows us to examine contextual factors relatively free from top-down influences. However, as our negative moderation by trust shows, some contextual factors may play out differently in such an organization. While earlier research has found similar results in self-managing settings (Langfred 2007), more research in similar settings and more formalized settings is required to validate these results as being indigenous to self-management.

Apparently, team context can have a differential influence on individual characteristics. We have shown that ambidexterity is a concept that is not only

dependent on the way organizational members work together or divide their attention, as is usually researched. This paper moves research in ambidexterity beyond separated individual level or (sub-)organizational level analysis. In our model, an intricate relationship between organizational context, individual characteristics and outcomes has a significant influence on team ambidexterity. Task autonomy influences the ability of members to behave creatively, which in turn results in a higher level of combinations of exploration and exploitation. We have shown that certain elements in the organizational context can be both stimulating and detrimental at the same time. Organizations should be aware that there can be a need make trade-offs when creating an organizational context for ambidexterity.

5 Discussion and Conclusion

Organizational ambidexterity can provide significant benefits for firms pursuing it (Duncan 1976; He and Wong 2004). However, it also poses considerable challenges when seeking to become ambidextrous by creating and maintaining high levels of both exploration and exploitation (O'Reilly and Tushman 2008). This dissertation suggests that exploration and exploitation appear antagonistic, yet can be combined to create synergy in outcomes (Gibson and Birkinshaw 2004). To obtain these benefits, firms must mobilize, coordinate and integrate dispersed exploratory and exploitative efforts, and allocate, reallocate, combine and recombine resources and assets simultaneously (Jansen et al. 2009). However, such a process requires a paradoxical view of exploration and exploitation (Andripoulos and Lewis 2009; Lewis 2000; Denison et al. 1995). This means that while exploration and exploitation must be allowed to co-exist, recombined, and pursued simultaneously within the same organization, members are also required to see synergistic value in combining them over time.

This dissertation attempts to capture several conceptual assertions and methods that organizations may employ to achieve ambidexterity. The studies in this dissertation have shown organizational ambidexterity to be a challenge that can be addressed through various means depending on context (i.e. hierarchical and self-managing) and hierarchical level (top-management, organizational, team, and individual level). In the next sections the main findings and implications of the three studies are summarized, after which avenues for future research are discussed and some final conclusions are drawn.

5.1 Assessing the contributions of the three studies

The insights that have been developed in the previous chapters refer to realizing ambidexterity at different levels and through different means.

In table 5.1, the main findings are contrasted with the intended contributions of this dissertation (see section 1.3). These findings include (1) contributing to a clearer understanding of the interrelationship between structural differentiation and integration in managing organizational ambidexterity (Benner and Tushman 2002; Tushman and O'Reilly 1996), (2) distinguishing between mechanisms at various hierarchical levels that work differentially towards ambidexterity (O'Reilly and Tushman 2008; Raisch and Birkinshaw 2008), (3) highlighting the importance of informal, contextual mechanisms to become ambidextrous (Gibson and Birkinshaw

2004), (4) shedding light on the potential effects of a firms' permeability with the external environment (Danneels 2003; Day 2000), (5) providing a first step towards understanding the multilevel and nested nature of the methods firms may employ to become ambidextrous (Gupta et al. 2006; Simsek 2009). In the next sections these findings and managerial implications are further discussed.

Table 5.1 Main Findings and contributions

Main Findings	Contribution
• Integration mechanisms mediate the relationship between structural differentitation and organizational ambidexterity. (study 1) • Without integration, differentiation will not lead to the synergistic output and consequential performance increase that is attributed to the ambidextrous organization. (study 1)	1. Extending the examination of the relationship between differentiation and integration in managing ambidexterity
• Top management team level requires informal mechanisms for ambidexterity (study 1) • Organizational level is benefitted by formal mechanisms for ambidexterity (study 1) • Teams that seek to develop contextual ambidexterity need to be aware of the potential differential effects of integration mechanisms (studies 2 and 3)	2. Distinguishing between mechanisms at various hierarchical levels that work differentially towards ambidexterity
• While certain contextual mechanisms work in concert with internal structure (i.e. tmt social integration, shared vision), others (trust, connectedness) have an influence that crosses internal and external boundaries of the firm, or may even work against it. (studies 1, 2 and 3)	3. Highlighting the importance of informal, contextual mechanisms to become ambidextrous
• Depending on internal network structure, network attributes with external parties, such as clients, may prove complementary or detrimental for firms seeking to become ambidextrous (study 2)	4. Investigating the effects of a firm's permeability with the external environment on its ability to become ambidextrous
• The value of a multilevel approach is underlined by the differential effects of trust when comparing different levels. In concert with firm-level external relationships, trust may prove beneficial (study 2), whereas it may be detrimental when paired with high task autonomy at the individual level (study 3)	5. Understanding the multilevel and nested nature of the methods firms may employ to become ambidextrous

5.1.1 Contribution 1: extending the examination of the relationship between differentiation and integration in managing ambidexterity

Study 1 acknowledges ambidexterity as a dynamic capability. This implies that levels of integration should be dependendent on levels of differentiation. While earlier research has mostly focused on either differentiation (Duncan 1976; Gilbert 2006) or integration (Atuahene-Gima 2005; Lubatkin et al. 2006), this study shows how levels of structural differentiation should be proportionally followed by levels of integration. This constitutes a departure from earlier research on differentiation (Lawrence and Lorsch 1967; Hage and Dewar 1973) and ambidexterity (Tushman and O'Reilly 1996), where integration is merely seen as an enhancing factor.

The proportional relationship between differentiation and integration is relatively new to research in management. Theories of social organization however (Durkheim 1933; Turner 1990; Weber 1947) have linked differentiation explicitly to consequential integrative efforts and to social cohesion. In this, the act of differentiation itself leads actors to consciously establish ways of coordinating and integrating with the other parties (Turner 1990). In this light, when confronted with differentiation of exploration and exploitation, the senior executives of an organization will seek to establish integration mechanisms in order to create value. By postulating the causal relationship between structural differentiation and integration mechanisms, the role of decision makers is emphasized in enacting and directing the process of resource and routine reconfiguration, i.e. a dynamic capability (Zahra et al. 2007).

