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THE PARADOXICAL MIND AND BODY: PHYSIOLOGICAL AND NEUROLOGICAL RESPONSES TO ORGANIZATIONAL PARADOXES

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NANYANG BUSINESS SCHOOL

2019

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Doctor of Philosophy

2019

Statement of Originality

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WEN CHEN

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Table of Contents

List of Tables

List of Figures

Appendices

Summary

Our experiences in organizations are fundamentally paradoxical. Organizational paradox theorists advocate that individuals' experience with paradoxes depend on whether they are comfortable with paradoxes and whether they embrace paradoxes. However, while paradox theorists allude to distinct emotional and cognitive components of individuals' subjective experience with paradox, it remains inconclusive of *how* the distinct aspects of an individual's mindset shape their experience. By directly investigating individuals' physiological and neurological responses to paradox, I open up the emotional and cognitive black boxes. I empirically reveal how individuals' paradox mindset (i.e., a disposition towards embracing and feeling comfortable with paradoxes) alleviates individuals' physiological arousal yet promotes their cognitive engagement in a creative production setting. In my first study, I employed a skin-conductance method to record individuals' physiological arousal they exhibited when they were instructed to fulfill competing demands in design tasks. In study 2, I employed an eye-tracking method to record individuals' visual attention as a proxy of their cognitive engagement when fulfilling competing demands. Finally, in study 3, I built insights from the laboratory studies to explore how entrepreneurial architects were able to excel in completing competing demands by being more comfortable with and more engaged in the paradoxes of their daily work. By revealing how the brain and the body responds to paradoxes in the laboratory and then corroborating the laboratory findings in the field, my thesis findings suggest that the mindset that enables individuals to respond to

paradoxes requires both arousal-reducing emotional comforting and high cognitive engagement, and thus is, in itself, paradoxical.

Chapter 1. Introduction

Our experiences in organizations are fundamentally paradoxical, as actors across organizations confront multiple contradictory, yet interrelated, demands, values, and interests that occur simultaneously and persist over time (Smith & Lewis, 2011). For example, managers must often simultaneously consider how to maintain control over their subordinates while enabling them to work flexibly and autonomously (Zhang, Waldman, Han, & Li, 2015), and how to collaborate with other units while remaining competitive (Tsai, 2002). Organizational paradox theory has emerged as a way to address how organizational members experience, and respond to, paradoxes (see Schad, Lewis, Raisch, & Smith, 2016 for a review).

A central tenet of organizational paradox theory is that paradoxes are an inherent part of organizational systems and processes (Lewis, 2000; Smith & Lewis, 2011), yet individuals' subjective experiences of paradoxes depend on how they respond to them, both emotionally and cognitively (Schad et al., 2016). Without a clear right or wrong answers to the contradictory demands, and with no apparent resolution available, paradoxes can paralyze decision-making (Smith & Berg, 1987) and trigger negative emotions, such as tension and anxiety (e.g., Smith & Berg, 1987; Vince & Broussine, 1996). To respond to a cognitive and emotional experience, individuals employ defensive mechanisms that allow them to avoid or alleviate their negative emotions, including ignoring the emotions, projecting the emotions onto scapegoats, or finding compromises between contradictory demands that do not entirely satisfy either demand (e.g.,

Lewis, 2000; Smith & Berg, 1987; Vince & Broussine, 1996). Such defensive responses provide short-term relief and the protection of the self-ego (Vince & Broussine, 1996); however, as paradoxes are not generally short-lived, the use of defensive mechanisms can lead to vicious cycles, with efforts to repress the paradoxes triggering further tension (Lüscher & Lewis, 2008).

At the same time, organizational paradox theorists have also posited that individuals have agency in responding to paradoxes, suggesting that individuals who accept, value, and embrace paradoxes can turn vicious cycles into virtual ones (e.g., Bartunek, 1988; Smith & Lewis, 2011; Sundaramurthy & Lewis, 2003). Underlying this assertion is that individuals vary in both their emotional and cognitive experiences with paradoxes. They contend that individuals who are comfortable with, and embrace, paradoxes (i.e., a high paradox mindset) are less likely to suffer from an increase in anxiety and stress or a paralysis of decision-making when experiencing a paradox. The notion that individuals can vary in their responses to paradoxes has been supported empirically by both qualitative and quantitative research. For example, previous research has found that managers who are comfortable when faced with paradoxes are more effective at managing the tensions between exploration and exploitation at the organizational level (Smith, 2014). Meanwhile, individuals in organizations who have high paradox mindsets (i.e., who are comfortable with, and can embrace, contradictions) have also been found to be more creative, innovative, and high-performing than their low-paradox-mindset counterparts when working under conditions where paradoxes are salient (Miron-Spektor, Ingram, Keller, Smith, & Lewis, 2018).

Because a high paradox mindset involves being comfortable with, and embracing, paradoxes, individual differences in paradox mindset are quintessentially about differences in emotion and cognition. The emotion literature has suggested comfort as a pleasant and deactivated (low arousal) emotion (Grandey, 2008). 'Being comfortable with paradoxes' is therefore a dispositional characteristic that describes a pleasant and low arousal emotional trait exhibited by individuals when they experience different paradoxes. 'Embracing paradoxes', on the other hand, implies an active cognitive style to approaching paradoxes. It is not only about learning to live with paradox (i.e., acceptance), but also about a general tendency to positively and proactively engage with the opposing poles of paradoxes.

While previous research has determined that differences in approaches to emotion and cognition around paradoxes suggest that individuals can vary in their cognitive and emotional experiences when confronted with paradoxes, no studies have examined the variance in individuals' experiences directly. Instead, related studies have relied on either post-hoc or self-reported qualitative accounts of such experiences (e.g., Vince & Broussine, 1996) or on post-hoc self-reported questionnaires (e.g., Keller, Chen, & Leung, 2018; Keller, Loewenstein, & Yan, 2017), which rely on the participants' subjective interpretations of their own emotional processes and experiences. Individuals often fail to consistently and correctly recognize their own emotions (Robinson & Clore, 2002) and cognitions (Healey, Hodgkinson, & Massaro, 2018), or acknowledge the impact of their emotions and cognitions on their own decision-making processes (Dane & Pratt, 2007). A reliance on post-hoc accounts leaves open critical questions about

how and why individuals vary in their cognitive and emotional experiences with paradoxes.

One critical question pertains to how individuals vary in their emotional experiences with paradoxes. Cognitive resources––defined as attentional, working memory––are limited, as one's brain has only a finite capacity to process information (Norman & Bobrow, 1975). Too much cognitive engagement is therefore likely to induce stress. This suggests that the stress that individuals experience when facing paradoxes is a result of having to cognitively engage in those paradoxes. Cognitive neuroscientists, however, have found that stress can actually precede active cognitive processes (Baumeister, Vohs, Nathan DeWall, & Zhang, 2007). The anxiety itself can then drain cognitive resources (e.g., Eysenck & Calvo, 1992), further dampening an individual's capacity to cognitively engage in the paradox. This suggests that the stress that individuals experience from being confronted with paradoxes may, in fact, be the body's anticipation of difficulty in managing contradictory demands. At the same time, cognition can also be used as a way of coping with stress (Marroquín, Fontes, Scilletta, & Miranda, 2010), as individuals have the capacity to regulate their emotions before potentially stressful events arise (Parkinson & Totterdell, 1999). Therefore, while previous research has found that individuals with a high paradox mindset are more likely than others to be comfortable with paradoxes, it is difficult to decipher whether they experience the same amount of stress, but manage the stress differently (e.g., using the stress as a motivator for improving outcomes), or if they experience less stress than low-paradox-mindset individuals before they even need to engage with a paradox.

Exacerbating this issue is the question of how individuals vary in their cognitive engagement with paradoxes. Individuals high in cognitive engagement participate in central and elaborate information processing, whereas those low in cognitive engagement are involved in peripheral and less elaborate processing (Cacioppo & Petty, 1982). Qualitative accounts of individuals' experiences with paradoxes are typically referred to as paralyzing (Amason, 1996; Smith & Berg, 1987). Paralysis, however, can hypothetically involve either high or low levels of cognitive engagement. Individuals can either experience an endless loop of cognitive engagement with contradictory demands, or can engage immediately. Individuals with high paradox mindsets may thus be able to reduce the effects of paralysis by cognitively engaging with paradoxes to a greater or lesser degree. Evidence of the effects of individuals experiencing paradoxes, under laboratory conditions, is inconclusive. Some studies have found that priming individuals to think about paradoxes can increase the complexity of their work output (e.g., Miron-Spektor, Gino, & Argote, 2011), which points to an increase in cognitive engagement. Others have found that individuals who are more aware of contradictions are immediately more likely to refrain from acting (Keller et al., 2017), suggesting a decrease in cognitive engagement. Without directly examining how individuals cognitively engage with paradoxes, it is difficult to determine how varying dispositions towards paradoxes can lead to various outcomes.

To understand how individuals vary in their cognitive and emotional experiences with paradoxes, we have to disentangle the cognitive and emotional components of their experiences and examine the two as distinct, but related, concepts. I achieved this in this study by directly investigating individuals'

physiological and neurological responses towards competing demands, followed by investigating entrepreneurial architects in the field as a means of corroborating my laboratory findings. In my first study, I employed a skin-conductance method to record the physiological arousal individuals exhibited when they were instructed to meet competing demands. I examined whether their paradox mindsets were associated with higher or lower arousal. My findings suggest that a high paradox mindset enables individuals to experience lower instant arousal than their low-paradox-mindset counterparts when exposed to paradoxical demands. In my second study, using the same laboratory design materials, I examined whether the paradox mindsets of the individuals were associated with higher or lower levels of cognitive engagement when faced with competing demands. The findings suggest that a high paradox mindset is associated with high cognitive engagement with competing demands. I then followed up with a field investigation, triangulating the insights from different methodologies and sources to improve external validity and generalizability (Jick, 1979). In this field study, I explored how entrepreneurial architects experience paradoxes in their creative production process, and how their emotional and cognitive accounts relate to their design performance, as assessed by the public. By combining archival accounts, personal interviews, and a rating survey by public participants on architectural design, I found that those architects who displayed comfortable rather than energized feelings during their creative production process, and who were more engaged with opposing demands, were also the ones whose designs were rated as better satisfying the opposing demands and being more creative. Taken together, I was able to deduce that stress-reducing emotional comforting and, paradoxically, high cognitive

engagement are the mechanisms that connect a high paradox mindset to the successful management of competing demands.

Across these three studies, I found that the paradox mindset impacts individuals' experiences with paradoxes through two pathways––physiological (via reduced arousal) and cognitive (via increased engagement). This work contributes to the literature in several ways. First, it contributes to the study of emotion and cognition (e.g. Ashforth & Reingen, 2014; Jarrett & Vince, 2017) related to individuals' experiences with paradoxes. Emotion and cognition are central components of organizational paradox theory (e.g., Schad et al., 2016); however, their theoretical sophistication and empirical investigation are both in their infancy. It is imperative to separate the pathways of emotion and cognition because the approaches to facing competing demands involve comforting or energizing effects that can produce different downstream impacts on individuals' behavior (e.g., Gilboa, Shirom, Fried, & Cooper, 2008; Halbesleben & Bowler, 2007; Sullivan & Bhagat, 1992) and welfare (e.g., Kim & Stoner, 2008; Lomranz & Benyamini, 2016; Pugliesi, 1999).

Second, building on the burgeoning literature on individual approaches to paradox (Bartunek, 1988; Miron-Spektor et al., 2018; Smith & Berg, 1987), this work also contributes to explaining the mechanism underlying the role of paradox mindset in dealing with competing demands. Previous literature tends to focus on how paradox mindset reduces tensions without differentiating the sources of the tensions: "Are tensions that underlie paradox inherent in organizational systems, or are they socially constructed?" (Smith & Lewis, 2011: 382). This materialization view argues that the tensions are embedded in the material conditions, such as organizations and their subunits (Smith & Berg,

1987). These material conditions are inherently contradictory because they are part of a complex human system full of ambiguity and equivocality. Tensions arise from contradictions between in-groups versus out-groups, individuals versus collectives, and self versus others. The latter representation––or constructivist view––argues that actors construct the situations, and that the paradox is a cognitively-created product (El-Sawad, Arnold, & Cohen, 2004; Luscher, Lewis, & Ingram, 2006). For example, Luscher et al. (2006) found that how middle managers at Lego worked towards addressing paradoxes (i.e., competing goals and strategies) depended on how they constructed and reframed their roles, expectations, and demands in response. Therefore, the question of how the paradox mindset facilitates the experience requires accurate information on the nature of tensions, and on the separation of underlying tensions that are triggered by situations and salient tensions that are constructed by the actors themselves. By examining the neurological and physiological aspects associated with the paradox mindset, the findings provide an account about how individuals concurrently display their physiological arousal and their engagement whilst experiencing paradoxical demands.

Third, this work contributes, more broadly, to the study of the biology of organizational behavior. As Nofal, Nicolaou, Symeonidou, and Shane (2018) pointed out, the field of management lacks a systematic understanding of how physiology, neuroscience, and genetics influence management. By tackling the role of biology in shaping individuals' reactions to competing demands, this work incorporates biology as a fundamental aspect of organizational behavior that encompasses multiple issues and contexts. It also expands the application of

paradox theory as a meta-theory (Schad, Lewis, & Smith, 2019), extending the boundaries of the paradox approach to encompass both the mind and the body.

Last, but not least, this work also contributes to the study of paradoxes associated with the creative production process (e.g., Bourdieu, 1993; Eikhof & Haunschild, 2007; Godart, Maddux, Shipilov, & Galinsky, 2015; Khaire & Hall, 2016). The creative production process is critical in ensuring continuous innovation for firms to maintain their competitiveness. By demonstrating that individuals who are emotionally less aroused while being cognitively more engaged with the demands involved in production, this work enhances our understanding of why some creative producers are better able to produce both creatively- and commercially-viable products.

This dissertation is structured as follows. In the next chapter, I present a review on the literature on individuals' experiences with competing demands. Specifically, I first review how the production process is fulfilled through consistent, competing demands. I then introduce how the existing literature has developed an understanding of the role of individuals' approaches. Finally, I examine the cognitive and emotional perspectives.

In Chapter 3, I outline the hypotheses I developed concerning the relations between paradox mindset and creative output through arousal and cognitive engagement. Following that, I provide an introduction to the empirical setting (Chapter 4), then an overview of the methodology (Chapter 5), in which I explain how and why I chose a mixed-method design, involving a field investigation and two experiments. In the following three chapters, I provide the details of each study, including their design, the procedures involved, methodology details, analysis results, and a summary with a brief discussion.

In the final chapter, I discuss the overall findings, theoretical and practical implications, limitations, and also the potential for future work inspired by this study.

Chapter 2. Literature review

2.1 Competing demands in our work lives

Our experiences in an organizational setting are fundamentally paradoxical, as individuals in different levels within the organization often face contradictory yet interrelated demands that occur simultaneously and persist over time (Smith & Lewis, 2011). Senior managers must often decide how to develop systems and structures that enable exploration while ensuring the exploitation of existing capabilities (Andriopoulos & Lewis, 2009; Smith, 2014), supervisors must often decide how to maintain control over employees while also enabling their employees to work autonomously (Zhang et al., 2015), colleagues must often decide how to compete for best performance while cooperating on shared tasks (Keller et al., 2017), workers must often decide how to produce novel products while ensuring that their products are useful (Miron-Spektor et al., 2011), and individuals throughout the organization must often decide how to fulfill their roles at work while satisfying their needs outside of work (Wieland, 2011).

Schad et al. (2016: 6) defined organizational paradox as a "persistent contradiction between interdependent elements". The definition points to three key components: persistence, contradiction, and interdependence (Lewis, 2000; Schad et al., 2016; Smith & Lewis, 2011). As the core of paradoxes, contradiction depicts the competition raised from opposing demands. Earlier scholars, such as Cameron and Quinn (1988), argued that paradoxes centers in the contradictory and even mutually exclusive elements. Later, Lewis (2000: 760) further specified that the contradictory demands "seem logical in isolation but absurd and irrational when appearing simultaneously". Interdependence highlights the

interrelatedness between the contradictory demands (Smith & Lewis, 2011). While contradiction emphasizes the pulling-apart forces of the opposing elements, interdependence emphasizes the pushing and bounding forces. Persistence, as a characteristic of time, implies that a paradox does not vanish shortly but persist over time (Smith & Lewis, 2011). Schad et al. (2016) further pointed out that the persistence nature is a result of the constant push-and-pull dynamic between the competing demands, such that any attempt to escape from the paradox signifies the tensions.

Paradoxes invokes tensions, but one fundamental debate in organizational paradox theory lies in the sources of tensions: "In many respects the tension between materialization and representation is the central issue." (Clegg, 2002: 1), "Are tensions that underlie paradox inherent in organizational systems, or are they socially constructed?" (Smith & Lewis, 2011: 382). The former materialization view argues that the tensions are embedded in the material conditions, such as organizations and subunits (Smith & Berg, 1987). These material conditions are inherently contradictory because they are part of a complex human system full of ambiguity and equivocality. Tensions arise from contradictions between in-groups versus out-groups, individuals versus collectives, and self versus others. The latter representation or constructivist view, on the other hand, argues that actors construct the situations and the paradox is a cognitively created product (El-Sawad et al., 2004; Luscher et al., 2006). For example, Luscher et al. (2006) found that working towards the performing paradoxes (i.e., competing goals and strategies) among the middle-managers at Lego Company depended on how the middle-managers constructed and reframed their roles, expectations, and demands. A third integrative

approach, on the other hand, denotes that paradoxes are both inherent in the material system and socially constructed (Smith & Lewis, 2011). In this approach, paradoxes arise from opposing demands in the environment, but the latency turns into salience only when individuals subjectively recognize the contradictions and experience the tension raised by the contradictions through their cognition and/or rhetoric. For example, the paradox of competition-and-cooperation is available and persistent in all systems, but an employee can only experience the competition-and-cooperation paradox when their work condition triggers the need to simultaneously engage in competition and cooperation; also, this employee can only perceive the paradoxical tension when they recognize that they need to juxtapose and address the competing yet interrelated needs to compete and cooperate with other employees at the same time (Keller et al., 2017).

In this dissertation, I follow this third integrative approach and contend that the paradoxes are embedded in our complex system, and individuals only experience and exhibit bodily responses when they cognitively interact with the paradoxes. Centering in individuals' subjective experience with paradoxes is how they emotionally and cognitively approach to the tensions. In the following sessions, I will walk through the theory development of the focused construct of this dissertation, paradox mindset, followed by the emotional roots and cognitive roots respectively.

