

## **Towards a Cognitive Dimension in the Organizational Ambidexterity Framework**

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# TOWARDS A COGNITIVE DIMENSION IN THE ORGANIZATIONAL AMBIDEXTERITY FRAMEWORK

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**Abstract:** Organizational ambidexterity is central for strategic renewal, as organizations struggle with simultaneous dualities, such as exploration and exploitation, as well as maintaining routines while being flexible. In this book chapter, we examine the cognitive microfoundations of management decision in such conditions. To this end, we integrate literature on organizational ambidexterity, dualities such as paradoxes, as well as management cognition. We discuss the role of cognition in achieving spatial, temporal, and contextual ambidexterity and introduce ‘cognitive ambidexterity’ as a manager’s ability to deal with contradictory dualities in their decision-making.

## **1. Introduction**

Organizations face a continuous struggle for strategic renewal in the pursuit of breaking path dependencies under internal and external demands (Schmitt et al., 2016). One important perspective on strategic renewal is organizational ambidexterity – the organization’s ability to manage contradictory strategic dualities, such as exploration and exploitation, at the same time. Interest in organizational ambidexterity has burgeoned during the past decade, with scholars appreciating its applicability and versatility (Birkinshaw and Gupta, 2013). Organizations and their managers are confronted with choices and tradeoffs among competing objectives all the time, and thus, the ambidexterity framework provides a readily applicable and normative perspective.

The definitions of organizational ambidexterity differ, and they have expanded over time (for review, Papachroni et al., 2015; Raisch and Birkinshaw; 2008; Simsek et al., 2009; Tushman and O’Reilly, 2013). However, as the core feature, the definitions typically include engaging

in opposite and contradictory activities and achieving a balance or fit between these (seemingly) conflicting demands. Traditionally, they have been viewed as exploitation and exploration, following March's (1991) typology. Fostering exploitation (performing routine tasks and sustaining the current activities) and exploration (renewing the organizational routines, creating new activities) can be seen as a paradox, as they are considered as interdependent and non-substitutable activities for the firm (e.g., Gibson and Birkinshaw, 2004).

Recently, the organizational ambidexterity literature has started to look more broadly at managing different types of dualities. Dualities can be considered to provide an umbrella terminology for myriad organizational opposite demands, such as paradoxes and dilemmas (for reviews, see e.g. Putnam et al., 2016; Schad et al., 2016), which can be seen as decision-making pairs of which both alternatives are important but are to some degree in conflict with one another (Birkinshaw et al., 2016). Organizations are attempting to address many types of dualities (Gulati and Puranam, 2009) that resemble a similar juxtaposition as with exploration and exploitation, where the conflict arises because resources and also managerial attention are limited. Such pressure to meet various but often inconsistent demands has only amplified with time as organizations are becoming more complex and managerial coordination activities more demanding (e.g., Benner and Tushman 2003; Graetz and Smith, 2008). Thus, organizations and managers must deal with a host of dualities, which are necessary for organizational renewal, including continuity and change (Evans, 1992, see also revolutionary and evolutionary change, Tushman and O'Reilly, 1996), efficiency and flexibility (Adler et al., 1999; Ghemawat and Ricart Costa, 1993), adaptability and alignment (Gibson and Birkinshaw, 2004), financial and social goals (Hahn et al., 2014; Margolis and Walsh, 2003; Smith et al., 2012), or functions and dysfunctions of processes, such as formalization (Vlaar et al., 2007). The fundamental challenge of such strategic dualities is that they often put forward contradictory tensions (Tushman and O'Reilly, 1996), whereas organizational ambidexterity helps to resolve these tensions, and the concept can thus be used to frame related research questions and designs (Birkinshaw and Gupta, 2013).

Encountering various strategic dualities places major demands on managerial decision-making, creating tensions that force managers to deal with controversial signals and mixed messages (e.g., Gibson and Birkinshaw, 2004; Smith and Lewis, 2014). Although some organizations adjust to this turmoil, many encounter various inertial forces (Kaplan, 2008). Knight (1921/1965 in Kaplan, 2008) proposed that this challenge does not stem from the

environmental changes *as such* that make them tough to deal with, but rather managers' ineptness in judging what the contradictions mean (see also Bartunek, 1984; Lüscher and Lewis, 2008). Therefore, achieving organizational ambidexterity is first and foremost a managerial challenge (see also Birkinshaw and Gupta, 2013; O'Reilly and Tushman, 2008), and to understand the management of various types of dualities and related ambidextrous solutions, there is a need to examine managerial cognition and decision-making.

In this book chapter, we provide several important implications. First, we address the lack of knowledge regards to the cognitive perspective in the endeavor to facilitate ambidexterity in an organization (Eisenhardt et al., 2010; Good and Michel, 2013). We integrate the findings from disparate research streams, drawing together the discussions from organizational ambidexterity, duality and managerial cognition literatures. This integration establishes a solid foundation for future empirical research of ambidexterity from a managerial standpoint. Second, we develop insights on the cognitive dimension in relation to different ways of building ambidexterity into an organization. In doing so, we aim to provide clarity on the broad, increasingly arbitrary (see O'Reilly and Tushman, 2013) juxtapositions of exploration and exploitation, as well as other dualities, especially at the individual level. Third, we introduce cognitive ambidexterity (following Chandrasekaran, 2009; Greenberg et al., 2013; Karhu et al., 2016, Neck, 2011) as an explanatory framework for how managers recognize and frame the duality-related tensions and we further examine how this relates to different ambidexterity modes. Overall, we aim to enrich the organizational ambidexterity framework in the context of organizational renewal and thus create a research agenda for better understanding of the managerial cognitive microfoundations of ambidexterity.