Sirmon, Hitt, and Ireland (2007) underline this notion by stating there is a direct relationship between structuration and integration in the development of capabilities. Only when management is able to first structure the firm's resource portfolio, and then integrate these resources to capitalize on them, is a firm able to create value for both current and new customers (Kazanjian et al. 2002; Sirmon et al. 2007). Therefore, when applying structural ambidexterity, it is critical for organizations to remain conscious of the direct link between differentiation and integration.

5.1.2 Contribution 2: distinguishing between mechanisms at various hierarchical levels that work differentially towards ambidexterity

In study 1, ambidexterity is shown to be achievable through structural differentiation followed by social integration (informal integration) at the top management level and cross-functional interfaces (formal integration) at the organizational level. In this respect, study 1 emphasizes the importance of structural differentiation within ambidextrous organizations; however, it also suggests that ambidextrous organizations

need to resolve conflicting tensions in top management teams, and to integrate diverse knowledge sources across differentiated exploratory and exploitative units (Kogut and Zander 1992; Smith and Tushman 2005).

This echoes earlier research on the importance of coordination and integration at various hierarchical levels (Martinez and Jarillo 1989). Other things equal, one can draw relationships between the level of interdependency and complexity and the formality of both differentiation and integration mechanisms (Egelhoff 1991). Typically, less formality can be observed when moving up an hierarchy. Because of the salience of resource allocation decisions at this level (Floyd and Lane 2000), managers at higher hierarchical levels face higher levels of interdependency and complexity, yet also undergo high levels of differentiation (although less formally so). This demands flexible and frequent mutual adjustments (March and Simon 1958), which are best supported through informal integration mechanisms (Daft and Lengel 1986; Hambrick et al. 2008).

In study 3, team context is shown to have differential moderating effects on the individual level relationship between task autonomy and creative problem solving. While team-level shared vision has a positive influence, team-level trust moderates this relationship in a negative manner. The outcome of shared vision as a positive moderator echoes earlier research on ambidexterity (Jansen et al. 2008). The outcome involving trust in study 3 however, is not only in clear contrast to earlier research on ambidexterity (Adler et al. 1999), but also to the outcome of study 2.

When comparing studies 2 and 3, it becomes apparent that trust may have differential influences on ambidexterity. This may be co-dependent on the type of ambidexterity a firm pursues, on the organizational context and applied level at which the paradox may be transcended. First, study 2 implies that *structural* ambidexterity (structural differentiation is a control variable) may be mitigated by internal social capital bridging units and hierarchies. Study 3 implies *contextual* ambidexterity as it examines the ability of teams to create ambidexterity by creating and facilitating a coercive context. Second, study 3 examines self-managing teams, which may influence the way certain contextual variables play out (Langfred 2005). Third, study 2 applies a firm level of analysis, whereas study 3 combines team and individual levels of analysis. Thus, it seems that trust may have a different influence depending on the way exploration and exploitation are embedded within organizations.

These results underscore the contingent nature of mechanisms that firms may employ to achieve ambidexterity. Depending on ambidexterity type (structural or contextual), hierarchical level (top management, team, organizational), and organizational context (internal, external, organizational structure), it may prove

beneficial to apply different mechanisms to appropriately stimulate integration of exploration and exploitation.

5.1.3 Contribution 3: highlighting the importance of informal, contextual mechanisms to become ambidextrous

All three studies in this dissertation underline the importance of informal mechanisms to achieve ambidexterity. While certain mechanisms work in concert with formal structure (i.e. top management team social integration, shared vision), others (trust, connectedness) have an influence that crosses internal and external boundaries of the firm. Finally, some mechanims may even work against the attainment of ambidexterity.

In study 1, we find a surprising result: connectedness, as an informal integration mechanism, has a significant influence, yet does not mediate the relationship between structural differentiation and ambidexterity. This suggests a potential of informal internal relationships aside from the formal structuring of ambidextrous firms. This is in line with research on social capital that states that informal relations tend to be more persistent than formal ones, as they continue to exist separately from formal interactions (Podolny and Baron 1997). As a result, informal relations have been shown to be superior to formal relationships when crossing functional borders (Gittell 2002; Ibarra 1993; Kellogg et al. 2006, Tsai 2002). While study 1 does not attempt to compare the power of informal mechanisms to that of formal ones, it at least highlights the boundary-crossing and persistent effect of informal mechanisms

With this result in mind, In study 2, the effect of both structural and relational capital on ambidexterity is examined. The outcome of our analysis is that connectedness matters for ambidexterity, whereas trust has no significant influence (without moderating influence of external social capital, that is) on reconciling exploration and exploitation. Moreover, these mechanisms did not intervene in the relationship with structural differentiation (as a control variable) and ambidexterity. Thus, the result from study 1 in this respect is replicated and validated. Interestingly, these outcomes imply effects similar to contextual ambidexterity even within structurally separated organizations. Effectively, internal informal relationships in these studies stimulate integration of exploration and exploitation across the organization as if it were a single domain (Gupta et al. 2006).

In study 3, individual creative problem solving provides ambidextrous teams with the ability to align themselve around adaptability (Gibson and Birkinshaw 2004). While creativity can be actively stimulated by an interplay between formal and

informal context and individual attributes (Amabile et al. 1996; Runco 2004), the translation of such thought-processes to concrete ideas that work towards ambidexterity is quite uncertain and dependent on participation of team members. Such processes are benefited by mutual adjustments (Van de Ven et al. 1976), and ad-hoc and informal interaction between members sharing their ideas (Sivadas and Dwyer 2000). As a result, members will enjoy an atmosphere where new ideas flow freely, yet they remain pragmatic towards applications of these ideas (Scott and Bruce 1994). In this, they may maintain both an exploratory and exploitative mindset (allowing for creative problem solving).

These results indicate that, while formal structure may provide organizations with ways to allocate resources and guide flows of knowledge beneficial for ambidexterity (Jansen et al. 2009), the informal context of organizations, organizational units, teams and processes helps members translate this knowledge into mindsets and insights that foster both exploratory and exploitative domains.

5.1.4 Contribution 4: investigating the effects of a firm's permeability with the external environment on its ability to become ambidextrous

In study 3, we test a model in which the relationship between internal social capital types and ambidexterity is moderated by external social capital in the form of client relationships. While earlier research has proposed or tested the influence of the environment on the link between ambidexterity and performance (Floyd and Lane 2000; Jansen et al. 2005a), few studies have examined its influence on the ability to achieve ambidexterity.