2.2 Paradox mindset

Although paradox mindset is the major focus of this dissertation, revisiting the development of paradox mindset requires first revisiting how prior

research develops understanding of individuals' response to organizational paradoxes. Earlier foundational work drawing on Freudian psychology posit that experiencing paradoxes triggers tensions and anxiety (e.g., Smith & Berg, 1987; Vince & Broussine, 1996), which can lead individuals to employ defense mechanisms to avoid or alleviate the tension and anxiety (e.g., Lewis, 2000; Smith & Berg, 1987; Vince & Broussine, 1996). These defense mechanisms, which include ignoring the tensions, projecting the tensions onto scapegoats, or finding compromises between contradictory demands that do not completely satisfy either demand, can lead to vicious cycles that paralyze decision-making, as tensions persist despite efforts to repress them (Lewis, 2000; Lüscher & Lewis, 2008; Smith & Berg, 1987; Vince & Broussine, 1996).

Alternatively, organizational paradox theorists have increasingly recognized that individuals "need to recognize, become comfortable with, and even profit from tensions and the anxieties they provoke…" (Lewis, 2000: 764) in order to excel in addressing polarities. Scholars have used different terms to qualitatively or quantitatively reveal how such a dispositional proclivity towards paradoxes provides a positive benefit to individuals' work outcomes. For example, in a set of laboratory studies, Miron-Spektor et al. (2011) found that individuals who are experimentally primed to adopt a paradoxical frame exhibit more creativity. Moreover, they found that the increased creativity is because the opposing task demands evoke a sense of conflict, which further improves individuals' ability to integrate the opposing elements.

The explicit reference to a paradox mindset emerged from a recent study by Miron-Spektor et al. (2018), which suggests that *accepting*, *being comfortable with*, and *embracing* competing demands (i.e. a high paradox mindset) is pivotal

to better in-role job performance and higher creativity. They contend that individuals who are high in paradox mindset have a natural propensity to recognize the interrelatedness of the contradictory elements of a paradoxical situation. Because they have a tendency to frame paradoxical situations from a "both/and" perspective (Lewis, 2000), individuals high in paradox mindset are able to integrate contradictory demands. As a result, individuals who are high in paradox mindset, when faced with conditions with heightened paradoxical demands (e.g., resource scarcity), are more creative, more innovative, and higher performing (Miron-Spektor et al., 2018).

Because a paradox mindset involves both embracing tensions and feeling comfortable with tensions, variance in individuals' paradox mindset is likely to influence individuals' general approach to manage both the cognitive and emotional effects of tensions. Whereas individuals low on paradox mindset should be more likely to view tensions as emotionally draining, those high on paradox mindset should be more likely to tolerate the cognitive and emotional impacts of tensions.

In fact, the construct definition of paradox mindset is both emotional and cognitive. Acceptance and embracement are both cognitive components. Acceptance refers to recognition of the opposing demands and resulting tensions. Without accepting that interdependent demands can compete and coexist at the same time, an individual fails to recognize the demands as paradoxical. Scholars argue that individuals can gain energy by accepting and valuing the tensions spurred from contradictions, increase well-being and satisfaction (Lomranz & Benyamini, 2016). Embracement, on the other hand, suggests a proactive engagement with the polarities. By accepting and embracing the interdependent

yet contradictory poles at the same time, organizational actors are adopting a both-and approach to achieve the competing demands through a forced merger of opposing polarities (Miron-Spektor & Beenen, 2015; Miron-Spektor et al., 2018; Zhang et al., 2015).

"Being comfortable with" refers to both an emotional state that individuals experience when under competing demands, and an attitudinal tendency to feel positively with competing demands rather than anxiety. Comfort emerges as an important characteristic in responding to paradoxes in other studies. For example, Zhang et al. (2015) found that leaders who are able to exhibit comfort to paradoxical demands promote higher proactivity, adaptability, and proficiency in their subordinates. Resonating with earlier paradox literature (e.g., Bartunek, 1988; Smith & Lewis, 2011; Sundaramurthy & Lewis, 2003), paradox mindset as a theoretically integrated and empirically validated construct showed that individuals with a high paradox mindset could both manage the stress and embrace paradoxes (Miron-Spektor et al., 2018).

Compounding this issue is ambiguity on emotions in prior paradox literature, which often referred to seemingly related but, in fact, distinct emotional constructs. For example, in the classic theoretical paper on Paradox Theory by Smith and Lewis (2011), individuals' positive response to paradox also uses terms such as as "excitement" and "energized", which suggests a positive arousal that is different from comfort as a positive low-arousal emotion. In fact three out of nine-items of Miron-Spektor and colleagues (2018) paradox mindset measure directly refer to energizing and uplifting feelings, including "Tension between ideas energize me", "I feel uplifted when I realize that two opposites can be true", and "I feel energized when I manage to address contradictory issues", which are

in contrast to statements about comfort, such as "I am comfortable working on tasks that contradict each other". As the emotions literature in psychology and organizational behavior both demonstrate, comfort and excitement are distinct emotions that impact cognitive processes and behavioral outcomes differently. Excitement as a positive active emotion is found to be beneficial to job satisfaction rather than performance (Thoresen, Kaplan, Barsky, Warren, & de Chermont, 2003). For example, Todorova, Bear, and Weingart (2014) showed in an investigation of employees in a health care company that mild task conflict among group members is likely to increase the information acquisition in the team and thus energizes the team members to achieve a higher job satisfaction. In the situation of paradoxes, competing demands that individuals have to handle do not vanish but persist over time, excitement as an active emotion might deplete cognitive resources thus that dampens individuals' capability to pursue both polarities at the same time.

2.3 Emotional responses to organizational paradoxes

One key way to address the question of emotions in paradox theory is to avoid an implicit assumption that individuals' emotional experience falls on a bipolar continuum. Research on general affect has suggested that rather than looking at emotions as two parts of a pole- either positive or negative feelings--emotion is a multidimensional construct, with two distinct dimensions (Elfenbein, 2007). Valence or hedonic tone (pleasant vs. unpleasant) is one dimension and intensity of activation (activation vs. deactivation) is the other (Feldman Barrett & Russell, 1998). The prior paradox literature has often claimed that the effective management of competing demands is associated with

generally positive emotional experiences (Miron-Spektor et al., 2018). This includes references to both "energizing" (e.g., Todorova, Bear, & Weingart, 2014) and "comfort" (e.g., Huy, 1999) in emotions. However, as prior literature in both psychology (Blanchette & Richards, 2010; Chorpita & Barlow, 1998) and organizational behavior (Elfenbein, 2007; Johnson et al., 2005) has found, positive emotions that are activated or high-aroused (i.e., energizing) and deactivated or low-aroused (e.g., comfort) have radically different behavioral effects (e.g., Todorova et al., 2014). Taking excitement and energizing as an example, the activation is found to be beneficial to job satisfaction rather than performance (Thoresen et al., 2003). In an investigation of employees in a health care company, Todorova et al. (2014) showed that mild task conflict among group members is likely to increase the information acquisition in the team and thus energizes the team members to achieve a higher job satisfaction.

Other work on paradoxes has adopted a psycho-analytic approach that suggests that emotions are the source of paradoxical tensions (e.g., Jarrett & Vince, 2017; Vince & Broussine, 1996), as tensions arise from contradictions between an individual's rationality and hidden feelings. However, while emotions are central to the work, the empirical evidence is limited to qualitative accounts of the individuals' experience. However, individuals often fail to consistently and correctly recognize their own emotions (Robinson & Clore, 2002) or recognize the impact of emotions on their own decision-making process (Dane & Pratt, 2007), Since affect can be both a trait (a general tendency to experience particular emotions) and state (a situated experience at a particular point in time) (Watson, 2000), it is difficult to assess how the emotions contribute to the experience based on an individual's judgment that is

shaped by both temporal and dispositional factors. Without an accurate understanding of the activation intensity of individuals' embodied emotional experience, it is difficult to understand the central role of emotions in shaping individuals' reactions to paradoxes, and how paradox mindset facilitates its role.

2.4 Cognitive engagement of organizational paradoxes

Another key aspect of individuals' response to paradoxes is active engagement with paradoxes, as the definition of organizational paradox implies the need of *simultaneous engagement* of competing demands (Smith & Lewis, 2011).

Prior research in organizational paradox theory treats engagement as both cognitive and behavioral, and the conflation of the two can limit our understanding of the individual's response. For example, prior literature often refers to defensive or active responses as two different types of responses to paradoxes (e.g., Jarzabkowski & Le, 2017). Individuals use defense mechanisms to avoid or alleviate tensions (e.g., Smith & Berg, 1987; Vince & Broussine, 1996). Defense mechanisms refer to "any policy or action that prevents someone (or some system) from experiencing embarrassment or threat, and simultaneously prevents anyone from correcting the causes of the embarrassment or threat" (Argyris, 1993: 40). Paradox theorists argue that defense mechanisms, which include ignoring the tensions, projecting the tensions onto scapegoats, or finding compromises between contradictory demands that do not completely satisfy either demand, lead to vicious cycles that paralyze decision-making, as tensions persist despite efforts to repress them (Lewis, 2000; Lüscher & Lewis, 2008; Smith & Berg, 1987; Vince & Broussine, 1996). On the contrary, paradox

theorists also posit that individuals might exhibit active responses, such as acceptance and transcendence (Lewis, 2000; Smith & Lewis, 2011). By accepting the tensions, individuals thrive on finding a balance among the competing demands (e.g., Sundaramurthy & Lewis, 2003); by confronting the tensions, individuals directly address the demands (e.g., Engeström & Sannino, 2011; Lüscher & Lewis, 2008); and by transcending, individuals seek a "higher level of abstraction" from the interdependency to create an overarching vision for the competing demands (e.g., Abdallah, Denis, & Langley, 2011; Andriopoulos & Lewis, 2009; Bednarek, Paroutis, & Sillince, 2017).

Our active response, however, is not a set of behaviors that are free of cognition. Engagement also involves cognitive engagement, which is specifically about the effort to purposefully process information (Kahn & Byosiere, 1992; Schaufeli, Salanova, González-Romá, & Bakker, 2002). Our efforts in responding to paradoxes (either defensive or active) therefore also include the way we process information when we see paradoxes. As found in cognition research, individuals high in cognitive engagement refers to those engage in central and elaborated information processing, whereas those low in cognitive engagement refers to those engage in peripheral and less elaborated processing (Cacioppo & Petty, 1982). A central idea in cognitive research is that cognitive resources, defined as attentional, working memory, and related "on-line" resources, are limited, as our brain has only a finite capacity to process information (Norman & Bobrow, 1975). During the processing process, the brain holds information as temporary buffers for attention and working memory to analyze and control (Broadbent, 2013; Franconeri, Alvarez, & Cavanagh, 2013; Norman & Bobrow,

1975). Therefore, cognitive engagement is exploitative to our cognitive resources, yet it is critical to process information.

When contradictory demands arise, individuals' cognitive engagement can be simultaneously low or high on both demands, or high on one pole but low on the opposing pole. While paradoxes naturally require high engagement on both poles, earlier scholars initially identified that individuals mostly exhibit low engagement on both poles or only high on one pole of a paradox when they respond defensively and experience paralysis of decision making (Smith & Berg, 1987). For example, Huy (2002) described managers who experienced anxiety and defensiveness in organizational change resulted in an inability to implement change.

On the other hand, some scholars contend that paradoxical relationships enable people to engage more with the demands (Smith & Tushman, 2005). cumulative evidence suggests that paradoxical thinking (Ingram, Lewis, Barton, & Gartner, 2016), paradoxical framing (Miron-Spektor et al., 2011), and paradox mindsets (Miron-Spektor et al, 2018) are associated with higher cognitive engagement in both poles. For example, individuals with a high paradox mindset "embrace paradoxes", which implies an active cognitive style to approaching paradoxes. In fact, Miron-Spektor et al. (2011) empirically found that priming people to think about paradoxical relationships created a sense of conflict, which improved creativity by enhancing individuals' ability to engage both poles.

Therefore, there is little consensus about whether paradoxes involve more or less engagement with each of the poles associated with contradictory demands. Although cognition is deeply rooted in the advancement of organizational paradox theory, we still know very little about how the actual

cognitive process happens when people respond to paradoxes. One possible reason could be that prior research tends to treat emotion and cognition as highly relevant and synchronizing constructs. In other words, individuals may just be responding to emotions through cognition and cognition through emotions. Indeed, emotion and cognition scholars posit that "Thinking and feelings are inextricably linked most of the time" (Ellsworth & Scherer, 2003: 572), emphasizing that the two function closely together. For example, conservation of resources theory (CRT) points to personal cognitive resources as supplementary resources that can reduce the impact of excessive demands on stress (Hobfoll, 1989; Hobfoll & Shirom, 2001), whereas emotions can be heuristic filters of information (Beck & Clark, 1997; Chaiken, 1980).

However, the perplex and inconsistent findings on emotion and cognition from prior literature could be attributed to the lack of disentanglement of the two. For example, whether paradox mindset plays its role by facilitating a reduction of latent tensions (negative arousal) or facilitating an increase of excitement (positive arousal), and at the same time allowing more active engagement or passive engagement with the task information, remains in question. It is imperative to separate the pathway of emotion and cognition, the latent tensions triggered by situations and the salient tensions constructed by the individuals as whether approaches to facing competing demands involves a "comforting" or "energizing" effects produces different downstream impact on individuals' behavior (e.g., Gilboa et al., 2008; Halbesleben & Bowler, 2007; Sullivan & Bhagat, 1992) and welfare (e.g., Kim & Stoner, 2008; Lomranz & Benyamini, 2016; Pugliesi, 1999).

I therefore separate the two and tackle them as distinct yet interrelated aspects of the paradox experience.

Chapter 3. Hypothesis development

3.1 Paradox mindset as an individual approach to competing demands

Organizational scholars have long theorized that individuals' approaches to paradoxes vary (see Schad et al., 2016 for a review). Systematic, quantitative assessments of how individuals vary in their approach to dealing with paradoxes have traditionally focused on domain-specific traits, such as paradoxical leadership style (Zhang et al., 2015), paradoxical self-concept (Spencer-Rodgers, Boucher, Mori, Wang, & Peng, 2009), and the paradoxical framing of cooperative and competitive behaviors (Keller et al., 2017). However, Miron-Spektor et al. (2018) proposed a domain-general concept, depicting that individuals with a high paradox mindset tend to be more comfortable in approaching competing demands. As a general tendency, paradox mindset denotes the propensity among some individuals to accept, value, and embrace tensions from competing demands, values, and roles (Miron-Spektor et al., 2018). Individuals who have high paradox mindsets have a natural propensity to recognize the interrelatedness of the contradictory elements of a paradoxical situation (Keller et al., 2017). Because they have a tendency to frame paradoxical situations from a 'both/and' perspective (Lewis, 2000), individuals with high paradox mindsets are able to integrate contradictory demands (Miron-Spektor et al., 2011). As a result, high-paradox-mindset individuals, when faced with situations involving heightened paradoxical demands (e.g., resource scarcity), are more creative, more innovative, and better performing (Miron-Spektor et al., 2018). Because the paradox mindset involves both embracing tensions and feeling comfortable

with tensions, variance in individuals' paradox mindsets is likely to influence their general approach to manage both the cognitive and emotional effects of tensions. Whereas low-paradox-mindset individuals should be more likely to view tensions as emotionally draining, those with high paradox mindsets should be more likely to tolerate the cognitive and emotional impacts of tensions.

3.2 Competing demands and physiological arousal

Individuals' responses to competing demands depend on how they approach the emotional experience triggered by such demands. Psychoanalytical studies on paradox have found that competing demands can trigger stress and anxiety (e.g., Smith & Berg, 1987; Vince & Broussine, 1996). The stress engendered by competing demands is independent of any stress created by the demands of each element of a paradox. For example, while the demand for a product to be novel, and for a product to be useful, will generate some level of stress, the stress will be heightened when the two demands occur simultaneously, as their juxtaposition is at once contradictory and interrelated. One reason why competing demands are particularly stressful is a perception of dissonance (Harmon-Jones, Harmon-Jones, & Levy, 2015). When individuals perceive two demands as being contradictory, they are likely to assume that one demand indicates the opposite of the other demand, such as when they must simultaneously cooperate and compete (Keller et al., 2017). Individuals are then more likely to believe that any action that satisfies one demand will undermine their ability to satisfy the other. This creates a perception that each demand is pulling the individual's efforts in opposing directions—an experience that paradox scholars refer to as 'tension' (Lewis, 2000; Smith & Lewis, 2011). As

psychoanalytical approaches to paradox have argued, the perceived contradictory ways of addressing the tensions sparked by opposing demands (e.g., cooperating and competing) triggers a sense of lack of control, which threatens the ego and thus provokes an emotional response to defend the ego (Jarrett & Vince, 2017). As research on emotions in psychology (Chorpita & Barlow, 1998) and organizational behavior (Johnson et al., 2005) have found, this perceived lack of control is a major contributor to stress.

Stressful events trigger physiological arousal because the sympathetic nervous system (part of the autonomic system) monitors and prepares the organism for external threats (Najström & Jansson, 2006). Part of the sympathetic response is the typically involuntary activation of sweat glands at the extremities (i.e., fingers and toes). While sweating may not be consciously detected by an individual themselves, it can be detected by monitoring changes in electrodermal activity (Freedman et al., 1994); the body's initial response to a stressful event is thus manifested as a skin conductance response (SCR; (Naqvi, Shiv, & Bechara, 2006). The external stimuli that can trigger an increase in SCR can have many different origins, including somesthetic (touch), auditory (e.g., Khalfa, Isabelle, Jean-Pierre, & Manon, 2002), and visual (e.g., Esteves, Dimberg, & Öhman, 1994) sources, as evidenced by the higher levels of SCR associated with high-arousal images, such as those found in suspenseful films (e.g., Hubert & de Jong-Meyer, 1991). Therefore, even when individuals are experiencing a stressful event that involves no physical activity, the stress can trigger an electrodermal response.

Because the perceived lack of control that arises when competing demands emerge creates a stressful event, individuals' bodies are expected to react to the

competing demands by increased electrodermal activity, which raises the SCR. Therefore, as competing demands are perceived to be less controllable than demands that are free of contradictions (i.e., when the demand only encompasses one element of a paradox), individuals would be more likely to react with elevated electrodermal activity when the demands are contradictory. Therefore, I hypothesize that:

H1: The SCR in individuals will be higher when they face competing demands compared to when they are presented with only one of the demands.

3.3 Paradox mindset and physiological arousal

Not all individuals have the same physiological reaction to opposing demands. In particular, high-paradox-mindset individuals have a positive approach to the emotional aspects of competing demands, and those who embrace paradoxes are also more comfortable with the tensions that arise from contradictions (Miron-Spektor et al., 2018). This dispositional attitude towards approaching tensions emotionally can help individuals to engage in ongoing, habitual behaviors for coping with paradox-induced stress (Keller & Chen, 2017). Cognitive neuroscientists have found that physiological responses, such as emotional sweating, temporally precede emotions (Adolphs, 2003; James, 1890). This finding is further supported by the somatic marker hypothesis, which suggests that such physiological responses are learned by our sympathetic system to become somatic markers that can bias our emotions and cognition when responding to similar stimuli (Damasio, 1996; Damasio & Sutherland, 1994). Thus, while individuals might be unconscious towards their emotional responses, the brain directs the body to respond emotionally in accordance with

the biological markers. The feeling of emotional comfort towards paradoxes (in a high paradox mindset) can reduce the stress associated with the competing demands by providing constant feedback on the events that are triggering the stress (Ullsperger, Danielmeier, & Jocham, 2014). Each time a competing demand arises, high-paradox-mindset individuals are more likely than others to self-provide metacognitive feedback about the positive aspects of experiencing tension. They are also less likely to perceive a lack of control and become anxious about this. Over time, the ongoing feedback loop will reduce the stress experienced each time competing demands arise, as constant conscious feedback looping can establish a habitual response to stress (Ullsperger et al., 2014). In addition, when high-paradox-mindset individuals experience contradictory demands, their sympathetic systems should control and direct their bodies to react with less anger, anxiety, and defensiveness because of their general propensity to be more comfortable when confronted with paradoxes.