In what follows, we first highlight the existing ambidexterity literature that touches upon and calls for further research on cognitive issues. Second, we review the extant literature on organizational ambidexterity, including the core notion of exploration and exploitation, as well as dualities more broadly. We also discuss the suggested solutions for managing ambidexterity: spatial, temporal, and contextual. Finally, we discuss how the cognitive dimension informs and contributes to the discussion on organizational ambidexterity.

## **2. Case for the cognitive dimension: Research gaps and early contributions**

Despite the large body of ambidexterity research, research into the underlying cognitive processes is still at an emergent stage. For instance, research around ambidexterity has

traditionally focused on macro-level tensions; how the challenges unfold and are perceived at the micro-level have been left with less attention (Zhang et al., 2015; Smith, 2014). Exceptions in the duality and paradox literature include e.g. Smith (2014), Jarzabkowski and Lê, (2017) and Knight and Paroutis (2017). However, also some ambidexterity scholars have started to pinpoint cognitive and psychological aspects, as well as calls for further research on the area, which we briefly review here before moving further.

There is much research concerned with the various ways that managerial cognition effects in corporate strategizing in general (e.g., Porac and Thomas, 2002; Walsh, 1995) as well as other organizational processes (Kaplan, 2011), however, only a handful of these studies focuses directly on the mental aspect of cognition (for such studies, see Eggers and Kaplan, 2011; Gavetti, 2012; Helfat and Peteraf, 2015), especially in the context of organizational ambidexterity (see also Parker, 2014; Tuncdogan et al., 2015). A better comprehension of how cognition facilitates or hinders managers' achievement of this balance between opposite demands is also lacking (Eisenhardt et al., 2010). Eisenhardt, et al. (2010) suggested that executives should empower the coexistence of contradictory cognitive agendas (Smith and Tushman, 2005), described as finding a balance between exploration and exploitation at the individual level (Eisenhardt et al., 2010; Good and Michel, 2013; Smith and Tushman, 2005). In addition, Birkinshaw and Gupta (2013) noted if we are to really advance our understanding on how ambidexterity is achieved, much more insight into the managerial capabilities is called for. According to them, we know that some organizations are more ambidextrous than others (as what comes to fit or balance of exploration and exploitation), but we have to take a more detailed look at the way they make their decisions and how those decisions are implemented.

Yet small but mounting number of empirical studies suggest that individuals are a significant source of organizational ambidexterity (Gibson and Birkinshaw, 2004; Lubatkin et al., 2006; Mom et al., 2007, 2009). These studies emphasize the behavioral actions undertaken by managers to explore novel information and to exploit the current knowledge (Good and Michel, 2013). For example, O'Reilly and Tushman (2008) define ambidexterity as the paradoxical capability of the senior management, manifested as a set of senior team decisions with regards to the organizational structure, culture, linking mechanisms as well as the processes (see also Lewis et al., 2014; Smith et al., 2010). Studies by Mom and colleagues (2007, 2009) are one of the primary empirical examples at the individual level of analysis, pursuing to understand the extent to which individual managers balance exploration and exploitation behaviors.

As managers ascend the organizational ladder, the complexity and scope of their decision-making responsibilities upsurges (McKenzie et al., 2009). Therefore, the senior management team is particularly subject to cognitive ambidexterity challenges. Although the desire for a balance between exploitation and exploration has been recognized, and that the endeavor to pursue both is likely to cause tensions, there is little evidence showing how to manage this (Eisenhardt et al., 2010). Such research gap is a key limitation to scholarship on ambidexterity, which is already delineated not only in the organizational (Mom et al., 2009; Raisch et al., 2009) but also neuroscience (Aston-Jones and Cohen, 2005; Laureiro-Martinez et al., 2015) and psychology research (Laureiro-Martinez et al., 2010). As a response, researchers have increasingly focused on individuals, especially managers' exploration and exploitation activities and the psychological antecedents related to those (Good and Michel, 2013; Kauppila and Tempelaar, 2016; Laureiro-Martinez et al., 2015; Tuncdocan et al., 2016). However, as Laureiro-Martinez et al. (2015) addressed, we are still far from effusively understanding how exploration and exploitation decisions are met, and providing the microfoundations for organizational ambidexterity.

Finally, the growing recognition of the applicability of ambidexterity has given rise to proliferation of diverse and parallel definitions and perspectives that provide insights into the cognitive dimension. For instance, the ambidexterity literature borrows heavily from duality and managerial cognition literatures, including paradoxical leader (Lewis et al., 2014; Zhang et al., 2014), paradoxical thinking (O'Reilly and Tushman, 2004; Mom et al., 2009; Raisch et al., 2009; Smith and Tushman, 2005; Smith, 2014), paradoxical cognition (Smith and Tushman, 2005) and paradoxical vision (Andriopoulos and Lewis, 2010). Together, these streams have increased the understanding of how paradox or duality cognitive framing helps to understand and explain managerial challenges and solutions to ambidexterity.