Our results show that combinations of internal social capital and client social capital can be complementary or detrimal for a firm's ability to become ambidextrous. Combinations of dissimilar social capital types (i.e. relational and structural) have a positive influence on ambidexterity, whereas similar social capital types hinder each other in a firm's pursuit of ambidexterity. This underlines the importance of careful management of client relationships in relation to internal informal structure. As firms are increasingly involving their clients in their innovation processes (Prahalad and Ramaswamy 2004), study 3 marks an important insight for firms that seek such collaborations and wish to make the most of them.

Regarding ambidexterity, these results mark the importance of embeddedness (Granovetter 1985; Uzzi and Lancaster 2003). Social interfaces with the external environment provide firms with an important, complementary tool to enhance internal efforts to integrate exploration and exploitation.

5.1.5 Contribution 5: understanding the multilevel and nested nature of the methods firms may employ to achieve ambidexterity

Many studies on ambidexterity have indicated the nested, multilevel nature of balancing high levels of exploration and exploitation (March 1991; O'Reilly and Tushman 2008; Raisch and Birkinshaw 2008; Rivkin and Siggelkow 2003). While some conceptual work refers to it (Gupta et al. 2006; Simsek 2009), to our knowledge none has examined it empirically as yet.

Study 3 captures the notion of nested antecedents by examining the influence of team level trust and shared vision on the relationship between individual-level task autonomy and creative problem solving, which in turn is related to team-level ambidexterity. To create and maintain team ambidexterity, members must be able to combine convergent thinking with divergent thinking (Parnes 1967). This enables them to apply multiple ideas from multiple sources, pursue more distant knowledge, yet retain a sense of direction and sensitivity for their team's ambitions and needs. Such members are stimulated or hindered by combinations of individual task autonomy and team context (trust and shared vision).

Our study shows that ambidexterity is a concept that does not only relate to the way organizational members work together or divide their attention, as is usually researched. This paper moves research in ambidexterity beyond separated individual level or (sub-)organizational level analysis. Instead, the model indicates a relationship between organizational context, individual characteristics and outcomes, which has a significant influence on team ambidexterity.

The value of a multilevel or nested approach to explaining ambidexterity is further underlined by the idiosyncratic effects of trust in studies 2 and 3. While these results provide evidence for different influences of trust at their respective organizational levels, they also indicate that there are mechanisms in play that intervene *between* levels of analysis. Such cross-level relationships can have a significant influence on the way certain mechanisms play out when organizations organize for ambidexterity.

In any case, study 3 presents a first empirical step towards understanding the nested nature of mechanisms that influence the abiltiy to achieve ambidexterity. In this, it shows that depending on lower level characteristics, contextual mechanisms may work out differently than expected.

5.1.6 Managerial implications: the differential and combinatorial influence of levers for ambidexterity and the power of context

Besides implications for theory development, there are some practical implications of the insights from the studies in this dissertation.

First, firms attempting to balance high levels of exploration and exploitation, should be aware that levers for ambidexterity can have differential effects depending on hierarchical level, internal or external context, and way of organizing.

For instance, study 1 shows that organizations seeking structural ambidexterity (i.e. establishing exploration and exploitation in separate units) should develop and apply different types of integration mechanisms depending on the hierarchical level under consideration. At the top management level, ambidextrous organizations should encourage (informal) social integration among senior team members. At lower hierarchical levels, however, organizations seeking ambidexterity should establish more formal cross-functional interfaces that deepen knowledge flows across differentiated units, yet maintain the contradictory processes and time orientation within exploratory and exploitative units.

In a similar vein, if a firm enjoys a broad and connected client network (i.e. many clients, diverse clients, being centrally positioned in the client network), it can facilitate the emergence of ambidexterity by stimulating higher levels of trust internally. However, if this firm is heavily dependent on teams to develop ambidextrous abilities in a self-managing and contextual fashion, trust may prove to be detrimental. In contrast, a firm that is characterized by structural ambidexterity will find trust to be 'the glue' that works to bind the dispersed knowledge coming from the client network.

A second overarching insight is that ambidexterity apparently requires combinations of mechanisms that have counterbalancing influences: formal and informal organization (control versus laissez-faire), structural and relational social capital (broad versus in-depth knowledge), autonomy versus shared vision (individualistic versus a focus on collective action and goals), and combinations of convergent and divergent thinking. Managers seeking to stimulate ambidexterity should be aware of the need to perform balancing acts, and organize processes and context accordingly. For instance, if organizational members are allowed to behave autonomously, managers should pay attention to the creation of a shared vision, or to other ways of creating a focus on the collective needs of the organization. In the organizational members' minds, this helps develop both convergent and divergent thinking. However, if control is tight and responsibilities are centralized (emphasizing

convergent thinking), it may prove helpful to establish a counterbalancing force that helps members to develop their divergent thinking processes.

A final note for managerial practice could be that, specific relationships notwithstanding, organizational context is key to becoming ambidextrous. All three studies in this dissertation seem to point in that direction. In study 1, informal connections across organizational units have a positive influence on ambidexterity, besides formal structuring of exploratory and exploitative processes. In study 2, results show that if a firm neglects to pay attention to the interrelatedness of internal and external relationships, it may fail to capitalize on the potential of informal organization when pursuing ambidexterity. Study 3 shows that team context (shared vision and trust) may make or break the potential of the structuring of exploratory and exploitative processes. Thus, firms should be aware of the complex and intricate nature of levers for ambidexterity.

5.2 Limitations of the dissertation and future research suggestions

There are several limitations in this dissertation's research that demand further inquiry. Since specific limitations of the individual studies have already been mentioned in preceding sections, the focus here will be on communal or overarching limitations and corresponding future research suggestions.

First, ambidexterity is conceptualized as a dynamic capability, which makes assertions regarding a firm's actions towards ambidexterity over time. Each study in dissertation separates the dependent from the independent variable with a lag of about a year, which brings an element of time into the models. However, research on ambidexterity will benefit from more extensive longitudinal or panel analysis, where firms' actions are examined over longer periods of time. Until now, this approach is largely lacking in research on ambidexterity (for an exception see Venkatraman et al. 2007). For instance, one would expect consecutive levels of differentiation and integration to vary depending on varying ambitions concerning levels of exploration and exploitation. It would also be interesting to see how this variation works out at different levels of the organization. In a similar vein, depending on different phases, clients may be more or less involved or not in the process of integrating exploration and exploitation, as firms seek to develop new markets or deepen existing markets. Lastly, teams may exhibit a larger variance in composition and orientation than firms, especially if they are self-managing. Given this characteristic of teams, a dynamic approach would appear to be especially valid at this level of analysis. Ambidexterity

at the team level is a relatively new topic of inquiry and would certainly benefit from such an approach.