The somatic marker hypothesis posits that high-paradox-mindset individuals' repeated positive feedback from exposure to paradoxes can activate somatosensory brain regions that enable the brain to construct a forward anticipatory model to expect positive bodily reactions when experiencing similar significant events in the future (Damasio, 1996; Dunn, Dalgleish, & Lawrence, 2006). Therefore, even though psychosomatic reactions to stressful events typically precede conscious reactions (Baumeister et al., 2007), high-paradox-mindset individuals are likely to have subconsciously established habitual mechanisms for mitigating stress responses at the moment opposing demands arise. As a result, relative to low-paradox-mindset individuals, those with high

paradox mindsets will have lower levels of electrodermal activity in response to opposing demands. Therefore, I hypothesize that:

H2: The paradox mindset moderates the influence of competing demands on SCR, such that high-paradox-mindset individuals will have a lower relative SCR than those with a low paradox mindset when faced with competing demands.

3.4 Competing demands and cognitive engagement

Competing demands also create cognitive challenges for individuals to cognitively engage with the demands. Cognitive engagement refers to the effort that individuals purposefully process information. As a result of successful attentional fit between available cognitive demands and mental resources (Wickens, 1991), individuals high in cognitive engagement often engage in central and elaborated information processing, whereas those low in cognitive engagement often engage in peripheral and less elaborated processing (Cacioppo & Petty, 1982). A central idea in cognitive research is that cognitive resources, defined as attentional, working memory, and related "on-line" resources, are limited, as our brain has only a finite capacity to process information (Norman & Bobrow, 1975). During the processing process, the brain holds information as temporary buffers for attention and working memory to analyze and control (Broadbent, 2013; Franconeri et al., 2013; Norman & Bobrow, 1975).

Previous discourse studies on paradox have shown that while each task demand activates processing of a set of thoughts, concepts, and ideas, the competing nature of opposing demands triggers the additional need to think about how the demands compete and/or associate with each other (Abdallah et

al., 2011; Lüscher & Lewis, 2008). This additional cognitive need is independent of the cognitive buffers triggered by the demands of each element of a paradox. For example, while the demand for a fashion design to follow the global trend and for a fashion design to be meet the local needs each triggers a set of ideas, the need to meet both demands at the same time requires one to think about how the global trend can or cannot simultaneously meet the local needs (Khaire & Hall, 2016). Therefore, simultaneously thinking about competing demands increase people's cognitive load and reduces their cognitive availability to engage with both demands at the same time (Vecchio, 1990). In addition, thinking about one demand hinders individuals' motivation to think about the contradictions of the opposing demand as people tend to seek coherent thoughts, concepts, and values (Festinger, 1962). For example, the cognitive effort in figuring out how to compete with a colleague decreases the tendency of the brain to think about how to befriend this colleague. Taking together, I hypothesize that

H3: Individuals' cognitive engagement will be lower when they face competing demands comparing to facing demands that involve only one of the demands.

3.5 Paradox mindset and cognitive engagement

Not all individuals will experience the same cognitive load and engagement when presented with competing demands. In particular, previous laboratory-based (e.g. Miron-Spektor et al., 2011) and field-based (e.g. Miron-Spektor et al., 2018; Smith, 2014) paradox research has provided abundant evidence that a general tendency to accept, value, and embrace paradoxes (in high-paradox-mindset individuals) increases an individual's integrative complexity, so that

they have a greater capacity to deal with contradictions and ambiguity (Tetlock, Peterson, & Berry, 1993). Because the demands are competing, but not logically exclusive, the ability to think in a cognitively complex way allows individuals to engage in more centralized and sophisticated information processing, such as a new product development project being both exploratory and exploitative (Andriopoulos & Lewis, 2009), a task being both novel and useful (Miron-Spektor et al., 2011; Miron-Spektor et al., 2018), and a colleague being both cooperative and competitive (Keller et al., 2017). Having a high paradox mindset also increases individuals' cognitive vigilance, so that they are more sensitive to the contradictory and interrelated elements in situations that require sophisticated engagement.

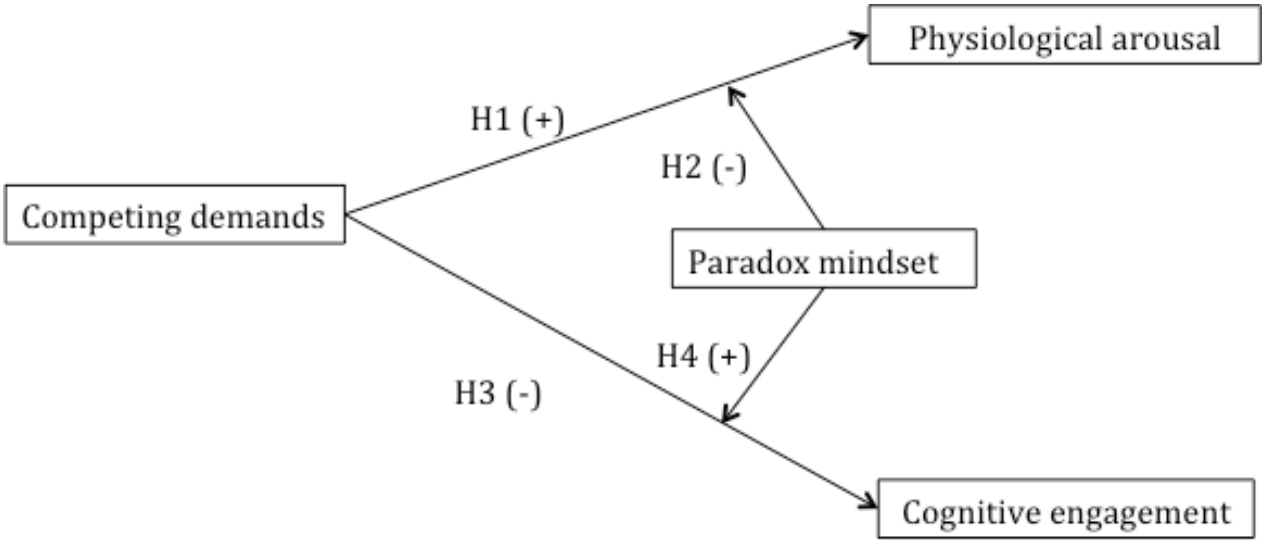
In addition, the tendency to embrace paradoxical demands motivates individuals to frame the opposition as an opportunity rather than a threat, thus altering the cognitive dissonance they experience during the process. As a virtuous circle, experiencing less cognitive dissonance promotes information reasoning. Therefore, having a high paradox mindset allows increased information flow from both poles, and promotes a greater tendency to juxtapose opposing ideas, bridge disparate information to make associations and distinctions, and reinvent from those associations and distinctions. In contrast, individuals with low paradox mindsets tend to view opposing demands as threats that consume additional cognitive resources. This causes a crisis of cognitive resources to emerge, impairing individuals' memories, their capacity to retrieve information, and their subsequent reasoning, making it difficult for them to engage with the demands of the task (Peters & McEwen, 2015). The low paradox mindset impairs the processing of both imperatives simultaneously,

with such individuals tending to question the coexisting opposites, and even dispute their existence, rather than skip this step and think about potential resolutions. Therefore, I hypothesize that:

H4: The paradox mindset moderates the influence of competing demands on cognitive engagement, such that high-paradox-mindset individuals will experience greater relative cognitive engagement than those with a low paradox mindset when faced with competing demands.

Below Figure 1 provides a diagram of the theoretical framework and hypotheses developed in this session, followed by the statements of the hypotheses.

Figure 1.
Theoretical framework and hypotheses



H1: The SCR in individuals will be higher when they face competing demands compared to when they are presented with only one of the demands.

H2: The paradox mindset moderates the influence of competing demands on SCR, such that high-paradox-mindset individuals will have a lower relative SCR than those with a low paradox mindset when faced with competing demands.

H3: An individual's cognitive engagement will be lower when they face competing demands than when they face only one of the demands.

H4: The paradox mindset moderates the influence of competing demands on cognitive engagement, such that high-paradox-mindset individuals will experience greater relative cognitive engagement than those with a low paradox mindset when faced with competing demands.

Chapter 4. Setting: Creative production

To examine my hypotheses of interest, I focus on the competing demands that actors face when engaged in the creative production process.

4.1 Creative production and creative industries

Creative production is critical to the success of firms in an assortment of industries, including fashion (e.g., Aspers & Godart, 2013; Godart et al., 2015; Khaire & Hall, 2016), film (e.g., Kim & Jensen, 2014), haute cuisine (e.g., Koch, Wenzel, Senf, & Maibier, 2017; Stierand, Dörfler, & MacBryde, 2014), art (e.g., Ertug, Yogev, Lee, & Hedström, 2016), games (e.g., Tschang, 2007), music (e.g., Lorenzen & Frederiksen, 2005), design (e.g., Ravasi & Stigliani, 2012), architecture (e.g., Jones, Maoret, Massa, & Svejenova, 2012; Jones & Massa, 2013; Manzoni & Volker, 2017) and others. In fact, some scholars even argue that technology companies are, in essence, creative production companies, as creativity is critical to their success (Eisenman, 2013). For example, the logics used to manage the design and manufacturing of mobile phones is now closer to the fashion industry than scientific and engineering industries (Djelic & Ainamo, 2005). Therefore, even industries that are not traditionally considered to be creative industries might still be involved in considerable creative production in their daily organizational routines. In other words, engaging and excelling in creative production is becoming increasingly important for all firms to compete.

The creative production process often involves multiple stakeholders. Haute cuisine restaurants and chefs must consider gourmet guides, restaurant critics, and guests (e.g., Koch, Wenzel, Senf, & Maibier, 2018; Stierand et al., 2014).

Fashion companies must consider fashion-conscious buyers, media, and fashion communities (Kawamura, 2018). As a result, creative producers often confront the struggle of pursuing economic value versus their own artistic expressions, the choice of being conventional versus being novel, and the need to anticipate and explore future directions while exploiting exiting creative vitality (Caves, 2000; Lampel, Lant, & Shamsie, 2000). Addressing these needs results in tension, because one need is often at the expense of the other. For example, the pursuit of self-expression is often at the expense of commercial values, so that even though musicians agree that revenues should cover basic costs for living, they do not expect "economic prosperity" in their new production (Albinsson, 2018).

4.2 Paradoxical nature of creative production

Organizational paradox theorists posit the tension depicted earlier in creative production as paradoxical tensions, i.e., seemingly interdependent contradictions that persist over time (Lewis, 2000; Smith & Lewis, 2011). The definition of organizational paradox contains three key elements: contradictions, interdependency, and persistence. The needs that creators need to satisfy for different stakeholders during the creative production are, as the definition suggests, essentially paradoxical. Creative production process, predominantly led by creative professionals, is multifaceted in nature. Those creators seek satisfaction from their firms, clients, and other parties that may involve in (e.g., policy makers). At the same time, they also compete with their professional peers and turn to professional associations for reputation promotion. Rather than the "Ah-ha" movements when creative ideas spark, creative professionals are required to constantly respond to paradoxical demands during the

production. For example, during the design process, architects may need to express their own aesthetic and reputational needs; they may need to save as much cost as possible for the clients; they may also need to learn, incorporate and reinvent from different conventions into the final products. When they address the customized needs for their clients' specific purposes, they may also consider how the public and other experts will evaluate, since creative products are often exposed to the public, propagated and judged by the public and professionals, resulting in professional reputation and fame (Boutinot, Joly, Mangematin, & Ansari, 2017). For example, haute cuisine food is judged and rated by guests, restaurant critics, and gourmet guides (e.g., Bouty & Gomez, 2010; Durand et al., 2007; Stierand et al., 2014; Svejenova, Planellas, & Vives, 2010). To summarize, the creative production process often involves multiple layers of paradoxical tensions stemming from different demands of different stakeholders, providing a theoretically relevant setting for the present research.

Chapter 5. Overview of methodology

In this dissertation work, I adopted a mixed-method approach to triangulate data from different sources (Jick, 1979), including two quantitative examinations from laboratory settings and a qualitative investigation from entrepreneurial architects. While every research method has advantages and disadvantages, a mixed-method approach provides evidence from multiple methods to cross-validate the theoretical inquiries (Creswell, Plano Clark, Gutmann, & Hanson, 2003). I started with two experiments directly examining my theoretical model and hypothesis. Understanding individuals through their physiological responses and biological characteristics, although rare in organizational paradox research, is not completely new in management (see Nofal et al., 2018 for a recent review). The general assumption is that the human brain and bodily activities can provide information not obtainable via conventional methods (Kable, 2011). Existing examples have been mostly focused on the role of genetics, physiology, and neuroscience in understanding managerial outcomes, including decision-making, leadership, work performance, and creativity. Biological responses are the most instant and unvarnished reactions we experience and exhibit, and thus, as well as being explanatory factors, they act as signs to assist the theoretical inquiries that we are not able to easily and accurately examine in other ways, such as self-reported surveys, behavioral experiments, and field investigations. These traditional methods require participants' willingness and competency to recall and describe their experience. Considering the central debate in organization paradox research that whether paradoxical tensions are inherently in the situations or socially constructed, one of the key challenges would be the

challenge to empirically tease out the factors leading to social constructions. The physiological and neurological methods can fairly well serve for this purpose.

The choice of skin-conductance surfaced from literature because of its unique advantage in understanding tensions in proximity than previous psychoanalytic and self-reported methods. Organizational paradox theory thrives on understanding the emotional responses and the coping strategies to the challenging (often stressful and threatening) feelings. However, studies almost all took an implicit assumption that individuals under paradoxical situations are able to recognize their emotions accurately. Previous studies on emotions provided tremendous evidence that on the contrary, individuals often fail to correctly and consciously recognize their emotions (Robinson & Clore, 2002) or recognize the impact of emotions on their own decision-making process (Dane & Pratt, 2007). When people repeatedly experience certain situations (e.g., competing demands in their jobs), their minds might store the instant emotional and bodily reactions as bodily markers so that they will automatically respond similarly without conscious recognition. Therefore, it is very challenging in itself to ask the actors to recall the exact emotions they experienced when they might experience seemingly close but actually very different feelings, not to mention they might experience several entangled emotions at the same time. Therefore, skin-conductance as an objective, non-invasive, and time-efficient method that can record one's physiological arousal concurrently and objectively became an ideal solution to investigate individuals' actual emotional responses under competing demands.

The adoption of the eye-tracking method is also natural as the eye-tracking is recognized as a powerful neuroscience method to understand cognition

through attention. To investigate my question on how paradox mindset facilitates individuals' cognitive engagement when handling competing demands, essentially it is the question to uncover how individuals allocate their attentional resources to the demands. However, although cognition and cognitive processes have been a centerpiece in the theory of organizational paradox, and in fact viewed as micro-foundations in many other organizational theories and fields (e.g., in entrepreneurship, Baron & Ward, 2004; sensemaking, Maitlis & Christianson, 2014; behavioral strategy, Powell, Lovallo, & Fox, 2011; and many others), little work has examined how the cognitive process happens concurrently, due to the difficulty of capturing and exhibiting it. Existing work adopted mostly retrospective methods, such as self-reported surveys. Cognitive mapping is one of the few ways that allow people to describe concurrent thoughts in oral interactions. However, in the pursuit of understanding how individuals think about the demands when they are completing tasks, we cannot have the target participants doing the mapping when they are also completing tasks, as this will contaminate their thinking process. In other words, we have to observe or record the thinking process independently from the target participants. As human interpretation could be very subjective and inaccurate, assistance from equipment became a natural choice. As such, as an unobtrusive, non-invasive, time-efficient and cost-efficient method, eye-tracking surfaced among other neurological methods, such as fMRI. Eye-tracking is often used in neuroscience with other methods to diagnose brain damage, neurological disease, and visual and neurological functions and processes. In business fields, it is commonly used in marketing research (Wedel & Pieters, 2008). Numerous studies in cognitive science, neuroscience, and also marketing suggest that eye-

tracking is a reliable and recommended way to proxy information processing through the eye movements. Therefore, I argue that the eye-tracking method is not only suitable for answering my questions on creative individuals' information processing but can also be advantageous for our knowledge of cognition in the field of management in general.

Taking the findings in the two laboratory studies, I conducted a third study by investigating the relationship between entrepreneurial architects' emotional and cognitive engagement and achievement of competing demands in their creative production of designs. This study aims to extend the previous two studies to relevant yet more general setting and explore the downstream performance. Qualitative discourse analysis is commonly used in organizational paradox research, as it provides a grounded understanding of the complexity of the paradox in a certain context yet allows abstraction to theories. The qualitative part is necessary, as it cross-validates findings in more restricted settings in the laboratory and provides additional richness from the field.

In an overview, I conducted three studies. In the first and second study, I recruited two groups of Singaporean undergraduates to conduct a skin-conductance experiment and an eye-tracking experiment. Both studies adopted same within-subject design, shared the majority of task design materials, with specific changes according to the needs of the technologies. As every laboratory study, conducting an eye-tracking and a skin-conductance study is at the expense of external validity. In order to surface individuals' biological responses, the study designs have to be parsimonious and simplified as opposed to real-life scenarios. For example, in my experiment designs, the design scenarios were simplified to introduce the competing demands in two sentences. But in reality,

every task has a context. For example, the architects in my field study often have to design to the customers' specific needs (oftentimes more than one requirement) and at the same time they also want to fulfill their own specific needs, such as experimenting new designs or materials (e.g., Lorenzen & Frederiksen, 2005) that will enhance their professional identity and reputation, their own aesthetical expression, or business concerns since they are both architects and a founder or founder in themselves.

In the third study, I interviewed ten entrepreneurial architects who own independent architect design studios in China. Belonging to the group of the most pioneering architects in China, they publish their designs in both academic journals in architecture and also commercial platforms (e.g., websites, news and media). In addition, some of them are also interviewed by commercial media, semi-commercial semi-professional platforms, and academic journals (the leading academic journals in architecture in China sometimes organize and publish themed interviews with architects). I consider these secondary interviews as valuable archival materials that might provide additional information beyond my interviews. Therefore I collected by a thorough search online and by asking the participants directly for their previous media coverage. I then excluded repetitive or non-relevant materials, leaving the rest as complementary to the ten semi-structured interviews. In addition, considering ten interviews might suffer from generalization concerns, I included another 32 secondary interviews from a themed interview activity, "Harmony in diversity: a review of post-1980s architects special report in New Architecture", organized by a leading academic journal in architecture. Combining the first-hand and second-hand qualitative materials, I then dived into identifying the competing

demands, the emotional and cognitive cues when responding to the demands, and how these findings associated with their performance.