### **3. Organizational ambidexterity**

#### *3.1 History of ambidexterity*

Ambidexterity is a derivative of the Latin words *ambi* referring to “both” and *dexter*, signifying “right” or “favorable.” In biological or medical science, ambidextrous people are equally skillful with both hands (see e.g. Szaflarski et al., 2008). Thus, ambidexterity literally means being “right on both sides.” In management literature, Duncan (1976) introduced the term organizational ambidexterity to illustrate an organization's capacity to do two different things

equally well. He described the dual structures companies inaugurate to deal with activities that encompass different managerial capabilities and time horizons. Twenty years later, Tushman and O'Reilly (1996) suggested that organizational ambidexterity, defined as “[t]he ability to simultaneously pursue both incremental and discontinuous innovation...from hosting multiple contradictory structures, processes, and cultures within the same firm” (p. 24), was a prerequisite of long-term survival. Since then, there has been broad interest in and extensive research on the topic, including hundreds of empirical studies (e.g., Gibson and Birkinshaw, 2004; He and Wong, 2004), theory building papers (e.g., O'Reilly and Tushman, 2008), special issues of journals (*Academy of Management*, 2006; *Organization Science*, 2009), review articles (e.g., Birkinshaw and Gupta, 2013; Lavie, et al., 2010; O'Reilly and Tushman, 2013; Raisch and Birkinshaw, 2008; Turner, et al., 2013), books or book chapters (e.g., Sidhu and Reinmoeller, forthcoming; Zimmermann and Birkinshaw, 2016), doctoral dissertations (e.g. Chandrasekaran, 2009; Jansen, 2005; Tempelaar, 2010), as well as academic conference tracks and other professional meetings (O'Reilly and Tushman, 2013). Tushman and O'Reilly's (1996) ideas were well received in the business world, and they contributed to the broader managerial debate going on at the time about how companies might cope with what Christensen (1997) called disruptive technological innovations. However, the discussion in academia remained modest until a decade later, when the research started to quickly pick up speed.

### *3.2 The challenge of exploitation and exploration and other dualities in organizations*

March's (1991) conceptual paper, which seems to have become a *pro forma* citation in the area of organizational ambidexterity, builds on March's earlier notions on bounded rationality and problemistic search, and addresses the underlying incompatibilities between exploration and exploitation as different organizational learning modes. March's (1991) exploration and exploitation (as broadly defined) have been a useful theoretical anchor for several discussions, including strategic renewal and many others (Papachroni et al., 2015; Schmitt et al., 2016). In the past decade, a particularly decisive link has been adopted for the exploration and exploitation duality and organizational ambidexterity. March (1991) characterized *exploration* as including things such as search, variation, risk taking, experimentation, play, flexibility, discovery, and innovation. *Exploitation*, in turn, includes such elements as refinement, choice, production, efficiency, selection, implementation, execution” (March, 1991, p. 71).

Organizations often face the challenge of an asymmetric preference for short-term exploitation (Volberda and Lewin, 2003). Focusing on exploitation in short-term might sometimes enhance performance. Sooner or later, however, such over-emphasis might turn into a competence trap through overly specialized resources and cognitive maps (Volberda, 1996). Thus, the initial core competencies may develop into core rigidities (Leonard-Barton, 1992), and firms may not be responsive enough to environmental changes (Good and Michel, 2013; Levitt and March, 1988). However, exploration holds dysfunctional effects as well. Responding to every trend and short-term changes, and avoiding routine behavior may mean a company is wasting resources on insignificant or random environmental signals (Volberda, 2003). Eventually, this puts forward a vicious circle that turns into a *renewal trap* characterized by disputes with regards to insufficient controls, authority, undefined responsibilities, and a lack of direction or shared ideology (Volberda and Lewin, 2003). In the paradox literature, a one-sided response to the tension has been described as *suppression*, in which one element is favored at the expense of the other one(s) (Jarzabkowski et al., 2013; Lewis, 2000).

As a remedy, organizations need to “engage in enough exploitation to ensure the organization’s current viability and engage in enough exploration to ensure its future viability” (Levinthal and March, 1993, p. 105). Accordingly, ambidextrous organizations are defined as those capable of “simultaneously exploiting existing competencies and exploring new opportunities” (Raisch et al., 2009, p. 685). Studies have proposed that organizations that manage to pursue exploration and exploitation simultaneously can achieve better financial performance (Gibson and Birkinshaw, 2004; He and Wong, 2004; Lubatkin et al., 2006).

Recently, organizational ambidexterity scholars have examined other types of dualities beyond exploitation and exploration (Birkinshaw and Gupta, 2013; see also Andriopoulos and Lewis, 2009, 2010; Smith and Tushman, 2005). At the same time, there is increasing cross-pollination between ambidexterity and the duality and paradox perspectives (Papachroni et al., 2015, 2016; Smith and Lewis, 2014), as well as the psychological and cognitive perspectives (e.g., Good and Michel, 2013; Lin and McDonough, 2014; Tuncdogan et al., 2016). This recent integration of literature streams has provided a broader outlook on the organizational and managerial mechanisms for dealing with exploitation or exploration and other organizational dualities.

Originally, March (1991) proposed exploration and exploitation to be two contradictory activities that can be considered as two ends of a same continuum that are competing for scarce resources and are technically incompatible (see also Walrave et al., 2011). However, this does



not apply to all resources. For instance, information or knowledge resources can be limitless and accumulated (Shapiro and Varian, 1998). Further, a firm can acquire at least some organizational knowledge via simple learning from experience (Huber, 1991). Thus, if we accept that the company's resources are not always scarce, and that exploration and exploitation are not mutually exclusive, we can move away from the notion of the two ends of a continuum (Gupta et al., 2009). An alternative—and increasingly popular—view is to frame these seemingly opposite activities as complementary (e.g., Cao et al., 2009; Katila and Ahuja, 2002).