Second, each study in this dissertation is grounded in either structural or contextual ambidexterity. However, the results regarding connectedness in studies 1 and 2 indicate that certain mechanisms may work towards contextual ambidexterity despite a structural approach. Connectedness helps to create a context for achieving ambidexterity directly, echoing research on contextual ambidexterity (Gibson and Birkinshaw 2004). While the two approaches (contextual and structural) have been positioned as opposites, aforementioned results hint at a possible co-existence of the two (contingent on level of analysis). A differentiating factor in this respect may be found in the complexity and interdependency of tasks and projects within firms: the more complex and interdependent these are, the higher the demands are for flexible and frequent mutual adjustments (March and Simon 1958), calling for low differentiation and for informal and high levels of integration (Daft and Lengel 1986). As such, while a firm may be characterized by structural ambidexterity as it separates most of its exploratory and exploitative activities, contextually ambidextrous teams may exist within this firm that work intensively for a short period of time to achieve synergistic outcomes that may be further developed afterwards.

An example of this phenomenon can be found at Royal Philips Electronics where production and research & development are structurally separated. However, in recent years the company has established sub-units called ‘incubators’(www.philips.com). The dedicated incubator groups specialize in identifying new business opportunities and developing these into successful business ventures which are based on novel technologies. As soon as the fundamental research department generates a promising outcome of their activities, an incubator group attaches itself to this idea and helps guide the process from development to actual production. Within this newly formed team, members from production, R&D and incubators collaborate throughout this process leading towards a product and market. In such a way, Philips actively seeks to blur the boundaries between exploration and exploitation by creating contexts within which integration facilitates an ambidextrous approach.

Future research may examine such activities within or between firms. It would be especially valuable if such research could identify conditions under which structural or contextual ambidexterity may be the preferred method of organizing activities.

Third, research on ambidexterity has only just begun to tap into the multilevel and embedded nature of ways to achieve ambidexterity. The three studies presented here indicate that ambidexterity may be differentially achieved at various levels, depending on internal and external context. These results beg further examination. For instance, research has indicated other mechanisms that may influence ambidexterity

such as decentralization (Jansen et al. 2005b), supportive coaching (Smith and Tushman 2005), member diversity (Beckman 2006), and conflict regulation (Guttel and Kohnlechner 2006) among others (Simsek et al. 2009). It would be an interesting avenue to examine whether these mechanisms work out differently at different levels of analysis, or between levels of analysis. Furthermore, as an indicator of external embeddedness, study 2 utilizes client relationships, yet research might extent this line of inquiry by also including, for instance, suppliers and competitors, as each may have distinct influence on exploration and exploitation levels (Sidhu et al. 2007). Finally, in terms of context, the three studies refer to organizations that are highly formalized but also to an organization that relies on self-management (Manz and Sims 1987). As indicated earlier, ways to achieve ambidexterity may differ to the extent that what works in one organization, may not work in another, or may even be detrimental. Further research is required in order to compare methods of achieving ambidexterity across different organizational contexts.

5.3 Conclusion

While this dissertation indicates differences in ways of achieving it, ambidexterity is a phenomenon that brings about tensions regardless of the organizational level or context it is applied to (March 1991; Raisch and Birkinshaw 2008). This is in line with the formal definitions of ambidexterity and the areas of interest they pertain to (see table 1.1): they point towards the difficulties of achieving and maintaining it. Furthermore, while they do not contradict the flexibility that benefits the ambidextrous individual, they hint at skeptiscism towards the cost-benefits ratio of pursuing ambidexterity.

The evolutionary origins of exploration and exploitation refer to the solution of this tension as a prisoner's dilemma (Holland 1975). By pursuing both exploration and exploitation, systems exchange optimal outcomes in the separate domains for suboptimal outcomes in favor of overall adaptive ability. This highlights the importance of balancing exploration and exploitation, the dynamic interplay between them, and the role of the environment as a driving force for adaptation (see table 1.2).

In managerial disciplines these evolutionary insights have been adapted to organizational challenges involving the pursuit of both exploration and exploitation (March 1991). However, contemporary research on organizational ambidexterity does not share the skeptiscism towards the cost-benefits ratio, nor does it point at suboptimal outcomes. Rather, conceptual and empirical work on ambidexterity

indicates superior performance (Gupta et al. 2006; He and Wong 2004). It does, however, underscore that achieving ambidexterity poses considerable challenges, as exploration and exploitation require ways of organizing and mindsets that appear at odds with each other (Tushman and O'Reilly 1996). To overcome these challenges, firms need to shape a context that stimulates a paradoxical view of exploration and exploitation among organizational members and managers (Andriopoulos and Lewis 2009). In such a view, members are better able to see synergies between exploratory and exploitative efforts (Smith and Tushman 2005). This facilitates integration between exploration and exploitation. It is in this crucial step that synergistic, superior value may be created. The role of integration as a key mechanism for organizational ambidexterity indicates potential synergies between members and units that go beyond the resource trade-off between exploration and exploitation. Through a conducive context and successful integration of exploration and exploitation, firms are able to reap benefits from ambidexterity in ways unpredicted by its semantic and evolutionary origins.

However, the way organizations may apply context and integration to achieve ambidexterity differ, depending on organizational level and context type. The three studies presented here highlight different contingencies and considerations when pursuing ambidexterity. It has become apparent that there are multiple ways of achieving ambidexterity, and depending on configurations, not all contexts are equal when pursuing ambidexterity. These findings present possibilities for further academic research, as well as considerations for practitioners. Both academics and practioners should be aware of the notion that there may not be a single best approach to reconciling exploration and exploitation. This further underlines the strategic importance of organizing for ambidexterity as a key driver for current and future firm performance.