Chapter 6. Study 1: a laboratory study with skin-conductance

I first conducted a skin-conductance study in a controlled laboratory setting to test hypothesis 1 and 2 regarding individuals' emotional response towards competing demands. As I mentioned in the previous chapter, skin conductance technology allows us to capture simultaneous physiological arousal and uncover its relationship with individuals' difference in approaching to paradox. Following other neuroscience studies to avoid as many external noises as possible, the two experiments adopted similar within-subject designs and task materials. Within-subject experiment ensures ecological validity while the controlled laboratory setting ensures internal validity (Charness, Gneezy, & Kuhn, 2012).

6.1 Task design

In the experiment, participants received six different design tasks that I adapted from the chocolate design task used in Leung and colleagues' prior research (Leung et al., 2018; Ong & Leung, 2013). In their work, they provided a background story of a chocolate firm (79 words) and asked the participants to design a piece of revolutionary chocolate within ten minutes. Because psychophysiological methods require simple and controllable tasks to reduce potential noise (Kivikangas et al., 2011), I simplified the chocolate design task by removing most of the background information and instead focusing on the task itself.

I manipulated the task demands to generate different within-subject conditions. There were three types of task demands: (1) a single demand (a

demand that is also used as one of the two paradoxical demands in the paradoxical demand condition), (2) a paradoxical demand (two contradictory demands that appear simultaneously), and (3) a baseline demand (simply asked participants to "make the best design"). For example, the instructions for the design of chocolates started with "You are asked to design a piece of chocolate to be included in a gift box. The chocolate should be…" In the single demand condition, it said "as FAMILIAR and COMMON as possible" or "as UNUSUAL and DIFFERENT as possible," and in the paradoxical demand condition it said, "as FAMILIAR and UNUSUAL as possible." Based on the chocolate task, I also developed another five similar design tasks (a total six design tasks for three within-subject conditions; full details of each task and task demands can be found at Table 1).

Table 1.
Study 1. Description of the design tasks and task demands

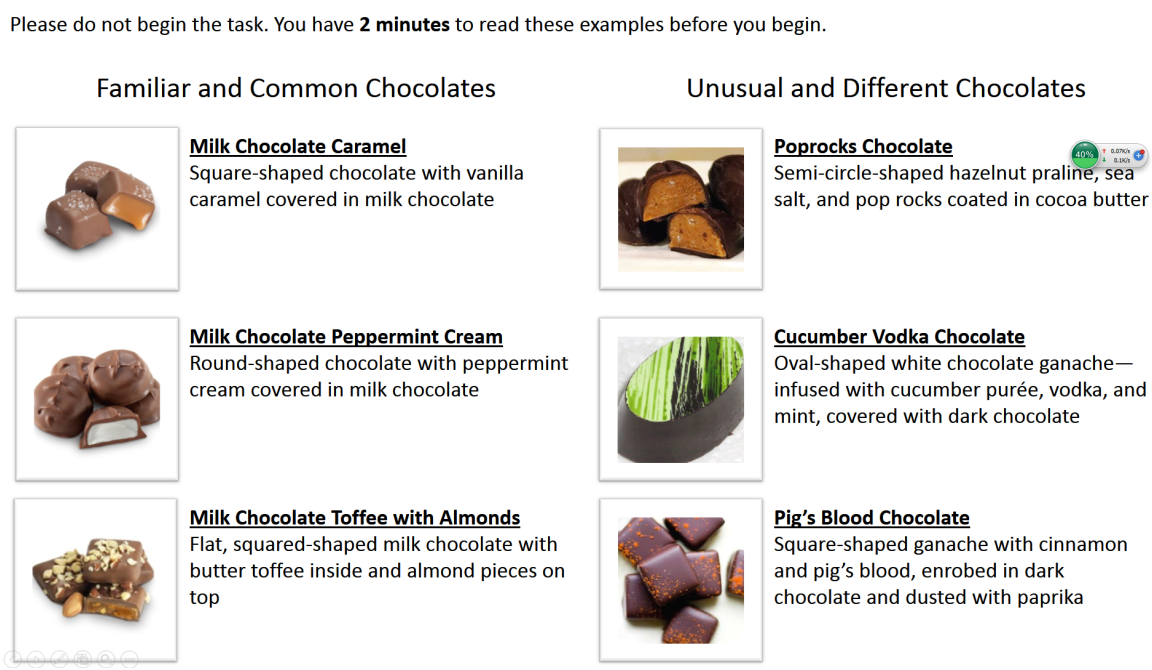
1. You are asked to design a piece of chocolate to be included in a gift box.	
Single element demand	The chocolate should be as familiar and common as possible.
Single element demand	The chocolate should be as unusual and different as possible.
Paradoxical demand	The chocolate should be as unusual and familiar as possible.
2. You are asked to design a chair.	
Single element demand	The chair should be as practical and useful as possible.
Single element demand	The chair should be as novel and avant-garde as possible.
Paradoxical demand	The chair should be as novel and practical as possible.
3. You are asked to design a three-day vacation itinerary.	
Single element demand	The tour should be as comfortable and relaxing as possible.
Single element demand	The tour should be as adventurous and daring as possible.
Paradoxical demand	The tour should be as adventurous and comfortable as possible.
4. You are asked to design a restaurant menu.	
Single element demand	The menu should be as casual and informal as possible.
Single element demand	The menu should be as fancy and sophisticated as possible.

Paradoxical demand	The menu should be as casual and fancy as possible.
5. You are asked to design a cup.	
Single element demand	The cup should be as simple and plain as possible.
Single element demand	The cup should be as elaborate and ornate as possible.
Paradoxical demand	The cup should be as simple and elaborate as possible.
6. You are asked to design a house.	
Single element demand	The house should be as modest and low-key as possible.
Single element demand	The house should be as luxurious and lavish as possible.
Paradoxical demand	The house should be as modest and luxurious as possible.

The tasks were designed to represent a range of paradoxical demands based on those experienced by employees within organizations (i.e., three performing and three learning paradoxes captured in Miron-Spektor et al., 2018), yet generic enough to enable student participants with limited workplace experience to have sufficient knowledge to conduct the tasks. They included designing a cup, a chair, a house, a restaurant menu, and a vacation itinerary. For each task, I provided a list of examples that included six exemplary designs (three for each paradoxical element) with pictures and a brief description. A sample of an example page can be found in Figure 2. The example page was used to ensure that participants had access to a consistent information base, and hence, their task procedure was not biased by background knowledge. To ensure that the subjects' background knowledge did not influence the results, I also analyzed if their majors and multicultural experience played a role in a post-hoc analysis.

Figure 2.

Study 1. A sample page of the chocolate design examples.



Following Rubio and colleagues (2003), I interviewed four representative participants in a pilot test and assessed the clarity, fluency, and difficulty of the task instructions. I examined the predictions based on how competing versus non-competing demands were associated with the SCR (physiological arousal), and how the paradox mindset moderated the effects.

6.2 Participants

A total of 110 (39.09% male; the average age was 21.35 years) right-handed Singaporean undergraduate students completed the study. Participants were recruited to participate in a study about "Design and problem solving" and received $25 Singapore dollars upon completion as a reward and an additional $1-10 Singapore dollars as a bonus. I employed a within-subject design, in which participants all received seven two-minute tasks, including a fixed practice design task ("design a mobile phone cover") and the six main tasks used in the

study. Following a Graeco-Latin square design (Ryan & Morgan, 2007: 80-83), each participant received two of each task demand conditions (competing demands, single element, and baseline), with the order of each task presented randomly.

6.3 Procedure

Before visiting the laboratory, participants were required to finish a survey online at least one day before the experiment. The survey contained questions on psychometric scales and demographic information. Upon arriving at the laboratory, an experimenter (me or one of the trained research assistants) explained the purpose of the study, the safety and the right to drop out during the experiment. The experimenter also answered any questions that participants raised. After participants confirmed they were ready and signed an informed consent document, they were brought into the testing room. In this sound-proof, temperature controlled room, the experimenter first guided the participants to gently wash and dry their hands, then helped the participants to sit on a chair without wheels (to reduce unintentional body movements) in front of a table with a desktop. Electrodes were attached to the participants' left hand's index and middle distal phalanges. The experimenter then guided the participants through the instructions on the computer screen, explained that the bonus process would be allocated based on the extent to which they will follow the task instructions, and then asked the participants to go through additional instructions on the screen and relax for around three minutes. The experimenter then checked participants' skin responses in a control room (next to the skin-conductance room) and went back to the skin conductance room to start the

experiment after the three-minute relaxation period. During the experiment, the participants were instructed to only use their right hands to proceed with the experiment and complete all the design tasks presented on the screen. They were required to place their left arm and hands on the table and maintain a still position throughout the experiment. Participants then completed the seven sessions, including the fixed practice task and the six main tasks.

During each session, the participants first read the task instructions. Subsequently, participants had a fixed time of two minutes to read the examples and then another fixed time of two minutes to complete the task. The task was completed using blank sheets of paper and a pencil (using only the right arm). After completing a task (i.e., developing their own design ideas), they were instructed to rest and watch a relaxation video before starting the next session to ensure that physiological arousal does not carry over from task to task. In total, seven sessions were carried out, and the whole experiment lasted approximately 40 minutes. After completing the experiment, the participants completed a short survey in which they recalled their tasks during the experiment and rated their perceived similarity, difficulty, emotions, and arousal during each task.

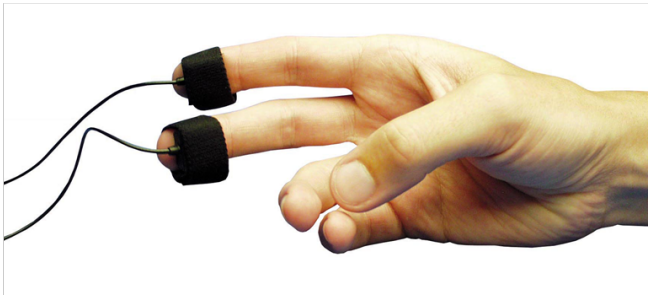
Throughout the experiment, SCR was monitored with video recording to monitor excessive movements or participants who did not execute the tasks according to instructions. Instances where there were excessive movements, discordant behavior (including not following the instructions) or any unexpected events were recorded for exclusion during data analysis. Participants with egregious cases of excessive movement were excluded from the analysis. In addition, full data acquisition failed in some participants due to technical reasons, and these participants were also excluded from the analysis. In all, I excluded 38

participants, with a sample of 72 (65% retention rate; 46.27% male; the average age was 21.61 years) available for further analysis. It is a comparatively lower retention rate as opposed to studies in management research in general, but not very different from other skin conductance studies (e.g., Yap, Christopoulos, & Hong, 2017). To further ensure that the exclusion was not biased by a particular characteristic, I subsequently conducted between-group comparison analyses and found that the retained group was not significantly different from the excluded group regarding gender, age, major, and paradox mindset, suggesting that the exclusion was not biased by these factors.

6.4 Variables

Skin Conductance Responses (SCR). I recorded skin conductance responses using the BIOPAC ® MP150 Data Acquisition system (version 4.1). Electrodes (8mm BioPac AgCI) were filled in with a 0.5%-NaCi paste (BioPac Gel 101) and placed on the left hand's index and middle distal phalanges (see Figure 3 for an illustration). This is a commonly used instrument that records the degree of the flow of current based on the degree of eccrine sweating on the fingers of left palms.

Figure 3.
Study 1. An illustration of a participant with skin-conductance.



Skin conductance can be categorized into two types of electrodermal activity that are controlled by the sympathetic neuro system: tonic and phasic. Tonic activity refers to slow fluctuating electrodermal activity in a relatively longer timescale. Phasic activity refers to faster and more instant electrodermal activity in a relatively shorter timescale, and often reflects the immediate responses to external stimuli. In other words, the event-triggered phasic activity is the focal activity. Skin conductance response (SCR), which I adopted as the focal measurement for this study, is the main indicator of phasic changes that essentially reflects the sympathetic response. I used LedaLab (Benedek & Kaernbach, 2010), which is a widely used Matlab-based toolbox, for analysis of SCR data. Following Boucsein's specific suggestions (2012), a neuroscientist and I quantified the SCR data to an analyzable level.

We first extracted the data from AcqKnowledge, the software of the Biopac Data Acquisition system. As the Acquisition sampling rate was set as 2000Hz, a typically suggested rate, the software recorded 2000 responses per second, resulting in a big data sample size during the experiments (around 30 minutes). The initial data was too big in terms of size to analyze that we first down-sampled the data to 20 Hz and then smoothed the data using a Gaussian Filter.

Gaussian smoothing is a typically recommended convolution technique to remove the noise of time-series data while maintaining the proportion of variance from the original data so that the data can be transformed to more analyzable data for later univariate analysis (Bach, Flandin, Friston, & Dolan, 2009; Benedek & Kaernbach, 2010). To separate the tonic and phasic components of the electrodermal activity, the preprocessed data was analyzed by using Continuous Decomposition Analysis (Ang, 2005; Benedek & Kaernbach, 2010) with optimization of four different initial values, resulted in the reported variable, the integrated skin conductance response (ISCR), a cumulative phasic activity within a focal response window (Benedek & Kaernbach, 2010). The advantage of the Continuous Decomposition Analysis is that it enables a model-based approach to estimate the non-event related responses and then separates these non-event related responses from the entire window. Specifically, ISCR corresponds to the integral area of the phasic driver (i.e., SCR) in a window of 1-4 seconds following the event of interest (prompt to initiate the design task) with an SCR amplitude of .01 muS (Benedek & Kaernbach, 2010). Trials with ISCR three standards deviations of the sample mean were considered as noises (e.g., the participants had larger body movements) and discarded (Braithwaite, Watson, Jones, & Rowe, 2013).

Paradox Mindset (PM). I used the nine-item scale developed by Miron-Spektor et al. (2018). Sample items include "I am comfortable dealing with conflicting demands at the same time" and "Tension between ideas energize me" (1 = strongly disagree; 7 = strongly agree; Cronbach's $\alpha = 0.85$; $M = 4.75$, $SD = 0.73$). The original scale and Chinese version can be found in Appendix 2.

Other variables. I also include age and gender as control variables.

6.5 Results

Table 2 provides descriptive statistics and correlations among the variables, including PM and SCR.

Table 2
Study 1: Means, standard deviations, and correlations of variables

N=72	Mean	SD	1	2
1. Paradox mindset	4.75	0.74		
2. ISCR_ single element demand	0.51	0.36	-0.15	
3. ISCR_paradoxical demand	0.60	0.56	-0.28*	0.51**

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

I conducted a Univariate General Linear Model (GLM) analysis, including SCR as the dependent variable, the competing demand condition as the independent variable (1 = competing demands, 0 = single-element demands), PM as the covariate, and controlling individuals' propensity to endorse a middle-ground approach (i.e., MGA) as another covariate since it affects individuals' tactics to respond to competing demands (Leung et al., 2018). I found that having competing demands (as opposed to a single-element demand) had a significant positive relation with SCR ($F(1, 125) = 5.72$, $b = 0.10$, $p = 0.02$; Mean ($SCR_{Competing\ demands}$) = 0.60, SD = 0.56; Mean ($SCR_{Single\text{-}element\ demands}$) = 0.51, SD = 0.36). Therefore, Hypothesis 1 was supported, as participants experienced higher physiological arousal when they had competing demands than when they had single-element demands. Hypothesis 2 was also supported, as results of the two-way interaction effect of paradoxical demands and PM on SCR ($F(1, 125) = 5.14$, $p = 0.03$). The results found that individuals with a high PM experienced a comparatively lower physiological arousal than those with a low PM when facing

competing demands (b = -0.14). The slope of arousal increased from a single element-demand to competing-demands condition was also steeper for individuals with a low PM than those with a high PM. Of note, I also found that the two-way interaction between competing demands and MGA on SCR was significant (F (1, 125) = 6.96, p = 0.01), suggesting that individuals with a higher MGA experienced higher physiological arousal when facing competing demands (b = 0.11). Finally, I had a significant three-way interaction effect from competing demands and PM and MGA on SCR (F (1, 125) = 6.21, b = -0.37, p = 0.01; see Table 3 for detailed results and Figures 4 and 5 for interaction effects).

Table 3.

Study 1. Results of Univariate General Linear Model on ISCR

Source	SS	df	MS	F	Sig.	η2
CD	1.13	1	1.13	5.72	0.02	0.04
PM	0.27	1	0.27	1.37	0.24	0.01
MGA	0.53	1	0.53	2.69	0.1	0.02
CD * PM	1.01	1	1.01	5.14	0.03	1.01
CD * MGA	1.37	1	1.37	6.96	0.01	0.05
PM * MGA	0.45	1	0.45	2.28	0.13	0.02
CD * PM * MGA	1.23	1	1.23	6.21	0.01	0.05

Note. CD refers to competing demands, PM refers to paradox mindset, MGA refers to middle-ground approach.
**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Figure 4.

Study 1. Triple interaction of competing demand (paradoxical vs. single element) and paradox mindset (PM) at low middle-ground approach situation.