The *paradox* perspective follows a similar logic and suggests that tensions may be viewed as persistent, opposing, but interconnected poles, as opposed to a *dilemma*, which refers to a dichotomous, either-or solution by weighing the pros and cons. Paradoxes are defined as “contradictory yet interrelated elements that exist simultaneously and persist over time” in states of dynamic equilibrium (Smith and Lewis, 2011, p. 382). The paradox perspective helps to understand how various types of dualities can be managed in an ambidextrous fashion. The opposite demands of a duality (such as exploitation and exploration) can be approached as they would be compatible and interdependent rather than incompatible and separate (see also Farjoun, 2010). For instance, Nerkar (2003) illustrated that overcoming the dilemma tradeoff (either-or) is not necessary if paradoxical thinking is used to achieve exploitation and exploration at the same time. Indeed, many ambidexterity scholars use the term paradoxical thinking as a condition needed to handle the contradictory demands (e.g., Andriopoulos and Lewis, 2007, 2009; Smith and Tushman, 2005). Lüscher and Lewis (2008) and Lewis and Smith (2011) discussed the duality categories comprising paradoxes and named them learning, organizing, performing, and belonging. In a review of the paradox research, Schad et al. (2016) discovered an emphasis on learning paradoxes, those that portray tensions between stability and change, old and new, or exploration and exploitation. This reflects the extensive interest in tensions that surface in attempts to facilitate ambidexterity and drive strategic renewal.

### *3.3 Three approaches to organize for ambidexterity*

The literature has concentrated on three methods that empower ambidexterity within an organization: spatial, temporal, and contextual. In spatial ambidexterity, two activities are carried out in different organizational units or domains (Tushman and O'Reilly, 1996). In temporal ambidexterity, managers organize activities in temporal, sequential, or back-and-forth cycles among different dualities (Brown and Eisenhardt, 1998; Nickerson and Zenger, 2002;

Siggelkow and Levinthal, 2003; Venkatraman et al., 2007). Contextual ambidexterity requires addressing different dualities, such as exploitation and exploration, simultaneously by the same individual or unit (Gibson and Birkinshaw, 2004; Tushman and O'Reilly, 1996; Raisch and Birkinshaw, 2008). In the following, we discuss the key characteristics of each approach.

### *3.3.1 Spatial ambidexterity*

When confronted with competing activities and demands, organizations can maintain high levels of both activities through spatial ambidexterity (or *structural ambidexterity*, e.g., Tushman and O'Reilly, 1996). This happens by spatially dispersed units focused on exploratory and exploitative activities (Jansen et al., 2009) or other types of dualities, such as competition and collaboration (Fernandez et al., 2014). This is possible when obtaining balance within the same organizational unit is not necessary or even conceivable (Gupta et al., 2006; Lubatkin et al., 2006; Papachroni et al., 2015). For example, individuals responsible for generating R&D may focus on exploration, while individuals responsible for accounting may emphasize exploiting efficiencies and economies of scale (Good and Michel, 2015). Jansen et al. (2009) described spatial ambidexterity as facilitating pragmatic boundaries (Carlile, 2004), which shelter experimental activities from overruling dominant managerial cognitions (see also dominant logic, Prahalad and Bettis, 1986) and inertia (Benner and Tushman, 2003). In spatial ambidexterity, the exploratory and exploitative endeavors coexist at separate locations, which gives a feel of freedom and ownership over particular work activities and allows structural flexibility to respond to contradictions locally in the task environments (Child, 1984; Jansen et al., 2009). This calls for leadership-based practices that make the senior management team accountable for responding and reconciling to the tensions that arise from the differences of opposite efforts (e.g., Mom et al., 2007, 2009; Raisch and Birkinshaw, 2008).

Thus, spatial ambidexterity refers to 1) managers' ability to recognize incompatible or complex tasks or processes that benefit from separation and 2) the unit of analysis, which is never a single person but two or more persons or business units, who engage in different types of activity (from the managerial perspective, such as exploratory or exploitative tasks).

### *3.2.2. Temporal ambidexterity*

Temporal ambidexterity (Siggelkow and Levinthal, 2003; Tushman and O'Reilly, 1996) – also called cyclical (Simsek et al., 2009) or punctuated ambidexterity (Helfat and Raubitschek, 2000; Rothaermel and Deeds, 2004; Winter and Szulanski, 2001) – starts from the fundamental assumption of the non-complementarity of competing demands (particularly exploration and exploitation). Temporal ambidexterity addresses these demands via temporal separation; that is, activities take place in different points in time (Papachroni et al., 2015). It serves as an in-between solution to the perceived contradictions: the negative effects of contradictions are neutralized by arranging them at different points in time for full concentration on either side of the duality for the time being.

Temporal ambidexterity originates in punctuated equilibrium (for a review, see Gersick, 1991), whose logic lies in the assumption that organizations develop during long periods of stability (i.e., exploitation) that are interrupted by episodes of change (i.e., exploration; Tushman and Romanelli, 1985). For managers, this means exploring and exploiting cycles based on seasonal peculiarities of the business (e.g., harvest season) or production cycles but also for their personal development to adjust to the change. In the dualities literature, Putnam et al. (2014) discussed an example: flexible work arrangements, where organizational actors cope with the tensions between fixed and variable hours by adopting fixed schedules during peak times and flexible schedules for the less busy times.

We suggest that temporal ambidexterity can be both proactive and reactive. First, after recognizing the duality tasks or processes that benefit from rotation (e.g., bring versatility to employees' tasks but are less burdening than simultaneous engagement), managers could temporally allocate such tasks in the organization. However, managers (and organizations in general) themselves are subject to such temporal changes due to the nature of the business (e.g., seasons or organizational renewal periods) and are required to react and adjust their operations and mindsets accordingly.