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APPENDIX

Measures and Items in Study 1[a]

Exploratory innovation (Jansen et al. 2006)
Our organization accepts demands that go beyond existing products and services
We commercialize products and services that are completely new to our organization
We frequently utilize new opportunities in new markets
Our organization regularly uses new distribution channels
Exploitative innovation (Jansen et al. 2006)
We frequently make small adjustments to our existing products and services
We improve our provision's efficiency of products and services
We increase economies of scales in existing markets
Our organization expands services for existing clients
Structural differentiation
Innovation and production activities are structurally separated within our organization
Our business units are specialized in specific functions and/or markets
We serve our customers needs from separate departments
The line and staff departments are clearly separated within our organization
Our organization has separate units to enhance innovation and flexibility
We have units that are either focused on the short term or the long term
Senior team contingency rewards (Collins and Clark 2003)
Senior team members' variable pay consists of multiple performance-based elements
Senior team members' variable pay is based on average firm performance
Incentive-based pay for the senior team is based on how well the organization is performing as a whole
Incentive-based pay for the senior team is based on the performance of its members organizational unit®

(continued on next page)

Measures and Items in Study 1 (Continued)

Senior team social integration (O'Reilly et al. 1989; Smith et al. 1994)
The members of the senior team are quick to defend each other from criticism by outsiders
Members of the senior team get along with each other very well
Members of the senior team are always prepared to work together and support each other
There is a lot of competition within the senior team ®
Cross-functional interfaces (Hage and Aiken 1967; Gupta and Govindarajan 2000)
Employees are regularly rotated between jobs in our organization
There is regular talk about possibilities for collaboration between units
Our organization coordinates information sharing between units through a knowledge network
We have cross-functional teams to exchange knowledge between departments
Our organization uses temporary workgroups for collaboration between units on a regular basis
Connectedness (Jaworski and Kohli 1993)
In our organization, there is ample opportunity for informal 'hall talk' among employees
In this firm, employees from different departments feel comfortable calling each other when the need arises
People around here are quite accessible to each other
In this organization, it is easy to talk with virtually anyone you need to, regardless of rank or position

[a] All items were measured on a seven-point scale, anchored by 1 = strongly disagree and 7 = strongly agree; ® reversed item

Nederlandse Samenvatting (Dutch Summary)

Ambidexteriteit (dubbelhandigheid) in organisaties, ofwel het balanceren van exploratie en exploitatie, is een onderwerp waar veel recent onderzoek zich mee bezig heeft gehouden (Gupta et al. 2006; Jansen et al. 2009; O'Reilly en Tushman 2008; Raisch en Birkinshaw 2008). De onderliggende redenering is dat ambidexter organisaties beter in staat zijn om zich aan te passen aan toekomstige verschuivingen in de markt, terwijl ze ook in staat zijn huidige product/markt combinaties uit te diepen en efficiënter te worden (Gibson en Birkinshaw 2004). Deze combinatie van factoren zorgt ervoor dat ambidexter organisaties over het algemeen beter presteren dan hun eenzijdige tegenhangers (He en Wong 2004).

Het is echter niet gemakkelijk om ambidexteriteit te ontwikkelen. De steunpilaren exploratie en exploitatie zijn tegenhangers van elkaar in vereiste structurering, denkrichting, en uitkomsten. *Exploratie* bijvoorbeeld, draait om het verkennen van nieuwe product/markt combinaties (Benner en Tushman 2003). Het is afhankelijk van onuitgesproken, latente kennisbronnen en klantvraag (Lubatkin et al. 2006) en wordt geassocieerd met experiment, flexibiliteit en afwijkend gedrag (March 1991).

Exploitatie daarentegen draait om het uitbuiten van bestaande competenties. Het is gericht op incrementele veranderingen om te voldoen aan de eisen van bestaande product/markt combinaties (Benner en Tushman 2003). Exploitatie steunt op expliciete kennis over het voldoen aan bestaande klantvraag (Lubatkin et al. 2006). Het wordt geassocieerd met efficiëntie, verfijning en focus (Zahra en George 2002).

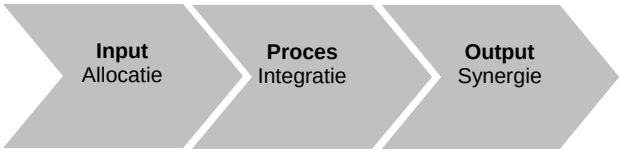
Het inrichten van zowel exploratie als exploitatie activiteiten in dezelfde organisatie zorgt onherroepelijk voor spanning, aangezien het zowel activiteiten en denkwijzen omvat die gericht zijn op het verbeteren van huidige product/markt combinaties, als activiteiten en denkwijzen die zeer afwijkend zijn.

In eerste instantie werd deze spanning als onoplosbaar gezien behalve in het geval van het scheiden van exploratie en exploitatie over tijd (Duncan 1976). In deze visie volgen exploratie en exploitatie elkaar op in een cyclus. Hierbij dient continu een afweging gemaakt te worden of exploratieve dan wel exploitatieve activiteiten van toepassing zijn.

Recent onderzoek naar ambidexteriteit heeft echter aangetoond dat het gelijktijdig combineren van exploratie en exploitatie een synergie teweeg kan brengen die tot hogere prestaties leidt (Tushman en O'Reilly 1996; Raisch et al. 2009). Dit onderzoek stelt dat er geen afweging tussen exploratie en exploitatie gemaakt hoeft te

worden. Op het niveau van allocatie van middelen (tijd, geld, aandacht, en inrichting) dient er uiteraard wel gekozen te worden een bepaalde balans (Sidhu et al. 2009; Uotila 2009). Deze allocatie afweging vormt echter een eerste stap (zie figuur 1) in het bereiken van ambidexteriteit (O'Reilly en Tushman 2008). In de volgende stappen, het integratieproces en de outputfase, kunnen exploratie en exploitatie met elkaar verweven worden tot een synergetisch geheel (Jansen et al. 2009).

Figuur 1 Een gefaseerde weergave van het organiseren van ambidexteriteit



(gebaseerd op Simsek 2009)

Input: het inrichten van ambidexteriteit

De allocatie- of inputfase omvat het inrichten van de organisatie voor zowel exploratie als exploitatie. Een van de meest onderzochte vormen waarin in dit kan gebeuren is het structureel scheiden van exploratie en exploitatie (i.e. structurele differentiatie), ook wel structurele ambidexteriteit genoemd. Binnen dit perspectief worden exploratie en exploitatie in aparte organisatie-eenheden geplaatst, om ze te beschermen tegen verstorende invloeden van andere activiteiten binnen de organisatie (Tushman en O'Reilly 1996).