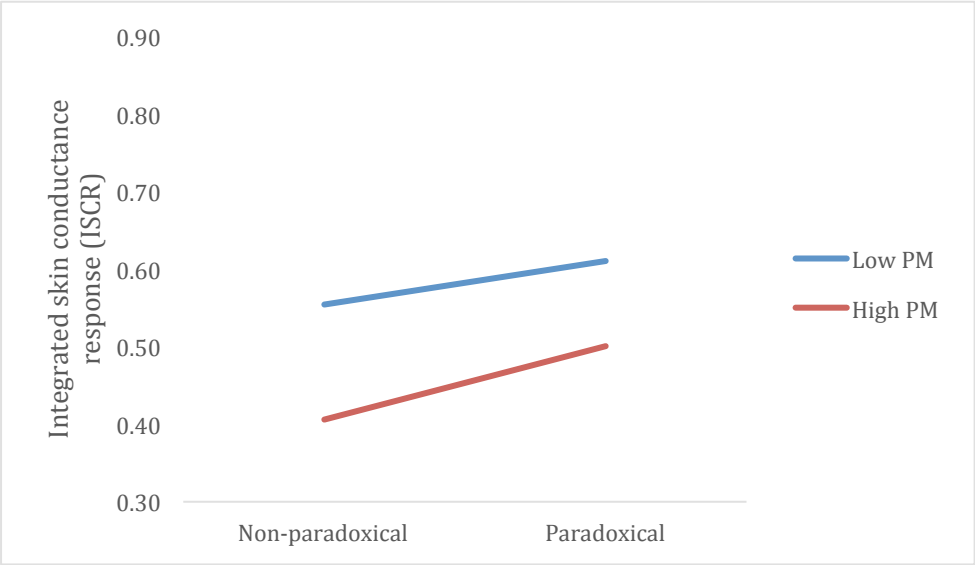
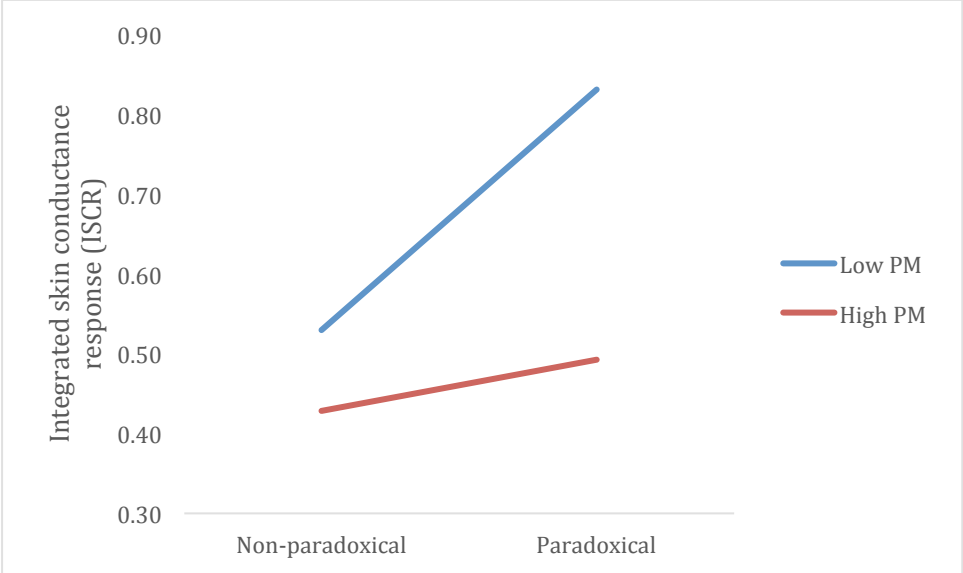


Figure 5.
Study 1. Triple interaction of competing demand (paradoxical vs. single element) and paradox mindset (PM) at high middle-ground approach situation.



To further inquire about the three-way interaction results, I conducted a moderation test with PROCESS moderation-mediation analysis (Hayes, 2017), and our results from PROCESS model 3 confirmed the main effects and interactions from GLM. The PROCESS analysis also generated conditional effects

of SCR at different ranges of PM and MGA (-1SD, 0SD, + 1SD). I found that the effects were attributed to three ranges: low PM X medium MGA (PM ≤ 4.00, 4.19 ≤ MGA ≤ 5.68, b = 0.26, p = 0.02), low PM X high medium MGA (PM ≤ 4.00, MGA ≥ 5.68, b = 0.58, p = 0.00), and medium PM X high MGA (4.00 ≤ PM ≤ 5.50, MGA ≥ 5.68, b = 0.22, p = 0.04). Because the mean and standard deviation of PM is 4.75 and 0.74 and the mean and standard deviation of MGA is 4.94 and 0.74, I categorized the ranges in the conditional effects into low PM and medium to high MGA levels. Therefore, individuals with a low PM experienced higher levels of physiological arousal if they also held a high MGA compared to those holding a low MGA (see Figure 4 and 5). The results suggest that the effects of being uncomfortable with paradoxes (i.e., a low PM) depended on the tactic that the individual used to respond to the paradoxical demand. When the individual was uncomfortable with paradoxes and had a desire to find a middle ground solution to managing the competing demand, the impact of having a competing demand on the level of electrodermal activity was at its highest.

Supplemental analysis

The supplemental analysis included two parts. Firstly, I tested a number of other individual differences, including PANAS, emotional ambivalence, cosmopolitanism, creative cognitive style, and integrative complexity to ensure if or if not these individual differences, rather than paradox mindset, are driving the effects. The results didn't reveal significant results.

Secondly, I also conducted supplemental analysis on whether the single-element demand and competing demands are statistically different from other challenging demands. So I designed a baseline demand condition in the design

that simply asked participants to "make the best design" to control for the possibility that the impact of the competing-demands condition was attributed to specific elements of the demand (e.g., to ensure that the effect of a demand to design a luxurious and modest house was not simply attributed to having to design a luxurious house). I then analyzed by first comparing SCR results for single-element demand versus baseline demand conditions, then on competing demands versus baseline demand conditions. I found that the SCR for the single element demand and baseline demand conditions were highly correlated ($r = 0.78$, $p > 0.1$). I then conducted the same GLM univariate analysis by having SCR as the dependent variable, the demand condition as the independent variable (1 = single element demands, 0 = baseline demands), paradoxical mindset and MGA as the covariates. The results showed that the model was not supported at all. I also used paired sample t-tests, and the results showed that the single element demand condition was not significantly different from the baseline demand condition. I then compared the paradoxical demand and baseline demand conditions (correlation = 0.54, $p > 0.05$), using the GLM univariate analysis again. The results were also not significant. These results together suggest that the effects of the competing demands condition were not attributed to the specific elements of the competing demands, but instead were attributed to the paradoxical nature of the competing demands.

6.6 Summary

In this study, I examined how paradox mindset, a general propensity to accept, value, and embrace paradoxical demands and tensions, influences individuals' physiological responses with competing demands. Three major

findings surfaced. First, supporting hypothesis 1, individuals' automatic physiological arousal was relatively higher when the demands they faced were competing as opposed to the single elements of paradoxes. This finding is in accordance with previous psychoanalytical work that individuals experience anxiety when under opposing demands. The difference is that, the electrodermal activity recorded by skin conductance technique in this study is controlled by the sympathetic nervous system, and hence it reflects the body's automatic response to stimuli rather than emotions accompanying or after conscious reasoning. Therefore, this finding provides some initial empirical evidence to the fundamental debate in organizational paradox research: "Are tensions that underlie paradox inherent in organizational systems, or are they socially constructed?" (Smith & Lewis, 2011: 382). By revealing that individuals experience the tensions before they socially construct the tensions, this finding suggests that the material conditions of competing demands invoke individuals' arousal without conscious recognition.

Second, supporting my second hypothesis, the results showed that a paradox mindset reduces individuals' automatic arousal when the demands they faced were competing as opposed to the single elements of paradoxes. As discussed above, the body's physiological response to stimuli precedes conscious reasoning (Nava, Romano, Grassi, & Turati, 2016). Therefore, by demonstrating that individuals whose mindset prepares them to be more comfortable with paradoxes, in fact, experience less physiological arousal, this finding suggests that individuals' attitude about paradoxes can mitigate the impact of competing demands on physiological manifestations of stress. As previous literature has found, individuals who are high in paradox mindset are more satisfied with their jobs, perform better,

and are more creative than those low in paradox mindset (Miron-Spektor et al., 2018). This suggests that a disposition that lowers the physiological response to paradoxical demands may have downstream benefits.

Third, the results also showed that even among individuals who are generally uncomfortable with paradoxes, those who have a lower propensity to seek a middle ground solution to resolving paradoxes also had relatively lower arousal when facing competing demands. This suggests that the use of the middle ground tactic that partially satisfies both elements of a paradox exacerbates the level of stress because such effort does not allow an immediate sense of resolution, whereas alternative tactics, such as when an individual splits the demands temporally, resolve contradictions temporarily. In other words, the tactics that individuals adopt to manage paradoxical demands can also have an influence on their level of arousal.

Taking together, by examining the physiological aspect of emotional experience with competing demands, this study provides nuanced empirical evidence towards the question of how individuals experience competing demands and how paradox mindset facilitates the experience.

Chapter 7. Study 2: a laboratory experiment with eye-tracking

I conducted an eye-tracking study in a similarly controlled laboratory setting to test hypothesis 3 and 4. As mentioned in the chapter of an overview of the methodology, eye-tracking is a widely recognized method to understand the brain-cognition relationship by monitoring eye movements, which are controlled by the peripheral nervous system. By capturing visual attention and information processing, eye-tracking is considered as a good indicator of cognitive engagement (Krajbich, Armel, & Rangel, 2010), which is defined as effortful and purposeful information processing process. Comparing with traditional ways to empirically understand cognition, eye-tracking can record how individuals engage with competing demands in an unobtrusive, sensitive, and concurrent way.

During the experiments, eye trackers generate reflection patterns through infrared diodes on the corneas of the subject's eyes. Image sensors collect the reflection patterns and other visual data for sophisticated processing algorithms to identify relevant features of eye movements and generate the output data of the eye tracker (Duchowski, 2007). For the ease of researchers' further analysis, an associated software named Tobii Studio displays the output data of the eye tracker as statistical metrics in the form of tables or charts. Essentially, the tracker follows participants' eye movements during their participation in the experiments to return gaze-based visual attention data to proxy participants' engagement with information processing (Russo, 1978). By uncovering how individuals cognitively engage with the competing information, I aim to reveal how paradox mindset impacts individuals' experience with competing demands.

Following study 2, this study adopted a similar within-subject design and a similar set of task materials.

7.1 Task design

In this experiment, participants received six different design tasks that I adapted from the chocolate design task used in Leung and colleagues' prior research (Leung et al., 2018; Ong & Leung, 2013). In their work, they provided a background story of a chocolate firm (79 words) and asked the participants to design a piece of revolutionary chocolate within ten minutes. To reduce as much potential noise as possible when capturing visual attentional responses (Duchowski, 2007), I simplified the chocolate design task by removing most of the background information and instead focusing on the task itself.

I manipulated the task demands to generate different within-subject conditions. There were three types of task demands: (1) a single demand (a demand that is also used as one of the two paradoxical demands in the paradoxical demand condition), (2) a paradoxical demand (two contradictory demands that appear simultaneously), and (3) a baseline demand (simply asked participants to "make the best design"). For example, the instructions for the design of chocolates started with "You are asked to design a piece of chocolate to be included in a gift box. The chocolate should be…" In the single demand condition, it said "as FAMILIAR and COMMON as possible" or "as UNUSUAL and DIFFERENT as possible," and in the paradoxical demand condition it said, "as FAMILIAR and UNUSUAL as possible."

Based on the chocolate task, another five similar design tasks were developed (a total of six design tasks for three within-subject conditions; same as

in Study 2). The tasks were designed to represent a range of paradoxical demands based on those experienced by employees within organizations (i.e., three performing and three learning paradoxes captured in Miron-Spektor et al., 2018), yet generic enough to enable student participants with limited workplace experience to have sufficient knowledge to conduct the tasks. They included designing a cup, a chair, a house, a restaurant menu, and a vacation itinerary. For each task, I provided a list of examples that included six exemplary designs (three for each paradoxical element) with pictures and a brief description. The example page was used to ensure that participants had access to a consistent information base, and hence, their task procedure was not biased by background knowledge. To ensure that our subjects' background knowledge did not influence the results, I also analyzed if their majors and multicultural experience played a role in a post-hoc analysis.

7.2 Participants

A total of 135 Singaporean Chinese undergraduate students participated in this experiment. I manually matched subjects' survey responses before and after the lab experiment with the eye-tracking data according to their identifiers and strictly excluded the data if any part of the data is incomplete, or if the subjects inputted the identifier wrongly. I then got 99 complete responses. 59.19% of the participants were female. The average age was 21.14 years (SD = 1.86). Participants were recruited to participate in a study about "Design and problem solving" and received $25 Singapore dollars upon completion as a reward and an additional $1-10 Singapore dollars as a bonus. I employed a within-subject design, in which participants all received six four-minute tasks. Following a

Graeco-Latin square design (Ryan & Morgan, 2007: 80-83), each participant received two of each task demand conditions (paradoxical, single element, and baseline), with the order of each task presented randomly.

7.3 Procedure

Before visiting the laboratory, participants were required to finish a survey online at least one day before the experiment. The survey contained questions on psychometric scales and demographic information. Upon arriving at the laboratory, an experimenter (me or one of the trained research assistants) explained the purpose of the study, the safety and the right to drop out during the experiment. The experimenter also answered any questions that participants raised. After participants confirmed they were ready and signed an informed consent document, they were brought into the testing room. In this sound-proof, temperature controlled room, the experimenter first explained the how Tobii eye-tracker would capture their eye movements through an embedded camera, following by a standard nine-point eye-calibration procedure based on the instructions on Tobii screen.

After the participants passed the calibration, the experimenter then guided the participants through the instructions on the screen, explained that the bonus process will be allocated based on the extent to which they will follow the task instructions, and then asked the participants to go through additional instructions on the screen, confirmed no more questions regarding the experiment, and exited the room. The participants then started the experiment by clicking the space bar and completed all six sessions sequentially.

During each session, the participants first read the task instructions about the specific task demands they need to meet, which could be a single element of a paradox, a paradoxical demand, or a neutral demand. Subsequently, participants had a fixed time of two minutes to read the examples and then another fixed time of two minutes to complete the task. The task was completed using blank sheets of paper and a pencil that the experiment placed on the table beforehand. In total, six sessions were carried out, and the whole experiment lasted approximately 27 minutes. After completing the experiment, the participants completed a short survey in which they recalled their tasks during the experiment and rated their perceived similarity, difficulty, emotions, and arousal during each task.

7.4 Variables

Cognitive engagement. Cognitive engagement refers to "sustained attention to, or work on, the problem or affect" (Parkinson & Totterdell, 1999). Cognitive neuroscience has explored various tools to investigate cognition, including using eye-tracking to record visual attention, a peripheral somatomotor activity (Kable, 2011). Following other eye-tracking studies, mostly in neuroscience (Eckstein, Guerra-Carrillo, Singley, & Bunge, 2017; Righi, Blumstein, Mertus, & Worden, 2010) and in marketing (Wedel & Pieters, 2008), I develop the proxy of how individuals purposefully engage with task information through fixation data. I first recorded eye movements using Tobii T120 eye tracker (www.tobii.com), an integrated eye tracker machine with a removable monitor. Tobii T120 has been found to be accurate and precise in recording eye movements without a need for a chinrest. Metrics of eye-movements (e.g., visit duration) are then transformed by Tobii Studio, a professional software affiliated with Tobii eye-tracker to

enable users to conduct further analysis. Before I advanced the analysis, I followed the guidelines in the handbook of eye-movements (Liversedge, Gilchrist, & Everling, 2011) to first go through the heat maps, gaze plots, and clustering maps (see figures below) to identify participants who lack sufficient fixation on the screen. Figure 6-11 demonstrates a comparison between typical sufficient eye-movements (regardless of the condition of the demands) versus not sufficient eye-movements based on heat maps, clustering maps, and gaze plots. As Figure 9 shows, participation was excluded because the participation was too limited to even generate a cluster map. Information from heat maps, cluster maps, and gaze plots was considered holistically for the decision to retain or exclude the data.

Figure 6.
Study 2. A typical heat map (regardless of the condition of the demands and the task) from a retained participant.

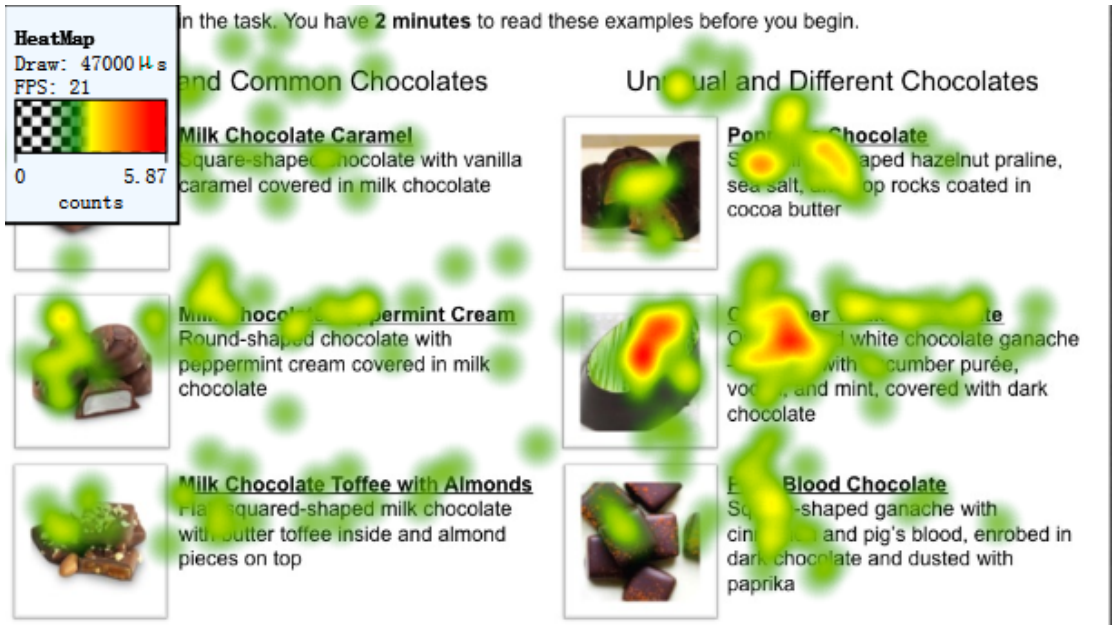


Figure 7.
Study 2. A typical heat map (regardless of the condition of the demands and the task) from an excluded participant.

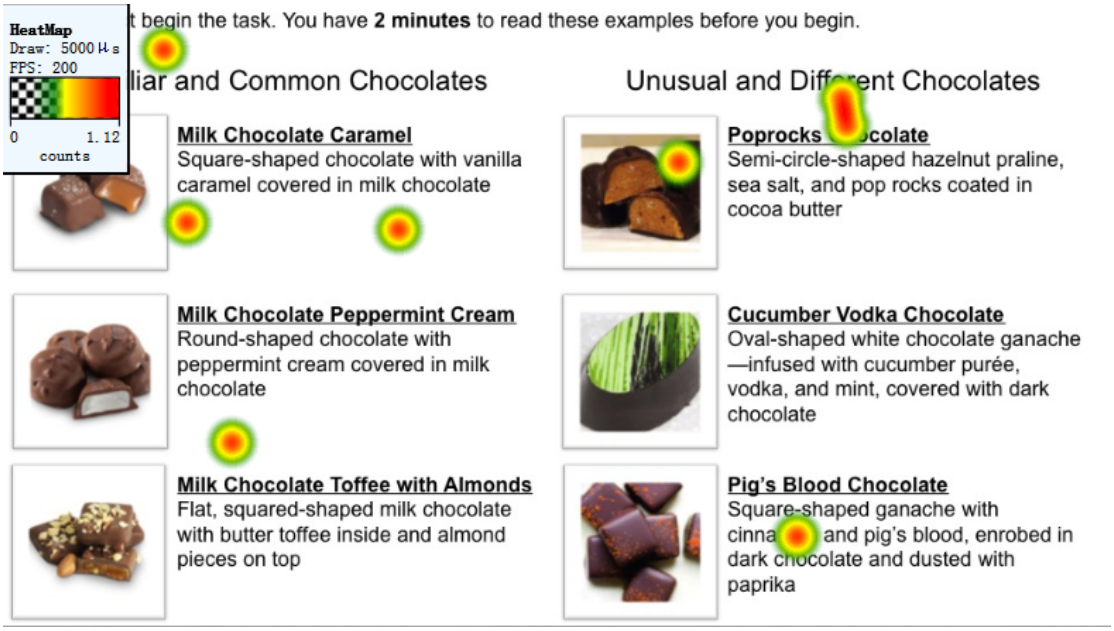


Figure 8.
Study 2. A typical cluster map (regardless of the condition of the demands and the task) from a retained participant.