### *3.2.3. Contextual ambidexterity*

The contextual ambidexterity (Gibson and Birkinshaw, 2004; He and Wong, 2004; Mom et al., 2007; see also harmonic ambidexterity, Simsek et al., 2009) approach suggests that ambidexterity is best attained by “building a set of processes or systems that enable and encourage individuals to make their own judgments about how to divide their time between conflicting demands for alignment and adaptability” (Gibson and Birkinshaw, 2004, p. 210).

Studies on individual ambidexterity build on the premise that ambidextrous organizations require ambidextrous individuals who are adept to sensing the differing demands required for exploration and exploitation efforts (O'Reilly and Tushman, 2004). In this regard, Birkinshaw and Gibson (2004) characterized ambidextrous behavior as proactive and initiative-taking, which involves recognizing opportunities outside one's core expertise, to collaborate with others, to play various roles, and to identify opportunities to reap synergies. Further, Mom et al. (2009) characterized ambidextrous managers as multithinkers and –taskers, who are capable in accommodating contradictions and willing to continuously improve and question their thinking.

Contextual ambidexterity often refers to the supportive organizational context that the senior executives put in place, so the front-line employees can address exploitation–exploration tensions within a single work unit, but poses cognitive demands on individuals at all levels of the organization (e.g., Zimmermann et al., 2015). In fact, ambidexterity has also been analyzed through the lenses of *individual ambidexterity* (e.g., Good and Michel, 2013), which refers to contextual ambidexterity at the individual level. Studies elaborating the role of the individual is sparse, probably due to the tendency to focus on structure instead of context (Good and Michel, 2015). Nevertheless, organizational ambidexterity researchers have acknowledged the central role of individuals (e.g., frontline employees, Jasmand et al., 2011; Yu et al., 2012) to better understand how to select, train, and develop employees to follow through on strategic initiatives in dynamic environments (Good and Michel, 2013). Thus, contextual ambidexterity (Gibson and Birkinshaw, 2004) accepts exploration and exploitation and other dualities as complementary. However, this is not because the fundamental conflicts would have been wiped away (Papachroni et al., 2015), but because individuals develop and apply the cognitive (and behavioral, Mom et al., 2009) capacity to distribute their time and attention between the two types of endeavors.

We suggest managers themselves have to manage both individual and contextual ambidexterity as the scope and complexity of their decision-making responsibilities are high (McKenzie et al., 2009). Therefore, managers need to be able to handle multiple tasks and roles themselves, but also to recognize the dualities the organization needs to respond to, and make judgments when assigning those tasks to particular individuals or business units.

#### **4. Cognition and organizational ambidexterity**

##### *4.1 Management decision-making and cognitive microfoundations*

The essential role of managers in all types of organizations and at all levels is to make decisions (Harrison and Pelletier, 2000). To do this, managers absorb, process and diffuse knowledge about the problems and opportunities they have discovered. Managerial cognition (see also managerial cognitive capabilities, Helfat and Peteraf, 2015) refers to the mental models, belief systems (also called knowledge structures, e.g. Walsh, 1995) and mental processes but also emotions (Hodgkinson and Healey, 2011). Thus, managerial cognitive frames explain why managers do not perceive the decisions in the same way but approach those differently and also attach divergent socioemotional information to the decisions (e.g., Smith and Tushman, 2005). The most essential challenge that managers come upon, though, is that the information to be processed is extremely complex, ambiguous, and the amount of it is immense (McCall and Kaplan, 1985). Tversky and Kahneman (1981) elaborated “the frame that a decision-maker adopts is controlled partly by the formulation of the problem and partly by the norms, habits, and personal characteristics of the decision maker” (p. 453). Therefore, understanding the cognitive microfoundations that explain how managers make strategic decisions, and how managerial cognition facilitates different types of organizational ambidexterity, is important.

The cognitive aspect of decision-making comes close to the recent conceptualization of managerial dynamic capabilities (Helfat and Peteraf, 2015; see also ambidexterity as dynamic capability, Jansen et al., 2009). For instance, Adner and Helfat (2003) introduced dynamic managerial capabilities “to underpin the finding of heterogeneity in managerial decisions and firm performance in the face of changing external conditions” (p. 1011). Furthermore, Helfat and Peteraf (2015) defined managerial cognitive capability as “the capacity of an individual manager to perform one or more of the mental activities that comprise cognition” and suggested it to lay a foundation of dynamic managerial capabilities. These include mental undertakings such as attention, reasoning, perception and problem solving as well as communication.