Een andere visie op het inrichten van exploratie en exploitatie activiteiten betreft de zogenaamde contextuele ambidexteriteit. Waar het perspectief van structurele ambidexteriteit noodzaak ziet exploratie en exploitatie strikt gescheiden te houden op operationeel niveau, stelt contextuele ambidexteriteit dat dit in bepaalde situaties overbodig is. Door een context te creëren die het gedrag van individuele medewerkers op de juiste wijze beïnvloedt, kan binnen dezelfde organisatie-eenheid zowel exploratie als exploitatie plaatsvinden. Medewerkers bepalen hierin zelf of en wanneer ze exploratie dan wel exploitatie nastreven (Gibson en Birkinshaw 2004).

Proces: integratie van exploratie en exploitatie

Hoewel beide visies verschillen in opvatting omtrent het inrichten van ambidexteriteit, zijn ze het eens over het belang van integratie van exploratie en exploitatie.

Hierbij is het van belang te benadrukken dat integreren een proces is. Gedurende dit proces kan door interactie en kennisdeling tussen medewerkers toegevoegde waarde tot stand komen die de individuele uitkomsten van de in de eerdere fase toegewezen bronnen en ingerichte processen overstijgt. Zonder kennis rond het transformeren van ideeën en concepten naar concrete toepassingen (een exploitatie vaardigheid), kunnen explorations hun toepassingsmogelijkheden binnen de organisatie en haar potentiele markten verliezen. Tegelijkertijd kunnen exploitaties dermate vastgeroest raken dat ze niet langer kunnen appelleren aan toekomstige verschuivingen in de markt, doordat ze geen toegang hebben tot kennis over deze toekomstige verschuivingen. Dus, separate inzichten vanuit exploratie en exploitatie dienen gezamenlijk bekeken en gecombineerd te worden om nieuwe mogelijkheden voor zowel exploratie als exploitatie te creëren.

Output: het overbruggen van de exploratie-exploitatie paradox om synergie te creëren

Teneinde deze waarde te realiseren dienen echter de spanningen tussen exploratie en exploitatie weggenomen te worden. Een vast onderdeel van het integratie traject is dan ook het creëren van een visie die exploratie en exploitatie als complementair ziet in plaats van tegenpolen. Dit kan op verschillende wijzen.

Structurele ambidexteriteit geeft de voorkeur aan integratie op top-management niveau. Zij brengen exploratie en exploitatie vanuit de afzonderlijke organisatie-eenheden bij elkaar, en retourneren ideeën ter ontwikkeling van zowel exploratie als exploitatie richting de respectievelijke eenheden (Benner en Tushman 2003).

Contextuele ambidexteriteit ziet ook een sleutelrol voor management, maar dan in het creëren van een context waarin medewerkers zelf gestimuleerd worden om een complementaire visie te ontwikkelen (Gupta et al. 2006).

Hoewel er vervolgens weer verschillende mechanismen zijn om deze doelen te bereiken, kennen ze één grote overeenkomst. Ze stimuleren exploratie en exploitatie te zien als een *paradox* (Andriopoulos en Lewis 2009). Een paradox betreft een specifieke verhouding tussen twee tegengestelde elementen:

> *Tegengestelde, elkaar uitsluitende elementen die aanwezig en actief zijn op hetzelfde moment. Paradoxen verschillen van andere gerelateerde concepten zoals dilemma, ironie, inconsistentie, dialectiek, ambivalentie, of conflict. (…) Een paradox verschilt van elk van deze concepten in die mate dat er geen keuze gemaakt hoeft te worden tussen twee of meer tegenstellingen. Beide tegenstellingen in een paradox worden geaccepteerd en zijn present. Beiden zijn tegelijkertijd actief.* (vrij vertaald uit Cameron 1986)

Het adequaat handelen in paradoxale situaties wordt in veel onderzoek gezien als een bron van (financiële) toegevoegde waarde (Quinn en Rohrbaugh 1983; Schulte et al. 2009). Om deze waarde te bereiken dienen de betrokken partijen tegenstellingen gebalanceerd te benaderen (i.e. het een niet als belangrijker dan het ander zien). De beste wijze om dit te bereiken is het *overbruggen* van de paradox (Lado et al. 2008). Overbruggen impliceert dat betrokken individuen hun eigen aannames en perspectief kritisch onder de loep moeten nemen (Denison et al. 1995). Feitelijk vraagt dit een herformulering van de afzonderlijke ideën en visies in het kader van het gezamenlijke doel (Lewis 2000).

Voor het overbruggen van de exploratie-exploitatie paradox impliceert dit in ieder geval dat medewerkers een diepgaand inzicht moeten hebben in de werking en uitdagingen van zowel exploratie als exploitatie om adequaat te kunnen reflecteren op de eigen activiteit (Andriopoulos en Lewis 2009). Bedrijven dienen daarom een positieve leeromgeving te stimuleren waarin kennis en informatie eenvoudig rond kan gaan. Bovendien zouden medewerkers hierin vrij moeten zijn om gemeenschappelijke grond op te zoeken en gezamenlijke doelen na te streven (Gittell 2002).

Dit benadrukt wederom het belang van integratie mechanismen in het kader van ambidexteriteit. Hoewel in de allocatiefase het fundament aangebracht wordt, is het de integratiefase waar door interactie tussen medewerkers de eerste stappen richting synergie gezet worden (O'Reilly en Tushman 2008). Dit alles leidt tot de volgende definitie van (structurele) ambidexteriteit:

De routines en processen waarmee organisaties gescheiden exploratie en exploitatie activiteiten mobiliseren, coordineren, en integreren, op basis van de allocatie, herallocatie, combinatie en hercombinatie van bronnen en vermogen in gedifferentieerde organisatie-eenheden. (vrij vertaald uit Jansen et al. 2009)

De wijze waarop organisaties ambidexteriteit inrichten is niet alleen afhankelijk van een conceptuele uitgangspositie (i.e. structurele of contextuele ambidexteriteit), maar ook van het organisatieniveau (i.e. top-management niveau of lagere hierarchische niveaus), context (i.e. strakke hierarchie, of meer organische inrichting) en externe bedrijfsomgeving. Gegeven de bovenstaande overwegingen, poogt deze dissertatie het volgende te bereiken:

Inzicht verkrijgen in de wijze waarop organisaties nastreven ambidexteriteit vorm te geven, door het managen van differentiatie en integratie op verschillende organisatie-niveaus en in verschillende contexten, in overeenstemming met interne en externe vereisten.