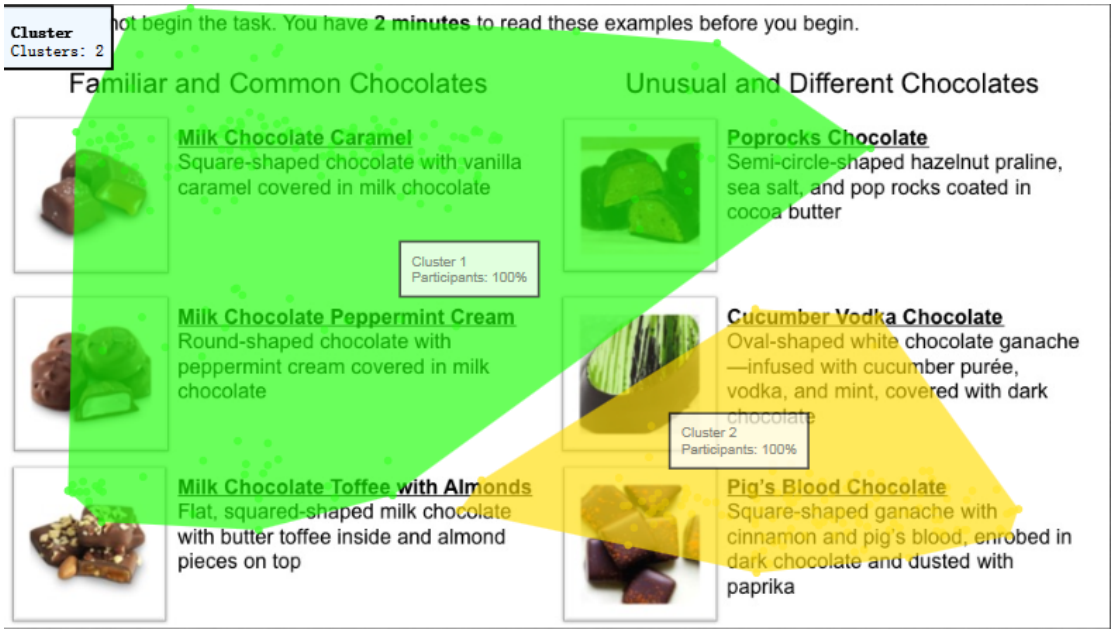


Figure 9.
Study 2. A typical cluster map (regardless of the condition of the demands and the task) from an excluded participant.

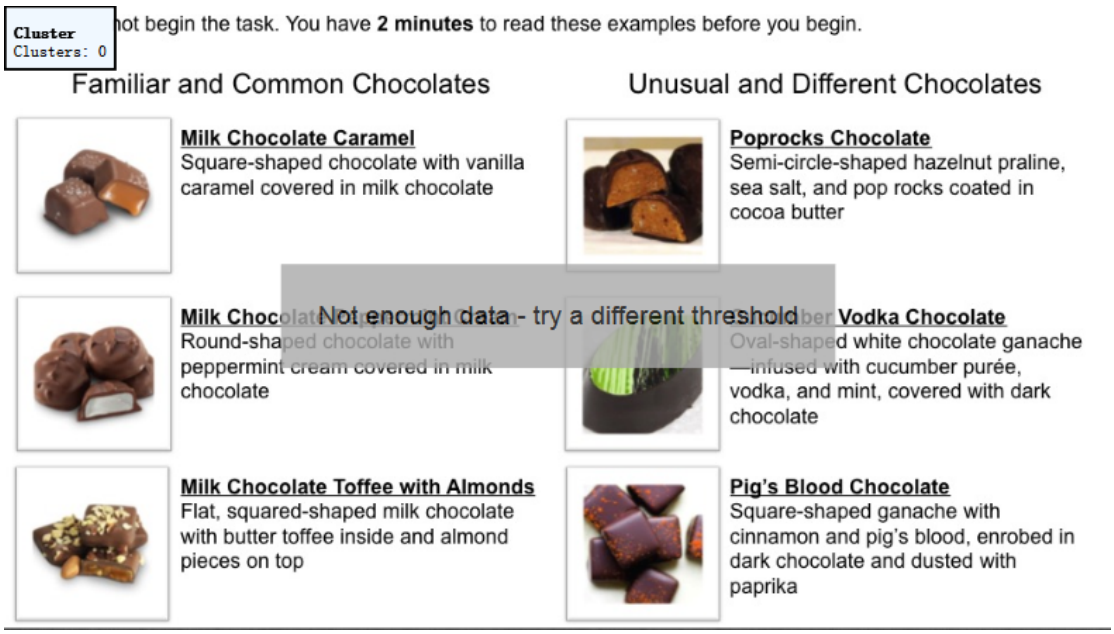


Figure 10.
Study 2. A typical gaze plot (regardless of the condition of the demands and the task) from a retained participant.

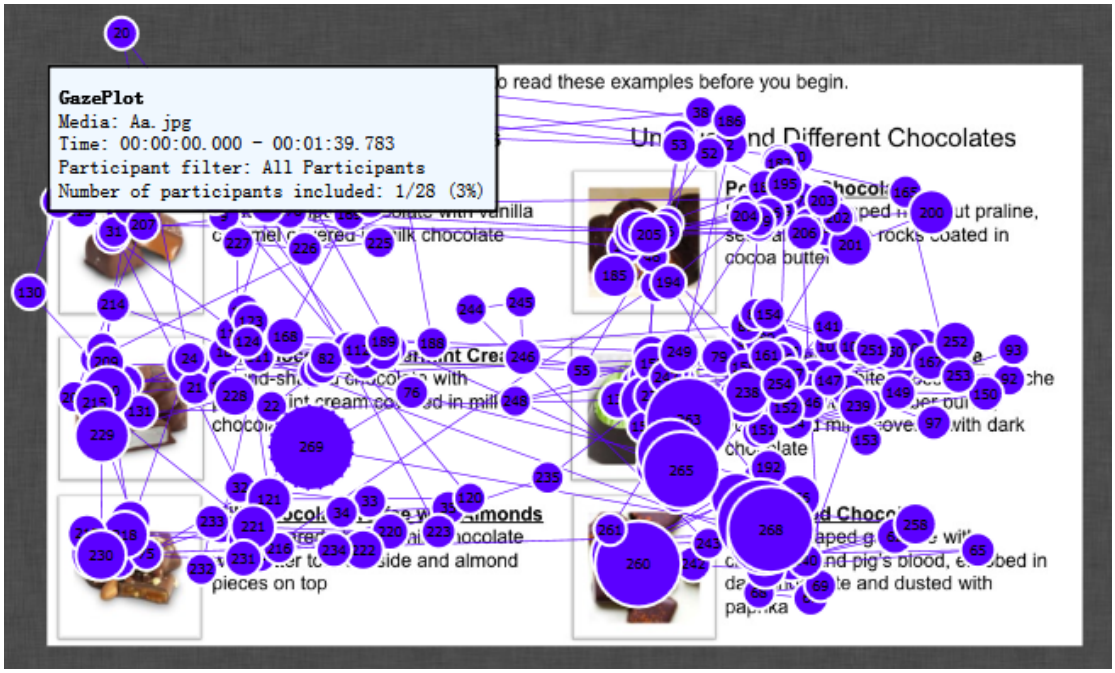
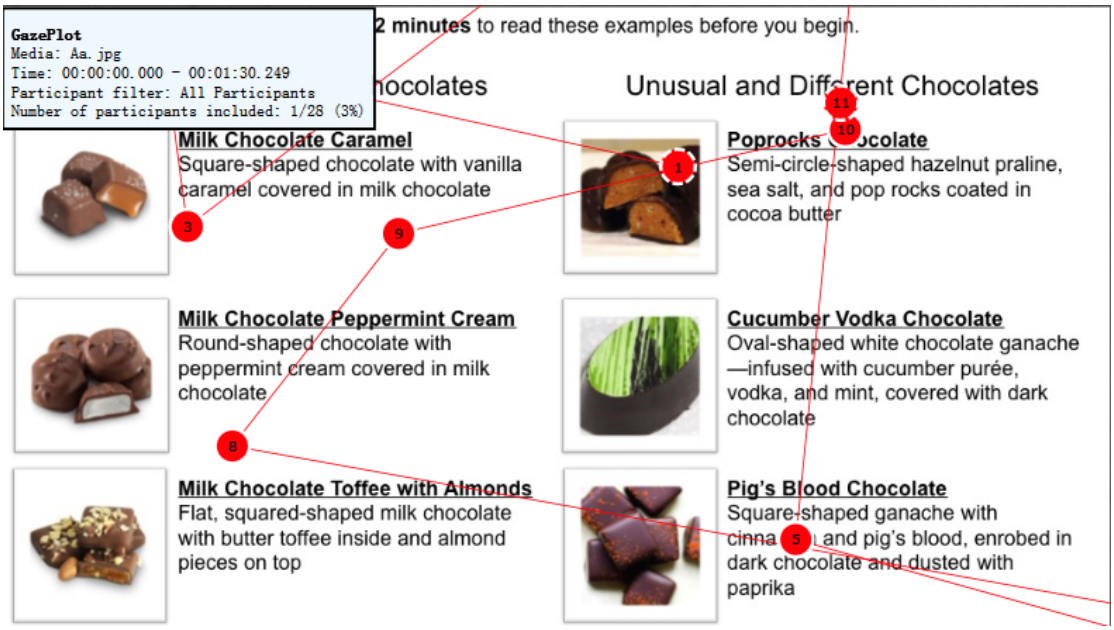


Figure 11.
Study 2. A typical gaze plot (regardless of the condition of the demands and the task) from an excluded participant.

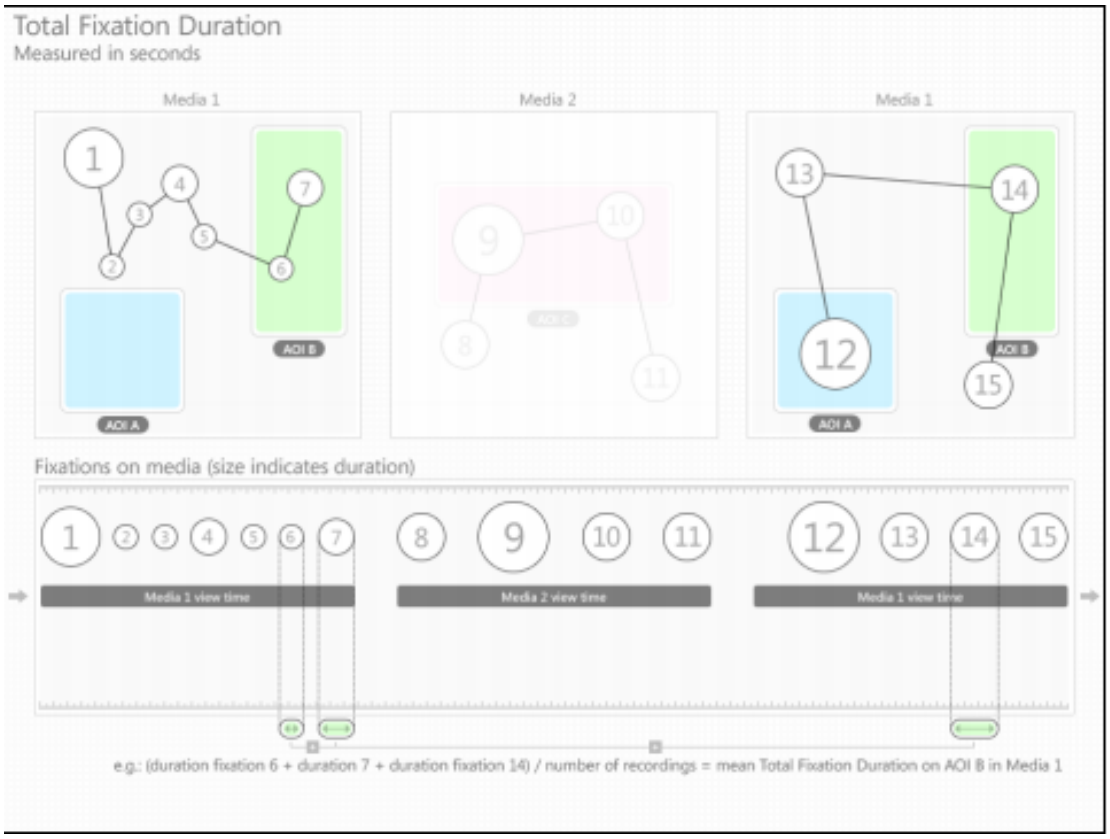


During the experiments, Tobii Studio collected raw eye movement data and transformed to fixation-based metrics for researchers' further needs (detailed introduction can be found at Tobii Studio' user manual from https://www.tobiipro.com/learn-and-support/learn/tobii-pro-studio/). After the focused area of interests (AOIs) defined, Tobii Studio returned a list of self-selecting variables (e.g., fixation duration, visit duration, fixation counts) that can be exported in metric form.

In this study, I marked several AOIs to compute the engagement of competing information. One AOI refers to the area that encompasses all information, and two other AOIs encompass information of the single elements of a paradox. I then calculated total fixation duration metric (see Figure 12 for an illustration) of each individual visit within an AOI (a visit is defined as the interval of time between the first fixation on the AOI and the next fixation outside the AOI). Based on this, I then calculated the duration that a participant's attention travels between the two single elements by subtracting the visit duration of single elements from the visit duration of

competing information. By doing so, I was able to surface how much time one's attention travels between the two single elements, which I termed as "Cognitive Engagement".

Figure 12.
Study 2. Illustration of calculation of total fixation duration.



Paradox Mindset (PM). I used the same nine-item scale developed by Miron-Spektor et al. (2018). Sample items include "I am comfortable dealing with conflicting demands at the same time" and "Tension between ideas energize me" (1 = strongly disagree; 7 = strongly agree; Cronbach's $\alpha = 0.84$; $M = 5.00$, $SD = 0.73$).

Other variables. I also included age and gender as control variables.

7.5 Results

To examine hypothesis 3 and 4, I conducted the ordinary least square (OLS) regression analysis to test how paradox mindset facilitates individuals' cognitive engagement with competing demands. I regressed cognitive engagement on competing demand condition (DC; 1 = competing demands, 0 = single-element demands), paradox mindset (PM), and the demand condition (DC) X paradox mindset (PM) interaction in three models. The results are presented in Table 4. As shown in the table, hypothesis 3 was not supported, suggesting that the participants under competing demands did not show a significantly lower engagement (b = -5.72, p = 0.09). It might worth noticing is that the effect is trending, suggesting that people under competing demands, they were trending to be less engaged with the competing information. Hypothesis 4 was supported, as I found a significant two-way interaction between demand condition and PM on individuals' engagement with the competing task information (b = 1.27, p = 0.05). Figure 13 illustrates this result. To be more specific, when individuals are under competing demands condition (as opposed to a single-element demands condition), those with a high paradox mindset exhibited more engagement with the paradoxical demand information.

Table 4.

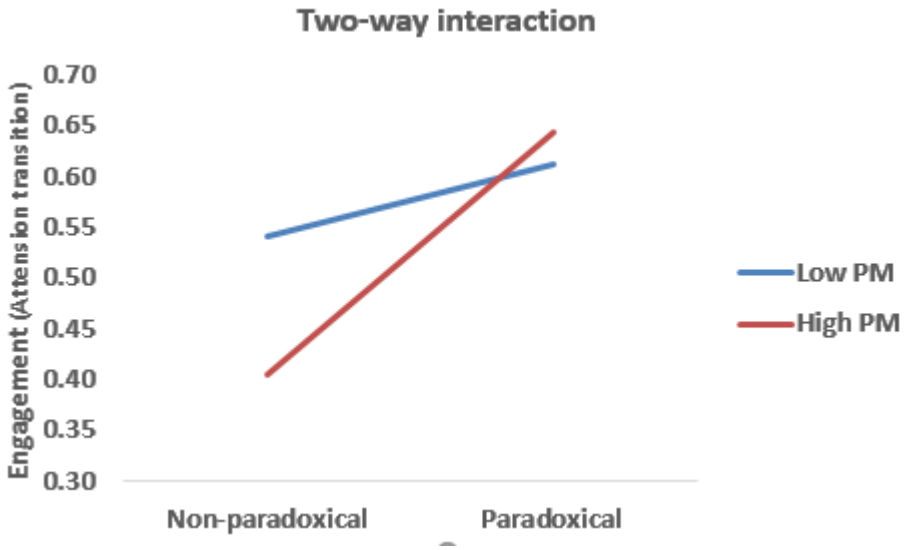
Study 2. OLS regression results on cognitive engagement

	Model 1	Model 2	Model 3
Constant			
B	3.56	5.08	7.99**
SE	0.32	1.68	2.24
Demand Condition (DC)			
B	0.65	0.64	-5.72
SE	0.46	0.46	3.31
Paradox Mindset (PM)			

B		-0.3	-0.88*
SE		0.33	0.44
DC * PM			
B			1.27*
SE			0.65
R^2	0.01	0.02	0.04
Adjusted R2	0.01	0.01	0.02

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Figure 13.
Study 2. Two-way interaction of competing demand (paradoxical vs. single element) and paradox mindset (PM) on cognitive engagement.



7.6 Summary

Results of this study supported hypothesis 4 but not hypothesis 3 by demonstrating that paradox mindset facilities individuals' cognitive engagement with competing task demands, so that people with a high paradox mindset are more engaged with the demands than their low paradox mindset counterparts. Specifically, the condition effect was not significant, suggesting that people tend to process available task-related information regardless of whether the demands require them to engage with both sides. Considering the experiment presented

the competing demands on the screen despite whether the participants were asked to complete a single demand or competing demands, individuals' visual attention was not fully directed by their demands – meaning that they tend to go through and process the information at hand no matter if the information is directly related or not to their task requirements. However, the effect of paradox mindset suggests that individual difference impacts how individuals acquire and process information. A high paradox mindset, as opposed to a low paradox mindset, directs individuals to engage more with the information, even the information appears to be contradictory. On the other words, this general tendency to accept, value, and embrace paradoxes "motivates" individuals to be more aware of and willing to deal with both polarities simultaneously.

Chapter 8. Study 3: a field study with entrepreneurial architects in China

To further understand the role of paradox mindset in organizational actors' emotional and cognitive experience with competing demands, I then conducted a qualitative study with entrepreneurial architects in China. By approaching the information "in vivo" (Van Maanen, 1979: 520), this field study aimed to reveal how the laboratory findings are manifested in the field (Jick, 1979). By combining ten interviews I conducted with the entrepreneurial architects and 32 second-hand interviews from an academic journal in architecture, I first categorized the competing demands surfaced from these 42 interviews, followed by analyzing how the architects feel about and think about those competing demands. At the same time, I had the designs mentioned in the interview rated by massive raters in an online survey platform (So-jump) on to what extent the design fulfills each of the competing demands. By mapping the text analysis results and the design rating results, I found that architects who are able to show more engagement with the demands received high design ratings on both poles of competing demands, and at the same time they exhibited comfort rather than tensional responses (e.g., frustration, anxiety, stressed). By contrast, architects that show less engagement and explicitly express their tensional feelings about the competing demands received only high ratings on one pole of competing demands or low ratings on both poles.