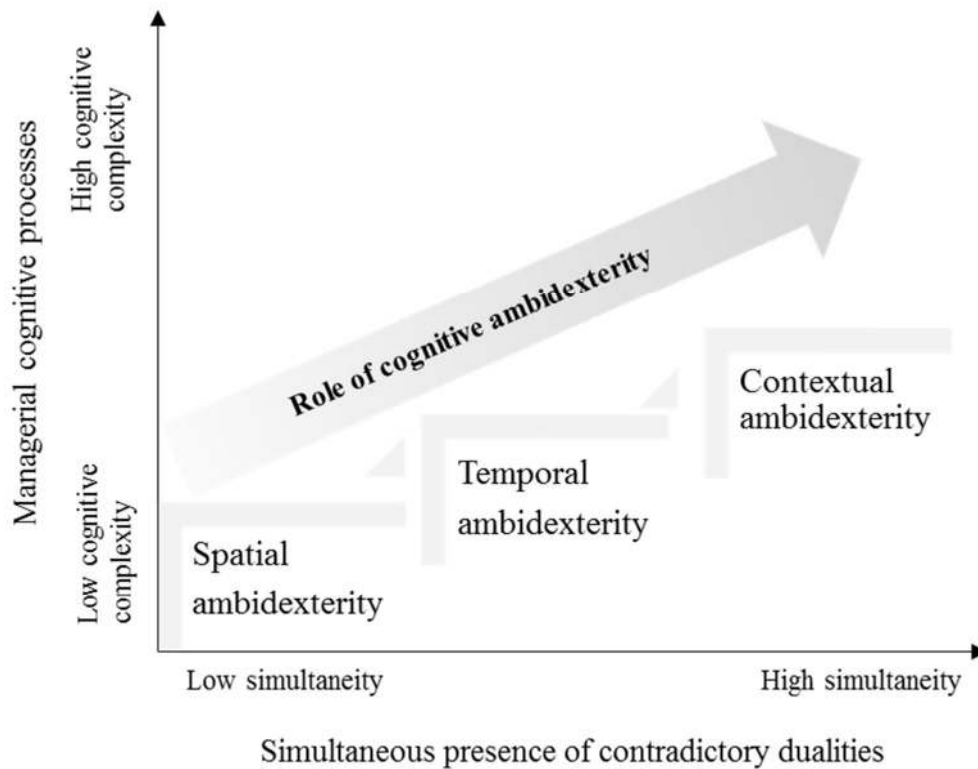
The knowledge structures give stimuli to heuristics and biases that come into play when managers anticipate market changes, attempt to understand the consequences of different choices and finally take action (Garbuio et al., 2011). In some way, managers “must see their way through what may be a bewildering flow of information to make decisions and solve problems” (McCall and Kaplan, 1985, p. 280). Managers, and in fact all individuals who come

to make decisions tackle the described information challenge by using their knowledge structures (Walsh, 1995).

#### *4.2 Cognitive ambidexterity framework*

Based on the premises thus far, we characterize the core abilities related to *cognitive ambidexterity* through three complementary elements: (1) managers' ability to recognize the nature of the duality in their cognitive framing process, (2) managers' ability to build ambidexterity into their individual and organizational contexts in spatially, temporarily, and contextually as a result of the framing of the decision, and (3) managers' ability to continuously assess the balance and dynamics between exploration and exploitation (or other dualities) and alter the ambidexterity mode to arrange dualities when needed. Together, these aspects of cognitive ambidexterity build on and refine its recent definition as "the ability to engage in parallel mental processes that are paradoxical or in contradiction" (Karhu et al., 2016).

Figure 1 depicts the role of cognitive ambidexterity in the broader organizational ambidexterity framework. In particular, two dimensions are highlighted: The complexity of the required managerial cognitive process and the simultaneity of the contradictory dualities (varying from low to high). This concerns each ambidexterity-building mechanism with different intensity level (i.e., spatial, temporal, and contextual), and becomes gradually more and more significant when dualities are to be coped with simultaneously (i.e. individual level contextual ambidexterity).



**Figure 1: Theoretical framework of Cognitive Ambidexterity**

**Figure 1.** The cognitive ambidexterity dimension in the organizational ambidexterity framework

The presence of contradictory dualities increases as we move from the requirements of spatial ambidexterity toward contextual ambidexterity. Similarly, the complexity of cognitive processes increases, as the demands for parallel processing of competing dualities becomes more prominent in moving from separate solutions (structural or temporal ambidexterity) toward integrated, simultaneous solutions. Such simultaneity requires special cognitive abilities and tolerance for ambiguity from managers and decision-makers. In the following, we discuss these demands in conjunction with the three modes of ambidexterity.

#### *4.3 Role of cognition in different modes of ambidexterity*

For *spatial ambidexterity*, we suggest that managers adopt the ambidexterity type *as per* the cognitive complexity level of the duality (e.g. exploration and exploitation) as well as their respective compatibility. When managers cognitively frame the duality as a dilemma, they observe the decision-pair at hand as incompatible and begin to seek solutions to separate them

spatially. Similar solution has been discussed also in the paradox literature (Poole and Van de Ven, 1989). Likewise, Tushman and O'Reilly (1996) argued for separate structures within the same organization to accommodate what are reflected as contradictory systems, competencies and practices to enable both exploration and exploitation. For instance, the dominant culture of exploitative incremental innovation often reacts hostilely toward explorative discontinuous innovation as they compete for scarce resources (Papachroni et al., 2015). In consequence, spatial separation demands managers' cognitive comprehension of the opposites and the benefits of separating (rather than merging) those activities. O'Reilly and Tushman (2004) emphasized the role of the senior management team to act as the 'corporate glue' and retain the organization together by managing the tensions that arise between dualities.

For *temporal ambidexterity*, managers have to identify the contrasting activities and decide how to compartmentalize those in time. For adopting this type of ambidexterity, the activities constituting the duality must, first of all, be separable and, secondly, offer more value separately than when carried out concurrently. Similarly, in paradox literature, Poole and Van de Ven (1989) discussed temporal separation. Alternatively, when duality arises from exogenous sources, managers can comprehend duality as exploratory (turbulent) or exploitative (stable) periods, for instance, to which the organization is exposed from the environment. In such case, the theoretical stance is a contingency approach, which is based on choice (Clegg et al., 2002), where actors vacillate between both demands, and the focus on one (e.g., exploration) puts pressure on being attentive to the other (e.g., exploitation). Studies on emotions in contradictory situations show that those can cause stress, burnout and turnover at workplace (Putnam et al., 2016). Furthermore, research shows that a recurrent vacillation between the two poles builds up the feelings of frustration, even anger (Apker et al., 2005), principally as various tensions intensify (or attenuate) one another (Putnam et al., 2016). Therefore, temporal ambidexterity requires careful consideration when applied.