Drie studies naar ambidexteriteit

De drie studies in deze dissertatie incorporeren het perspectief van het overbruggen van de exploratie-exploitatie paradox om ambidexteriteit te creëren. Elke studie beargumenteert en test determinanten die verschillende invloed hebben op de wijze waarop organisaties integratie van exploratie en exploitatie kunnen bereiken. Ze verschillen echter in analyse niveau, focus en theoretische fundering. De volgende paragrafen geven een gedetailleerde beschrijving van deze studies.

Studie 1: Structurele differentiatie en ambidexteriteit, de medierende invloed van integratie mechanismen

De eerste studie bekijkt de rol die zowel structurele differentiatie als integratie speelt in het creëren van ambidexteriteit. Het hoofdargument (en bijdrage aan de literatuur) is dat hierin de relatie tussen differentiatie en integratie zowel ‘noodzakelijk’ als ‘afdoende’ is. Met andere woorden, om ambidexter te worden dienen organisaties de mate waarin exploratie en exploitatie gedifferentieerd (d.w.z. gescheiden) zijn te laten volgen door een proportioneel niveau van integratie. Zonder deze integratieslag zal de organisatie in kwestie de vruchten niet kunnen plukken van ambidexteriteit.

Daarnaast maken we een onderscheid tussen top-management en het lagere, operationele niveau, en formele en informele integratie mechanismen (zie figuur 2).

Figuur 2 Constructen en analyse niveaus in studie 1

	Formele integratie	**Informele integratie**
Top management niveau	Groepsbeloningen	Sociale integratie
Operationeel niveau	Cross-Functionele Verbindingen	Verwevenheid

Op het top-management niveau blijken groepsbeloningen niet van belang te zijn voor het ambidexter worden van organisaties, terwijl de formele tegenhanger op het operationele niveau, cross-functionele verbindingen, wel een significante positie blijkt in te nemen tussen structurele differentiatie en ambidexteriteit. Daarentegen is op het top-management niveau informele integratie, ofwel sociale integratie, wel weer van invloed. Informele verwevenheid van een organisatie medieert de relatie tussen differentiatie en ambidexteriteit niet, maar heeft wel een op zich zelf staande invloed op het bereiken van ambidexteriteit

Deze afwijkende werking van formele dan wel informele integratie mechanismen geven aan dat de wijze waarop ambidexteriteit bereikt kan worden afhankelijk is van unieke karakteristieken en uitdagingen op verschillende organisatie-niveaus.

Studie 2: Sociale inbedding en ambidexteriteit: de gezamenlijke invloed van intern en extern sociaal kapitaal

De afwijkende invloed van informele verwevenheid op operationeel niveau in studie 1 gaf aanleiding tot verdere verdieping. In de tweede studie wordt gekeken naar de invloed van de sociale context waarbinnen organisaties opereren op ambidexteriteit. Onderzoek heeft aangetoond dat een dergelijke context van invloed kan zijn op de integratie-vaardigheden van organisaties die ambidexter wensen te worden (Gibson en Birkinshaw 2004; Jansen et al. 2005). In dit licht kan sociaal kapitaal van grote invloed zijn op de wijze waarop individuen samenwerken en kennis vergaren en delen (Adler en Kwon 2002). Bij structurele scheiding van exploratie en exploitatie verwachten we een op zichzelf staande, overbruggende werking van sociaal kapitaal op de mogelijkheden tot integratie tussen de verschillende organisatie-eenheden. We

maken hierin een onderscheid tussen structureel en relationeel sociaal kapitaal. Structureel kapitaal betreft de structurele samenstelling van een sociaal netwerk, bijvoorbeeld connecties met veel personen, of het bekleden van een centrale positie in het netwerk (Borgatti en Foster 2003). Relationeel kapitaal omvat de inhoud van relaties, bijvoorbeeld wederzijds vertrouwen, of als expert worden gezien (Uzzi 1997). Verder wordt er zowel naar intern als extern sociaal kapitaal (met klanten) gekeken. Figuur 3 geeft deze verhoudingen weer.

Figuur 3 Interne of externe focus en sociaal kapitaal type in studie 2

	Structureel sociaal kapitaal	**Relationeel sociaal kapitaal**
Intern	Verwevenheid	Vertrouwen
Extern	Klanten netwerken	Klantvertrouwen

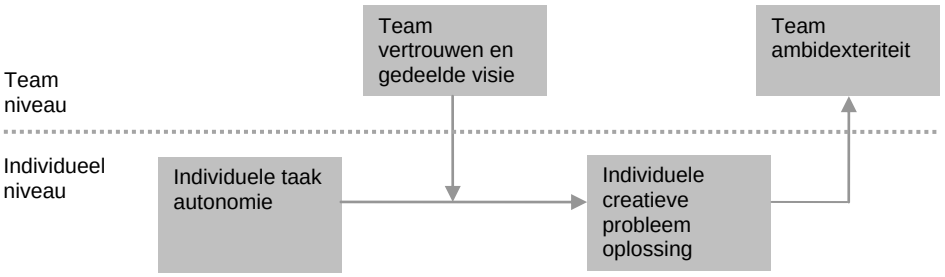
We vinden allereerst een positieve significante invloed van beide vormen van intern sociaal kapitaal op de ambidexteriteit van organisaties. Blijkbaar helpt intern social kapitaal inderdaad bij het overbruggen van structurele scheiding. Vervolgens testen we of en hoe deze relaties worden beïnvloed door klantrelaties. Hier vinden we enkele verassende en interessante resultaten. Het blijkt dat wanneer intern en extern sociaal kapitaal type van het zelfde soort zijn (relationeel-relationeel), de invloed van sociaal kapitaal met klanten negatief is op de relatie tussen intern sociaal kapitaal en ambidexteriteit. Wanneer ze echter verschillend zijn (bv. relationeel-structureel), gaat er een positieve werking uit van sociaal kapitaal met klanten.

Deze resultaten duiden op de relatieve verbondenheid van verschillende gereedschappen om ambidexter te worden. Afhankelijk van de aard van het interne sociale netwerk (veel connecties, of veel vertrouwen?), kan het belangrijk zijn voor bedrijven aandachtig te kijken naar het type relatie dat overheerst in klantcontact. Als er bijvoorbeeld intern een breed en sterk verweven netwerk is, wordt het van belang om nauwe banden te smeden met enkele selecte klanten (ook wel *customer intimacy* genoemd, Treacy en Wiersema (1993)). Als er daarentegen veel intern vertrouwen is, wordt het juist belangrijk om contact te leggen met meer en verschillende klanten.