8.1 Empirical context

The target group of architects in this study is founders or co-founders of independent design studios in China. They are the ultimate persons liable to the competing demands they encounter from different stakeholders, including firms, clients, and third parties (e.g., policy makers). At the same time, these architects compete with their professional peers and turn to professional associations for reputation promotion. Rather than the "Ah-ha" movements when creative ideas sparks, principal architects are required to constantly respond to competing demands when producing the design. For example, during the design process, architects express their own aesthetic appetite while saving as much cost as possible for the clients, learning, incorporating, and reinventing from different conventions into the final products. When they address the customized needs for their clients, they may also consider how the public and other experts will evaluate, since creative products are often exposed to the public, propagated and judged by the public and professionals, resulting in professional reputation and fame (Boutinot et al., 2017). Therefore, the entrepreneurial architects sample is a theoretically relevant context for my inquiry on how individuals actually experience competing demands emotionally and cognitively in the field.

8.2 Data collection

I collected the data from multiple sources, primarily semi-structured interviews, supplemented with archival documents, and survey data.

Interviews.

I conducted semi-structured interviews with ten Chinese entrepreneurial architects (group A). Each interview lasted between 33 to 96 minutes, with an average of 52 minutes in length. A typical interview started by asking 1) the architect's role in the studio to confirm that their founders or co-founder status; 2) a representative project within the last two years that the architect functioned as the primary designer; 3) the challenges that the architect experienced during the design process; 4) the aims that the architect wanted to achieve through this project; 5) why the listed challenges were challenging; 6) whether the architect experienced different challenges in his or her previous experience as the primary designer, what those challenges are, and why they are challenging. See appendix 1a for the original protocol in Chinese.

Survey.

The architects completed a survey about themselves and their studios/firms a week before they were interviewed. The questions on their personal information included their age, educational background, ethnic group, religion, marital status, satisfactory of their current career status, and their experience as principal architects. The questions about their firms included firm tenure and self-reported performance. I coded the rest information of the firms from their official websites, including information about their founding team members, prizes on architects, and full-time employees. I followed Stam and Elfring (2008) to include a subjective performance measure because subjective measures can also provide strong reliability and validity for non-financial-based performance (Dess & Robinson Jr, 1984).

Table 5.
Study 3. Summaries of architects (Group A) interviewed in semi-structured interviews.

ID	Interview length	Gender	Age	Highest Education	Experience as PD[a]	Firm tenure
Architect#01	96	Male	30	Master	3	1
Architect#02	53	Male	33	Master	8	2
Architect#03	49	Male	30	Bachelor	4	2
Architect#05	40	Male	28	Bachelor	3	3
Architect#06	61	Male	35	Master	8	8
Architect#07	55	Male	37	MBA	8	3
Architect#08	46	Male	39	Master	10	6
Architect#09	36	Male	34	Master	1	1
Architect#10	51	Female	37	Master	5	5
Architect#11	33	Male	34	Master	1	1

[a] PD refers to principal designer.

Archival documents.

My archival documents for this study included two parts. The first part has surrounded the interviewees that I conducted semi-interviews with (group A). For group A interviewees, By searching online and asking them directly, I collected additional 15 secondary documents, including the interviews they had with media, such as a world-widely recognized architecture-specialized platform "Archidaily" (https://www.archdaily.com/), and a similar one in China "Position/有方" (http://www.archiposition.com/).

To reduce single-source bias (Eisenhardt, 1989; Yin, 1994, 2017), I also obtained 32 secondary interviews (group B) in the form of transcribed conversations published on *New Architecture*, a leading academic journal in architecture in China, during 2015-2016. Different from academic journals in management, Chinese academic journals in architecture sometimes organize themed interviewing activities and publish transcribed conversations as reports. The journal also listed the interviewees' age, gender, educational background, working experience, and the prizes (if any). Below Figure 14 is an example of the

first page of a report titled *Li Daode (the architect's name): Apart from Technology and Art.*

Figure14.
Study 3. The first page of an exemplary reported interview published in New Architecture

李道德：游离于技术和艺术之外

Li Daode: Apart from Technology and Art

穆威　陈可臻　Mu Wei　Chen Kezhen

中图分类号 TU201　**文献标志码** D　**文章编号** 1000-3959（2014）02-0075-03

1　你何时开始接触建筑学？何时开始从事建造实践？

在进入美院设计系（建筑学院前身）之前，我一直没有想过自己会成为建筑师。记得当年高考志愿上第一志愿是中央美院，第二志愿是中国美院，然后是“不服从分配”，“上美院”是那个年代最单纯的、最原离的理想，然而上了美院之后干什么？真不清楚，但我清楚的是，我不希望做孤芳自赏的艺术家，而是希望我的创作可以被公众所关注，甚至能对他们产生正面的影响。所以，当时就报了设计系，在进一步选专业的时候，选择了我理解的更具有公众性的“建筑设计专业”。然而中央美院的建筑系，即使后来成为建筑学院，在10年前仍然属于绝对的“非主流”且饱受争议。人们在谈论这帮学画画儿的，连高等数学都没学过的人，怎么能建房子呢？这个时候，其实连我们自己也都有这样的疑问。这是一个很痛苦和纠结的时期，一方面，作为当时所谓的“精英教育”的受众（当时建筑设计专业全国招收10－15个人），对自身创造力和“设计能力”的自信，一方面是对建筑师职业的彷徨。我的选择是继续学习，而且一定要去一个“更专业”的学校，专业到只有建筑学，于是我去了AA。AA毕业后，就去了福斯特建筑事务所，这才算是真正参与到建筑设计实践当中了。

2　工作室的名字是怎么来的？

“dEEP”由四个英文单词的首字母缩写而成：design+Elegance+Emotive+Practical。design的含义指我们工作的内容和重点，只要和设计相关的，都可能会是我们的工作；Elegance是指我们对设计风格的一种判断，我们希望我们的设计独特且由内而外具有优雅性，给公众带来正面的影响，而不一味地求奇求怪；Emotive是强调我们作为设计者要带有情感和思考来工作，也希望我们的设计能让人有所感触；Practical是根本，一切设计、优雅、情感都要基于实践，以实际项目为基础进行设计研究与探索，是我们从始至终所坚持的。

3　在这个行业当中四五十岁的建筑师还被称作“青年建筑师”，作为80后，你是如何去获得业主的信任，获得设计委托，并最终将设计实现的呢？

年轻并不等同于无知，设计经验和阅历需要时间的累积，但对待设计的态度，是任何年龄的设计师都可以把握的。我在成立dEEP的时候，其实连一个助手都没有，所有的设计工作，包括排版、打图都要自己动手，一丝不苟。早期甚至很多时候都没有正式的商务合同（当然那个时候也完全不懂），有一点机会，就全身心的投入进去，也正是在那种高强度的工作中，迅速地积累经验，这里的经验包括设计与执业。记得2010年曾经有前辈建筑师朋友来工作室串门，看到我们那两年所做的项目，不由得惊叹：“单从工作内容与数量来看，你们应该是一个中小型设计院的规模才对。”而当时我们也不过三个人，我不知道面对这样的评价是应该开心还是郁闷。

努力工作的同时，我也更加明确了自己作为建筑师的位置。那就是我们所谓的“乙方”并不应该是在“甲方”业主的对立面上，而更多的要从甲方的角度来思考问题，当然也要始终坚持自己创作的初衷，明白自己要的是什么。坚持在实践的第一线，实事求是地面对问题，向使用者、建造者、加工商学习。若能做到努力、认真、实事求是，就不难获得甲方的认可。

4　在最近的751车站改造项目中，你是怎样想到要设计一个可变形的建筑？

可以变形的建筑，是我们一直想要做的。本科的时候虽说是在建筑学院，但毕竟还是在一个艺术的氛围中，老师会鼓励学生找自己的方向，而不是教你该怎么做，会让你寻找自身对空间的感受及表达方式，那时习惯了不受约束，天马行空。之后在AA的学习则是强调设计当中的研究性。当时我们研究生的课题就是Create Space（创造空间），就是讨论构成空间的多种方式和可能性，这也延续了之前的课题：Responsive Environment（互应环境），强调建筑、城市等空间是随着外界信息条件的不同而发生相应的变化和反应。我们所理解的建筑与城市，不是一个静止的状态，而是一个动态的系统。在福斯特建筑

李道德
出生年月：1981年2月
籍贯：开封
教育背景：
中央美术学院建筑学院建筑学专业
英国伦敦建筑联盟建筑学院（AA School）设计研究实验室（DRL）
职业经历：
在回国创立dEEP设计事务所之前，工作于伦敦福斯特建筑事务所（Foster+Partners）
自我介绍：
画画与打篮球是在我成为建筑师之前最有兴趣的事情。我从小喜欢画画，记得小学四年级的时候还像模像样地在学校办过个人画展。另外从初中到大学一直是校篮球队的主力前锋。所以少年时的梦想是成为一名会画画的职业篮球运动员，或者是一名会打篮球的艺术家。但是读了建筑之后，这些梦想都破灭了。
关于80后的记忆：
回忆起小时候，好像没有太多玩的时间，记得每周末去少年宫学画的时候，家人会给一两块钱，那会儿是五毛钱一碗凉皮，我会不舍得花都攒起来去买变形金刚，那会儿对我来说这可是相当奢侈的事西。

关于李道德　一个天生具有自我主张和判断的新一代建筑师。

通过他在中央美院建筑学院、美国AA建筑学院、美国福斯特建筑事务所等一系列“主流”经历，他能轻松地洞察建筑世界中的轻重缓急与“大是大非”的问题，明确自己的方向。专注于建筑实践，李道德带领着他的dEEP团队把建筑带离了“艺术”与“技术”之无意义的争论。当然，这有他天生的条件，还有后天的努力与遭逢，只要大家不被炉前灶后机会，他必然能成为一个备受尊重的国际建筑师。

易介中
中国社会科学院哲学博士后
中央美术学院艺术史论博士
美国南加州建筑学院硕士

作者单位：华中科技大学建筑与城市规划学院（武汉，430074）

I defined this group of architects as group B. Two participants from group A were also in group B. *New Architecture* titled the theme of these 32 interviews as "Harmony in diversity: a review of post-1980s architects special report in New Architecture". What is interesting is that even the title of the previous exemplary report and also the theme of these 32 interviews are using seemingly contradictory elements: "technology vs. art" and "harmony vs. diversity."

One editor in chief and his colleagues conducted these 32 interviews during 2014-2015 and published two to three reports on each volume of the journal during 2015-2016. I received these articles (and also the materials about the interviewed architects and the projects they mentioned during the interviews) from the editorial team. I also confirmed with them that the published transcription-based reports were directly transcribed from the inter,views, with modifications for formal expression under the authorization of the interviewees, assuming that these interviews are reliable sources to represent what these architects were thinking and experiencing in their design career.

8.3 Method of analysis

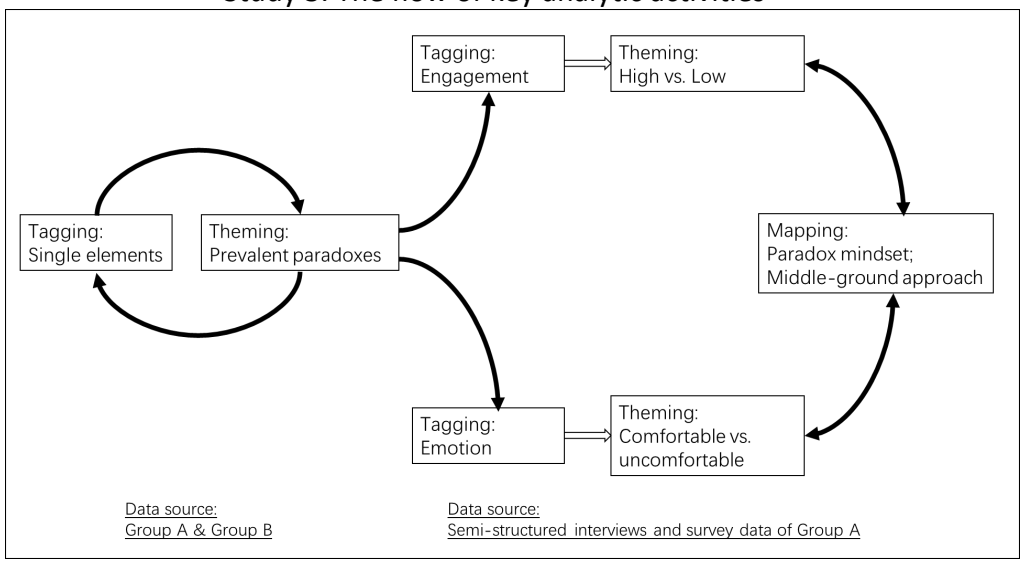
The goal of this study is to provide field-grounded evidence of how creative producers cognitively and emotionally experience the competing demands during their creative production.

I first obtained basic demographic information of both group A and group B architects, including age, gender, educational background, and previous work experience. Two architects were in both groups. While group comparison on demographic information showed that group B architects were not radically different from group A architects, I used the interviews from both groups to

reduce single-source bias (Eisenhardt, 1989; Hartley, 2004) when surfacing the key paradoxical demands.

Following previous qualitative literature on organizational paradox (e.g., Jay, 2013), my overall analytic approach was iterative with several activities: tagging, theming, and mapping (Eisenhardt, 1989).

Figure 15.
Study 3. The flow of key analytic activities



I used Nvivo 11 for all coding activities. As indicated in Figure 15 above, my initial rounds of coding aimed to identify all contradictory yet interrelated elements during the design process (Lewis, 2000; Smith & Lewis, 2011). While Jay (2013) argued that some paradoxes are more salient because of the outcomes, this study was exempted from such concern, as part of study's main focus is to identify to what extent creative producers saliently engage with the demands. Therefore, less salient elements and paradoxes suggest less engagement from the actors.

As described earlier about my interview protocol, I tried to surface the competing single elements by asking the interviewees about the challenges they encountered and the goals they aimed to reach during producing a design (e.g.,

Jay, 2013; Smith, 2014). I then first coded the verbatim transcripts of the ten semi-structured interviews of group A, which is my primary materials for the whole analysis, following by secondary materials of group A for complementation. I then coded the 32 interviews from Group B and linked back to literature to make sure I captured all salient elements and paradoxes to my best effort. The tagging of single elements constituted the first layer of coding, and the theming of paradoxes from these elements constituted the second layer of coding. This second layer of coding involved identifying the paradoxes from the single elements and also categorizing the types of the paradoxes identified. For example, satisfying a customer's specific needs may contradict with how the principal designer manage his project teams internally, and I categorized this as an organizing paradox; but when the customers' specific needs contradict the design philosophy that the principal designer holds, I categorized as a belonging paradox.

The process was iterative, and I referred to qualitative literature for identifying single elements and paradoxes (e.g., Andriopoulos, Gotsi, Lewis, & Ingram, 2018; Jarzabkowski, Lê, & Van de Ven, 2013; Jarzabkowski & Lê, 2017; Smith, 2014), and literature on creative industries (e.g., Caves, 2000; Hartley, 2005; Jones, Anand, & Alvarez, 2005; Jones, Svejenova, Pedersen, & Townley, 2016) and creative production (see Hadida, 2015 for a recent review) for alternative elements.

Following previous qualitative work on competing demands and organizational paradoxes (e.g., Jarzabkowski & Lê, 2017), I identified paradoxes through several signals. The first one is linguistic cues when the interviewees explicitly use oppositional and contrasting language when describing the challenges they experience. For example, an interviewee described as "… 这样一

个传统的东西和正在做的业务的气质能有一个融合，这是他需求的一个矛盾点/…one **contradiction** is that the integration of the very traditional thing (memorial archway) and the (modern) business of the firm [note: it's a technology-based firm]." The second one is when the designer expressed frustration and/or defensiveness, I then went back to the associated texts to identify what led to the frustration and/or defensiveness, and whether the causes are interdependent contradictions. If so, I then categorized as a paradox too. The third one is to compare between the interviews and literature on creative industries to make sure I do not miss important contradictions.

In the next stage, I coded for engagement with the poles of competing demands and emotional or tensional experience, but only within the ten semi-structured interviews from group A for the next stage of mapping, as only group A was available for additional survey measures on their individual approaches to paradoxes (e.g., paradox mindset).

To code how informants engage with the polarized demands, I looked at the possible patterns they might exhibit during the design and coded accordingly. First, engagement with only one pole temporally or permanently. The architects may engage with only one pole by attending to one demand and ignoring the other (categorized as "ignorance"; Drummond, 1998), by choosing one and repressing the tensions (categorized as "repression"; Kraatz & Block, 2008; Lewis, 2000; Vince & Broussine, 1996), or by denial.

Second, engagement with both poles, but in a defensive rather than accepting way. The defensive response provides temporary relief to the actors, but also leads to vicious cycles in the long run as the tensions keep intensifying negatively (Lewis, 2000). Individuals may engage with both poles by address a

bit of each demand and seek a bland compromising solution (categorized as "ambivalence", Lewis, 2000; Murnighan & Conlon, 1991), or spatially separate the demands to different people or groups, or address one first, then the other (categorized as "splitting", Poole & van de Ven, 1989), or adopt what has been done previously from their experience and knowledge of the industry (categorized as "regression", Lewis, 2000; Vince & Broussine, 1996), or argue how one should be dominant than the other and thus override one on the other demand (categorized as "suppressing", Jarzabkowski et al., 2013).

Third, engagement with both poles and feel comfortable. We expect that for people with a high paradox mindset, they will be able to recognize both poles, understand the contradiction and relatedness, consider the contradiction and relatedness as natural of their work, thinking of how one pole can complement the other, recognize and accept the possibility and need to achieve both. I expected some positive and even uplifting language in their description, such as “opportunities” “exciting” and “necessary and natural” when they describe their experience with the competing demands.

The next step was about measuring emotion. As Elfenbein’s defined (2007: 315), emotion is a process that “begins with a focal individual who is exposed to an eliciting stimulus, registers the stimulus for its meaning, and experiences a feeling state and physiological changes, with downstream consequences for attitudes, behaviors, and cognition, as well as facial expressions and other emotionally expressive cues.” Following this definition, I captured creative producers’ emotional experience from both their feeling state in the creative production in the field and instant physiological change in the lab (study 2). In study 2, I recorded individuals’ physiological arousal to capture their instant

arousal, as a proxy to understand their stress level. I found that individuals who are more comfortable with competing for task demands (i.e., high paradox mindset) also experience less arousal when they are given paradoxical task demands. In this field study, while I do not have the privilege to record actors' stress during the production, I identified their emotional experience from language clues (e.g., Jarzabkowski & Lê, 2017) in the text of their experience with creative production, including how they experienced and handled the challenges from different demands. I coded instances that the interviewees explicitly indicated their tension experience based on tension-related language clues, such as "tensions," "yet," "but," "balance," and "on the one hand/on the other hand" (e.g., Andriopoulos & Lewis, 2009; Smith, 2014).