Finally, when managers are able to frame contradictions as fortifying each other and thus complementary, the managers decide on *contextual ambidexterity* solutions, which forces managers and also their subordinates to deal with compound dualities, which, in order to obtain the synergy benefits, cannot be divided in space or time but have to be realized in chorus. The challenge is thus not to move from one configuration to another but to sustain numerous competencies instantaneously (Gilbert, 2006). This brings the focus on individual ambidexterity (i.e., contextual ambidexterity at the individual level), which obliges handling parallel mental activities, in other words, the development of paradoxical cognition. The



managerial cognition literature suggests developing a paradoxical cognition for holding exploration and exploration activities as mutually reinforcing and thereby succeeding in contextual ambidexterity. In paradox literature, Lewis (2000) outlined strategies for managing a paradox (acceptance, confrontation, and transcendence) that together serve as the means to proactively address tensions (Smith and Lewis, 2014; see also Gaim and Wåhlin, 2016; Jarzabkowski and Lê, 2016). *Acceptance* involves “learning to live with the paradox” (Lewis, 2000, p. 764; Poole and Van de Ven, 1989, p. 566); *confronting* the tensions means to socially discuss them to construct a more accommodating understanding (Lewis, 2000). *Transcendence* is the ability to think paradoxically and engage in a range of diverse activities, roles, and learning (Mom et al., 2009; O’Reilly and Tushman, 2004; Raisch et al., 2009; Smith, 2014; Smith and Tushman, 2005). McKenzie et al. (2009) referred to transcendence as a nonconventional mental capacity allows to recognize and hold contradictions until something triggers to transcend the tensions. Illustrating a transcendence approach, Eisenhardt and Westcott (1988) described how adopting a paradoxical frame (instead of concentrating on one side of the pole) empowered Toyota’s senior leaders to create a new strategic practice, the “just in time” process, by contrasting goals of carrying no inventory while maintaining the access to any component that may be needed at the right time. However, as valuable as it sounds, transcendence is a stressful mental activity, which calls for the capacity to step back and the eagle-eye perspective on the conflicting alternatives, and embrace all options (McKenzie et al., 2009).

To summarize, Table 1 depicts a pragmatic framework for managerial framing of dualities and the resulting ambidexterity types, the related mechanisms in the paradox literature, as well as cognitive requirements and solutions. Here, we parallel spatial and temporal ambidexterity with managerial ‘dilemma framing’, where the decision alternatives are seen as incompatible in the same spatial or temporal context. In this case, a manager perceives the duality as a tradeoff (either-or) and seeks structural solutions, or temporal solutions when the poles of duality benefit from or require such a rotation. For contextual ambidexterity, the managerial framing of the duality is perceived as paradoxical, and they choose contextual solutions to arrange the tasks simultaneously in the order to benefit from synergies. The other columns in the table summarize the cognitive requirements for managers for each ambidexterity mode, as well as the role of ‘cognitive ambidexterity’ –related managerial abilities and activities.

**Table 1.** Links among the paradox, ambidexterity, and managerial cognition literature streams

<b>Ambidexterity literature</b>	<b>Managerial framing of duality</b>	<b>Mechanisms in paradox literature</b>	<b>Cognitive requirements</b>	<b>Role of cognitive ambidexterity</b>
<b>Spatial ambidexterity</b> (Dual structures)	Dilemma (Either-or)  Duality as two ends of a continuum	Differentiate structurally  Resolve A and B by arranging them at different spatial locations	Top management team as the “corporate glue” governing exploration and exploitation operated by different units/persons  Organizing for high specialization of individuals in the organization	Identification of dualities in the organization  Recognizing the incompatible nature of the duality  Comprehension of the big picture; which dualities to separate
<b>Temporal ambidexterity</b> (Punctuated equilibrium or Structure-building and structure-changing periods)	Dilemma (Either-or)  Duality as two ends of a continuum	Differentiate temporally  Situate A and B at different temporal locations	Compartmentalization of opposites and vacillation between poles of the duality focusing on one at the time	Identification of opposites  Recognizing the incompatible nature of the duality that benefits from rotation  Understanding the endo- and exogenous triggers for such rotation
<b>Contextual ambidexterity / Individual ambidexterity</b>	Paradox (Both-and)  Duality as orthogonal dimensions	Acceptance and Confrontation  Accept the paradox of A and B and learn to live with it by socially discussing it  Transcendence Find a new perspective which eliminates the opposition between A and B	Coping with cognitive complexity and acceptance of competing cognitive agenda  Out-of-box mindset Ability to play multiple roles	Development of paradoxical cognition to allow duality-mindset  Connecting dispersed ideas to overcome “doing two things at the same time” to “do better things”

## 5. Discussion and implications

In this chapter, we have discussed the cognitive dimension of organizational ambidexterity, and furthermore, cognitive ambidexterity as managerial microfoundations of organizational ambidexterity. In doing so, we contribute to the persisting gap in the literature: How are the various modes of ambidexterity selected, and how to organize those in an optimal way? This

issue was pinpointed by Simsek (2009), who noted that research on ambidexterity typically uses only one theoretical lens to illustrate it, such as dual structures of spatial ambidexterity or organizational context for contextual ambidexterity. However, in reality several ambidexterity modes are employed simultaneously at different levels of an organization (see also Birkinshaw and Gupta, 2013), and for this reason we need to better understand the foundations of the decision making processes to better grasp the complexity of ambidextrous solutions in organizations. We contribute to this discussion by putting forward an underlying dimension of organizational ambidexterity—cognitive ambidexterity, as a managerial condition for organizing ambidextrous behavior. By integrating theoretical insights from the ambidexterity, dualities, and managerial cognition literatures, we shed light on the cognitive microfoundations of how managers frame their ambidexterity decisions. In the following, we discuss implications for the organizational ambidexterity literature, as well more broadly to strategic renewal literature.