Studie 3: Ambidexteriteit in zelf-organiserende teams: een multilevel analyse van team en inviduele karakteristieken

De vorige studies bekijken integratie *op* verschillende niveaus (bv. top-management niveau of operationeel niveau) en hun effect op ambidexteriteit. Het is echter aannemelijk dat er ook interactie is *tussen* verschillende niveaus in het bereiken van ambidexteriteit. In de derde studie beargumenteren we daarom dat zowel horizontale als verticale processen de mogelijkheden om ambidexter te worden beinvloeden (McKelvey 2002). In deze studie bekijken we hoe team-context de mogelijkheden beinvloedt om op individueel niveau autonomie maximaal te benutten om creatief probleemoplossend vermogen te ontwikkelen. Dit probleemoplossend vermogen wordt vervolgens weer gerelateerd aan ambidexteriteit op team-niveau (zie figuur 4).

Figuur 4 Multilevel relaties tussen team en individueel niveau in studie 3



Deze studie vindt plaats in een non-hierarchische omgeving. De onderzochte organisatie, een financieel consultant, bestaat uit 34 zichzelf managende teams, zonder budget, zonder regels en procedures van bovenaf.

Dit geeft de mogelijkheid om goed te kijken naar of en hoe het overbruggen van de exploratie-exploitatie paradox afwijkt in een dergelijke context. Zo vinden we bijvoorbeeld een negatieve invloed van team vertrouwen op het individuele niveau. Dit wijkt af van eerder werk over ambidexteriteit bij bijvoorbeeld Toyota (Adler et al. 1999). Dit geeft aan dat het creëren van ambidexteriteit sterk afhankelijk is van de organisationele en culturele context waarbinnen dit geschiedt.

Conclusie

Hoewel er verschillen zijn in de wijze waarop organisaties ambidexteriteit kunnen organiseren, brengt het ambidexter worden onherroepelijk spanningen met zich mee die opgelost moeten worden (March 1991; Raisch en Birkinshaw 2008). Voorheen werd dit fenomeen als onoplosbaar beschouwd, tenzij exploratie en exploitatie gescheiden worden over tijd (Duncan 1976). Tegenwoordig is er echter de concensus dat deze spanning gelijktijdig te managen is (Tushman en O'Reilly 1996; Raisch et al. 2009). Dit vormt echter wel een uitdaging, aangezien exploratie en exploitatie elkaars tegenpolen lijken te zijn. Om deze spanning op te lossen dienen ze echter als een paradox in plaats van tegenpolen gezien worden (Andriopoulos en Lewis 2009). Op deze wijze wordt integratie gestimuleerd en kan synergie gecreëerd worden die tot superieure resultaten kan lijden (Gibson en Birkinshaw 2004; He en Wong 2004).

De studies in deze dissertatie plaatsen integratie op de voorgrond als drijvende kracht achter het bereiken van deze synergie. Tegelijkertijd blijkt dat de wijze waarop ambidexteriteit bereikt kan worden afhankelijk is van een pluriformiteit aan omstandigheden. Organisatie-niveau, -cultuur, -context, en interne en externe netwerken vormen contingenties die de keuze voor een type integreren en de effectiviteit ervan beinvloeden. Hieruit blijkt dat er geen archetypische benadering van ambidexteriteit is. Dit inzicht onderstreept het strategisch belang van het organiseren van ambidexteriteit als drijfveer voor zowel huidige als toekomstige prestaties van organisaties.

About the Author

Michiel Tempelaar (Groningen, June 2, 1978) obtained his MSc. degree in Business Studies at the Faculty of Economics and Econometrics of the University of Amsterdam. His master thesis involved conceptual work on the application of complexity theory and chaos theory to strategic challenges such as balancing exploration and exploitation. After his studies, he worked as a project coordinator and reporting specialist for BBned NV, where he was involved in projects concerning business intelligence, financial reporting, strategic supply management, and revenue management.

In January 2006 Michiel started as a PhD at the Department of Strategy and Business Environment at the Rotterdam School of Management. During his period as a PhD candidate, one of the studies in this dissertation was published in Organization Science. Also, he presented his work at various conferences, such as the European Academy of Management Conference, European Group for Organization Studies Colloquium, Annual Meeting of the Academy of Management, and the Strategic Management Society Conference. The remaining unpublished studies in this dissertation are currently under review at international journals.

He is involved in a coordinative capacity in the Erasmus Competition and Innovation Monitor (Erasmus Concurrentie en Innovatie Monitor), an annual survey among 10.000 Dutch companies. This survey represents a recurring measure of the Dutch corporate community and its challenges. Each year, the results are fed back to the participating companies, providing them with benchmarks on their competitive position in relation to their industries.

Michiel's research interests involve the multilevel determinants and consequences of exploration, exploitation and organizational ambidexterity. In this, he has investigated a variety of topics such as company structure, internal and external social networks, organizational context, team characteristics, personality traits, and performance.

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ORGANIZING FOR AMBIDEXTERITY

In the current volatile business world, being able to handle both future market shifts (explore) as well as current market dynamics (exploit) is of critical importance. Research has pointed out the role of developing and integrating exploration and exploitation activities, or ambidexterity, to achieve such capabilities and associated superior performance. Becoming ambidextrous is, however, a challenge as exploration and exploitation appear juxtaposed in ways of organizing, mindset, and intent. Nevertheless, scholars have indicated several ways to overcome these tensions and achieve ambidexterity. However, many contingencies and factors influencing this process remain uninvestigated.

The studies in this dissertation contribute to our understanding of such critical factors that foster appropriate allocation of resources and ambidexterity. One central perspective in these studies is that, instead of viewing exploration and exploitation as contradictive, they should be viewed as a paradox from which, despite their differences, synergies may emerge. Such a perspective shapes the ability of organizations and individuals to realize ambidexterity.

An overarching insight from these studies is the notion that depending on several contingencies, such as hierarchical level and individual attributes, different integration mechanisms should be employed. Furthermore, some integration mechanisms work out differently depending on the context within which they are embedded. These findings suggest that there is no single best method of achieving ambidexterity. This underlines the strategic importance of organizing for ambidexterity as a key driver for current and future firm performance.

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