### *5.1 Cognitive dimension in the organizational ambidexterity framework*

We suggested that management cognition plays an important role across the different ambidexterity modes (see Figure 1 and Table 1). The selection of the right ambidexterity mode itself has roots in the discussion on whether exploration and exploitation (and other dualities) are fundamentally compatible or incompatible activities in particular decision-making scenarios. The nature (compatibleness or incompatibleness) of the two alternatives of a duality is assessed through the managerial framing process, which produces an inquiry for either dilemma solutions (separation temporarily or spatially) or paradoxical thinking (contextual ambidexterity). This is rooted in managerial cognitive processes, through which managers formulate their personal perception of the decision at hand based on their personal beliefs and attitudes. In addition, personal emotions (e.g. Hodgkinson and Healey, 2011) play a role in the managerial framing process. It may be that managers, therefore, are likely to separate exploration and exploitation not only because they are actually incompatible but also because they are perceived and framed as incompatible.

Previous research suggests that implementing paradoxical solutions increases the cognitive complexity, but on the other hand warns about the harmful effects of cognitive simplicity in a complex, fast changing world (Levy et al., 2007). In this regard, ambidexterity and paradox scholars are increasingly advocating for synergetic and higher-order managerial thinking, and

thus a reduced use of structural or temporal separation of exploitation and exploration (e.g. Aubry and Lièvre, 2010; Gebert et al., 2010; Smith and Lewis, 2014).

Implementing contextually ambidextrous solutions is a cognitively complex endeavor. This requires managerial abilities to reformulate problems, tolerate ambiguity, and consider additional alternative perspectives. In order to deal with such issues, managers tend to search for more widespread and new information, spend more time interpreting it, detect deeper dimensions, and simultaneously obtain myriad competing but also complementary elucidations of their observations (Levy et al., 2007). Adopting transcendence-type of solutions requires even more complex thinking. In this regard, Gavetti (2012) noted that some managers are well-equipped to establish associations (i.e. analogs) between knowledge structures in different contexts, which allows them to access and utilize cognitively distant, yet greater business opportunities. Further, when there are changes in the source context, the managerial capacity to utilize this and build analogies to different target contexts improves in the long run (Gary et al., 2012). Through employment of cognitive frames that accept the contradictions, the managers and management teams can strive for more complex strategic actions, such as supporting the development of new competencies, as well as deepening existing ones (Mihalache et al., 2014). Thus, if skillfully applied, contextual ambidexterity could be good solution for resolving key strategic dualities and paradoxes.

However, some scholars have discovered that it is a tenuous process to hold the opposites together, and the endeavor reverts favoring one pole over the other (Langley and Sloan, 2011; Putnam et al., 2016). In this light, notable is that “wearing two hats at the same time” (Gibson and Birkinshaw, 2004) can be expected to cause a major cognitive burden. Therefore, managers are advised not to target paradoxical solutions without careful consideration. Rather, it might be reasonable to also aim at simplicity rather than complexity and specialization especially when the structural solutions are feasible in facilitating the co-existence of the dualities in the organization to guarantee that exploration actions can be carried out. Thus, we advocate a more pragmatic contingency approach where best fitted organizational ambidexterity solutions are a result of the individual context, which refers to the decision-makers personal cognitive abilities as well as the organizational context regarding a particular duality.

### *5.2 Cognitive ambidexterity and strategic renewal*

The contradictions and tensions managers face during decision-making processes are manifold. They are not only an unintended outcome of managerial decisions but can also result from the market and stakeholder demands. While some scholars have suggested that organizations get increasingly rigid as they age and grow, others have demonstrated that longstanding firms can retain their competitive edge through strategic renewal (Lewin and Volberda, 1999; Schmitt et al., 2016).

Mental and cognitive models are present in any renewal process, becoming even more significant in the situation when individuals are required to simultaneously cope with contradictory demands. Indeed, organizational ambidexterity solutions – structural, temporal, contextual or individual – cannot fully facilitate the strategic renewal if the members of the organization are not mentally and cognitively engaged in the change process. Furthermore, especially when the ambidexterity solutions are contextual and require individual and team level engagement of both sides of the duality such as exploration and exploitation, the demands for cognitive processing and judgment increase. Therefore, we call for further research focusing on the role cognition in the strategic renewal process.

### *5.3. Managerial implications*

Managerial decision-making becomes more complex due to ever-rising demands of different internal and external stakeholders. This chapter sheds light on the interface of organizational ambidexterity, strategic dualities and managerial cognition, which together help practitioners to better understand why dualities should be acknowledged, the potential situations where dualities emerge, and how the perception of these dualities affects their resolution. This chapter promotes a pragmatic contingency approach where organizational ambidexterity solutions – spatial, temporal, and contextual – should be chosen based using a thoughtful managerial framing process. Some renewal demands might be best solved via strict trade-offs where different processes are separated and leave the problem-solving to specialized experts, while sometimes behavioral adjustments and contextually flexible arrangements help to react quickly to various impulses and to reap synergies. Nevertheless, we expect that managers could do better choices over ambidextrous solutions, if they critically reflect the cognitive demands, challenges and opportunities of those solutions.

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