8.4 Evaluation of design performance

The value of creative products is often intangible and difficult to assess. Existing literature pointed out three types of evaluation systems based on the evaluators: market selection, peer selection, and expert selection (Wijnberg & Gemser, 2000). For this study, I collected market selection as opposed to the other two due to resource constraints.

I first collected 215 responses, each participant rated five architects' designs on eight criteria, including innovativeness, commercial viability, east, west, traditional, modern, creativity, and authenticity based on their lay perception (nine-point scale, 1 = strongly disagree, 9 = strong agree; a sample question page view is at Appendix 1a) . One rating was excluded because the rater failed to answer the decoy question correctly, resulting in 214 survey responses. Each architect's design was therefore rated 107 rounds on each of the eight criteria. I

then aggregated all the ratings and categorized the architects to two groups based on their ratings on each criteria. The first group, "High on competing demands," refers to architects whose designs were rated high on at least a pair of competing demands. The second group, "Low on competing demands," refers to architects whose designs were rated as not high on any pair of competing demands, regardless of whether the score is high on a single demand or the score is low on a pair of competing demands. A score is considered high if it is ranked as top five among ten scores. Table 6 lists results for all interviewed architects (Group A).

Table 6.
Study 3. Rating performance of architects' design on the competing demands.

		Innovative	Commercial	Authentic	Creative
High on competing demands	Architect#6	7.25	7.78	6.91	7.21
	Architect#10	6.92	7.28	7.13	6.94
	Architect#3	7.23	6.78	6.83	7.39
	Architect#7	7.10	6.80	6.42	7.21
	Architect#2	7.08	6.45	6.91	7.02
Low on competing demands	Architect#11	6.05	5.62	6.06	5.98
	Architect#9	6.30	6.94	6.65	6.32
	Architect#8	6.32	5.84	6.81	6.39
	Architect#1	6.82	5.76	6.78	6.62
	Architect#5	6.34	6.16	6.82	6.69

8.5 Results

Stage 1. Identify competing demands and paradoxes during architecture design.

As expected, the single demands naturally flowed out of the transcripts. These demands are supported in the literature of creative industries. I then termed the demands as different coding nodes in NVivo and coded throughout the transcribed texts again. Four stakeholders were heavily mentioned: clients, themselves, governments, and the public. Each stakeholder carried unique

requirements. For clients, their demands included: economic concern or a very tight budget, identity needs so that the design has to fit and somehow promote their identity (e.g., technology-based startup asked the architect to design their office fitting their "tech" identity, whereas another art-based startup asked the architect to reveal art-alike identity in the design.), time requirements.

For the architects themselves, their aims in the design included: experimenting new design ideas or materials (for future publish in reputable journals and websites), building up their own reputation in the field, and designing something "they like" or their own artistic and philosophical preference.

The government party was mentioned because some designs have to take the government's specific (and often changing) requirements into consideration. Architects also described how their consideration of the public's potential needs and lifestyles (e.g., the architects need to consider the local conventional culture when designing a new hotel in Shangri-La and Dali – Erhai, both are famous for their special local culture while the architects also want to express something "modern") impacted their design.

In an iterative process, I categorized the single elements to the following: economic concerns, time constraints, artistic expression, be innovative or distinct, commercial value and viability, authenticity, incorporating traditional or local cultural elements into the design, incorporating modern elements or techniques into the design, incorporate global elements into the design, experimenting new designs or materials, identity concern.

Stage 2. Code for engagement with the competing demands and sentiment expressions.

I identified three different levels of engagement with the competing demands from the design process. First, the architects see only one pole of a paradox. For example, one architect mostly focused only one side, such as how he practiced his new design ideas in the focal project, rather than seeing how his own need might contradict with the client's need. Therefore, he does not see competing demands as competing ("ignorance" response). Even when close to the end of the interview, I asked him that if he has to deal with hypothetical paradoxical situations, and he responded with a "separation" tactic by assigning the competing demands to different persons: "…如果你有团队的话，这个事情就特别好处理了，团队里面可能有人选这个，有人选那个…所以从这个角度来讲，最终怎么解决，要团队来解决，不要自己去解决，团队给你配好了。/ … it's very easy to handle [the paradoxical situation] if you have a team, because the team members may choose different [elements of a paradox]… So in this sense, the solution should be from the team rather than from individuals, and the team will settle it."

Here is another example from a different participant that showed selective engagement with mostly only one demand rather than both. Frustration accompanied: "感觉很崩溃。太复杂了，一旦经验不足，或者是能力不足，你很难同时处理好这么多问题…/ felt very frustrated. It is so complex that it is very challenging to handle all of them if you do not have enough experience or capability…"

The second type is that the architects pay attention to multiple demands but in a non-competing way. Instead of recognizing the demands are competing yet interrelating, this type is more about compromising. As one interviewer described, for example: "所以我们是在做更多的尝试，不是说凭空创造一个谁也没有见

过的空间类型，而更多的是把场景重新提取出来，做出一些有创意性的组合，做一些别人想不到的植入…/ we have been trying to, rather than create a new space that no one has ever seen, but more about recombine existing scenarios, and inputting some elements that others may not think of…"

The third type is that some architects were able to recognize contradictory yet interrelated demands and were able to identify the reasons how the demands were interdependent yet contradicting. Some of them were able to explicitly talking about how they identified the contradictions (矛盾) and value the contradictions as opportunities while I did not ask nor use the word "contradiction/矛盾" in the conversation until the architects started with it.

For example, one architect described the challenge she encountered: "所以要在很短时间内去觉得一件能觉得还满意的作品，这是比较大的挑战，也是它能够顺利实施的一个前提，时间足够短，足够紧张，反倒规定很快速，避免了很多不必要的环节。/So it is a big challenge to produce a design within a short time frame and satisfaction. But it becomes the premise of the production of this design, as the constraints of help to avoid unnecessary steps." In another example, an architect was asked to provide high-quality design for a tech-startup's office within a strict budget. While he used an analogy to explain his solution, he also summarized his attitude towards such contradictions as "我们设计的立足点在于解决矛盾，那矛盾如果很突出，可能你的设计能够翘动的价值就越高，这其实反向的也给你的设计带来很多的出发点/The foothold of our design is to solve contradictions, so if the contradictions are salient, which means the design could be more valuable, then this opens many starting points for the design." The similarity of both quotes is that they both treat the challenge from competing demands as opportunities rather than threats.

Stage 3. Mapping.

After blindly analyzed the corpus in parallel with having the designs rated, I then matched the performance rating results with the coding results on cognitive engagement and emotional expression. And found that those whose designs were rated as better and simultaneously satisfying competing demands are also able to engage with competing demands while tend to be more comfortable with the demands. As opposed to the other group whose designs were not considered as satisfying competing demands, this group of "better performers" value and treat contradictions as opportunities to produce better designs.

8.6 Summary

In this study, I inductively explored how entrepreneurial architects emotionally and cognitively experience competing work demands, and the findings provided some initiative evidence from the field for further examinations. I found that architects who are able to show more engagement with the competing demands received high design ratings on both poles of the demands, and at the same time, they exhibited comfort rather than tensional responses (e.g., frustration, anxiety, stressed). By contrast, architects that show less engagement and explicitly express their tensional feelings about the competing demands received only high ratings on one pole of competing demands or low ratings on both poles. The findings show some peripheral evidence that individuals who are more comfortable yet more engaged with competing demands can gain an emotional and cognitive advantage in handing competing demands. However, several drawbacks remain. First, while the major focus of the thesis in how paradox mindset facilitates individuals' emotional and cognitive experience, this first study was not able to address how people with different levels of

paradox mindset experience differently. This is most probably due to two reasons: the sample size and the ceiling effect. As it is deeply rooted in their traditional philosophical thinking, East Asians are more likely than Westerners to accept and embrace simultaneous competing demands. Thus, the focal group of this study scored high (average is 5.7, lowest score is 5, and the highest score is 7, 7-point Likert scale) on paradox mindset scale, reflecting a ceiling effect. This ceiling effect is further worsted by the small sample size of first-hand interviews that the sample size did not provide sufficient room for people with enough diversity on their levels of paradox mindset. Therefore, future work should increase the sample size of first-hand interviews and recruit participants with more diversity. In addition, future work could also recruit non-entrepreneurial architects, such as architects in real estate companies, to explore how role differences impact the way they approach competing demands.

Despite the limitations, this study provides initial field accounts on that people who are generally more comfortable with competing demands and more engaging with how the opposing poles relate to and different from each other tend to simultaneously fulfill the contradictory demands better. The following two studies aim to provide physiological and neurological evidence to further understand how paradox mindset facilitate individuals' experience with competing demands.

Chapter 9. Discussion and Conclusion

Paradox mindset––a general propensity to value, accept and embrace paradoxes––has been recognized as the key to unfolding the positive potential of the stressful experience generally associated with paradoxes (Miron-Spektor et al., 2011; Miron-Spektor et al., 2018; Smith, 2014). However, how paradox mindset impacts individuals' experiences with paradoxes remain unclear. By examining the physiological and neurological manifestation of stress and cognitive engagement, this study aimed to uncover the emotional and cognitive mechanisms underlying the role of paradox mindset. Unlike previous studies that have examined individuals' subjective interpretations of emotional and cognitive responses, I looked at how paradox mindset plays a direct role in individuals' concurrent physiological and neurological responses towards paradoxes. To further understand the downstream effect, and also to increase the external validity and generalizability of the study, I triangulated laboratory studies with an inductive field investigation. Together, these empirically revealed how a high paradox mindset enables a decrease in physiological arousal and an increase in cognitive engagement when individuals are presented with paradoxes.

Specifically, in replicating the findings of qualitative psychoanalytical works on the anxiety and stress that characterize the paradox experience (e.g., Vince & Broussine, 1996), the results revealed that individuals' electrodermal activity was relatively higher (supporting Hypothesis 1) when the demands they faced were competing. Because the electrodermal activity is controlled by the

sympathetic nervous system, and thus reflects the body's automatic response to stimuli (Boucsein, 2012), the results suggest that the physiological arousal stemming from competing demands precedes conscious reasoning. In fact, according to the somatic marker hypothesis, SCR responses provide anticipatory signals to the brain that orient the organism to respond (Öhlund, Lindström, & Öhman, 1992). Therefore, the physiological arousal results suggest that individuals' responses to competing demands begin with the body, which informs the mind and behavior.

The laboratory results also found that both the physiological response to, and cognitive engagement in, paradoxical demands were contingent on the individuals' overall approaches to paradoxes (supporting Hypotheses 2 and 4). When facing competing demands, individuals with a high paradox mindset had relatively lower SCR levels, while at the same time being more cognitively engaged with the demands compared to those with a low paradox mindset. As discussed above, the body's physiological response to stimuli precedes conscious reasoning (Nava et al., 2016). Therefore, by demonstrating that individuals whose mindset prepares them to be more comfortable with paradoxes experience less physiological arousal and more cognitive engagement, the results suggest that individuals' attitudes to paradoxes can mitigate the impact of paradoxical demands on both the physiological manifestations of, and cognitive capability of dealing with, stress.

Several possible reasons could account for the lack of significant evidence for whether individuals experience lower cognitive engagement in general when facing paradoxical situations, as opposed to facing non-paradoxical situations (Hypothesis 2 was not supported). Considering the results showed a trend, size

could be one reason. Also, the individuals may have gone through the competing information on the screen, despite the demands they had been asked to accomplish, thus mixing up the expected results. The cognitive process might also involve other complexities besides individual differences relating to the paradox mindset. For example, Leung et al. (2018) found that individuals who embrace a high middle-ground approach (i.e., sought compromises between competing demands) tend to partially incorporate both demands, but do not strive to push the boundaries of each demand. Therefore, individuals with a high middle-ground approach might exhibit seemingly similar eye movements, complicating the results from the presented situations. Thus, a lack of significant evidence for individuals' general cognitive engagement indicates that further empirical investigation is required.

The field investigation aimed to further the findings from the laboratory studies in the context of industry practices. The creative industries routinely deal with paradoxes, which has long been recognized (e.g., Caves, 2000; Lampel et al., 2000). By compiling, and exploring the richness in, the personal and archival interviews, and independent performance ratings I obtained, I found that architects who were able to show greater engagement with competing demands received high design ratings on both poles of the demands and, at the same time, experienced comfort rather than tensional responses (e.g. frustration, anxiety, stress). In contrast, architects who showed less engagement, and who explicitly expressed their tensional feelings about competing demands, received high ratings only on one pole of the competing demands or low ratings on both poles. These findings suggest that individuals who are more comfortable and more

engaged with competing demands can gain emotional and cognitive advantages that help them to simultaneously address the paradoxical demands better.

By triangulating the quantitative results from the two experiments and the qualitative insights from the architects, there is a suggestion that, in a creative production setting, a general tendency to value, accept and embrace competing demands promotes individuals' capability to simultaneously handle the polarities while experiencing only low arousal. Therefore, it is quite likely that the mechanism underlying the performance promoted by individuals' approaches to competing demands is comfort, rather than the more aroused active emotion of excitement. Emotions can reduce both short-term and long-term impacts on the mind and body. Comfort––based on both the qualitative and physiological accounts––is more likely to provide short-term relief of the stress triggered by competing demands, and also a longer-term cognitive advantage to iteratively perceive and process the demands, eventually benefiting the performance of addressing the competing demands, as illustrated by the market ratings for the interviewed architects' designs.

In addition, I found that, even among individuals who generally felt uncomfortable with paradoxes, those with a lower propensity to seek a middle-ground solution to resolving paradoxes also experienced relatively lower SCR responses (but not changes in cognitive engagement) when facing paradoxical demands. This result reveals that the tactics that individuals adopt to manage paradoxical demands can also influence their level of stress. Specifically, the results suggest that the use of the middle-ground tactic, which only partially satisfies both elements of a paradox, exacerbates the level of stress because such effort does not allow an immediate sense of resolution, whereas alternative

tactics, such as when an individual temporally splits the demands, temporarily resolve contradictions. A lack of change in cognitive engagement is probably due to the nature of the middle-ground approach, which stresses the motivation to seek compromising solutions for both poles. Therefore, individuals are motivated to direct attention to both demands, but rather than trying to push boundaries and be transcendent, they approach each demand separately for a crude and superficial solution to each.

9.1 Theoretical contribution

The results of the studies contribute to the literature in several ways. First, it contributes to the study of the role of emotions (see Jarrett & Vince, 2017 for a review) and cognition (see Keller & Chen, 2017 for a review) in individuals' experiences with paradoxes, both of which are central components of organizational paradox theory (e.g., Schad et al., 2016). My results point to a complex interplay between the environmental conditions that trigger paradoxical stimuli, the body's response to the stimuli and the cognitive tendencies among individuals to approach the stimuli in ways that alter the body's response. By examining the neurological and physiological aspects of the emotions and cognition associated with a paradox mindset, in particular, this work also builds on the burgeoning field concerning individual approaches to paradox (Bartunek, 1988; Miron-Spektor et al., 2018; Smith & Berg, 1987), which demonstrates the mechanisms that explain why people vary in their approaches to paradoxical situations.

Second, the field study was targeted at entrepreneurial architects, and the laboratory studies involved creative production tasks. Therefore, this work also

contributes to the study of paradoxes associated with the creative production process (e.g., Eikhof & Haunschild, 2007; Godart et al., 2015; Khaire & Hall, 2016). The creative production process is critical in ensuring continuous innovation for firms to maintain their competitiveness. By demonstrating that individuals who are emotionally less aroused while being cognitively more engaged with the demands during production, this work enhances our understanding of why some creative producers are more able to produce both creatively- and commercially-viable products.

Third, this work contributes more broadly to the study of biology in organizational behavior. As Nofal et al. (2018) pointed out, the field of management lacks a systematic understanding of how physiology, neuroscience and genetics influence management capabilities. By tackling the role of biology in shaping individuals' reactions to competing demands, this work has incorporated biology as a fundamental aspect of organizational behavior that encompasses multiple issues and contexts. It has also expanded the application of paradox theory as a meta-theory (Schad et al., 2019), widening the boundaries of a paradox approach to encompass both the mind and the body.

9.2 Practical implications

This study also sheds light on industry practices and management education. Organizations are finding themselves in increasingly high-velocity, volatile, complex, and ambiguous environments (Madjar & Shalley, 2008). Tensions in the workforce can arise from simultaneously competing demands, challenging all organizational members in an ongoing, and even overwhelming, way. How organizational members can better manage such tensions, and even use them to

succeed, is becoming increasingly important in management research. Although previous research on organizational paradoxes has urged that managing competing demands is essentially about managing tensions, an empirical guide for how organizational actors should approach those tensions remains in development. This work, while following the previous literature on paradoxical framing and the paradox mindset, has highlighted two specific implications concerning organizational practitioners that go beyond prior work. First, while employees tend to respond defensively to paradoxical tensions, an alternative approach to value, accept and embrace paradoxes can reduce the aversive feelings at an unconscious level, so that employees can feel less stressed before their conscious reasoning takes over. As the emotion-as-input theory has suggested (Davis, Love, & Maddox, 2009; Schwarz & Clore, 1983), the tendency to be more comfortable with such tensions can lead to a more uplifting emotional and cognitive experience, eventually benefiting the employees' in-role performances. Second, while competing demands challenge individuals' cognitive capacities and capabilities to deal with those demands, embracing the paradox can enable employees to better engage in thinking about the interdependent, yet contradictory, nature of the paradoxical demands. Therefore, organizations should consider developing relevant training that does not only highlight the importance of a paradox mindset but guides their employees towards engaging with the emotional and cognitive components of paradoxes in their daily practices.

Another implication is that organizational leaders and managers should consider leading the top-down organizational culture to accept, value and embrace paradoxes so that employees can develop and adopt paradox mindsets

when facing paradoxical demands at work (Smith, 2014). Miron-Spektor et al. (2011) examined whether such a mindset can be manipulated, suggesting that a systematic thinking system in an organization can cultivate such a mindset. While employees might not be able to consciously and consistently recognize the tensions from the situational or external factors that comprise paradoxes, an embedded mindset might reduce their aversive defensive responses and enable them to more actively engage with the demands. My study suggests that in order for the effects to work, employees must be deeply engaged in developing a paradox mindset, as the mechanisms involve physiological and neurological devices.

For creative industries, and other industries that engage in creative production, this work offers additional practical insights. While these industries often record competing demands and resulting tensions in a paradoxical manner, organizational paradox theory is rarely invoked. For example, scholars have focused on discussing whether creative producers should pay more attention to artistic versus business values, novelty versus conventionalities, and authenticity versus popularity. This work has highlighted both the emotional and cognitive aspects associated with handling such demands, and has determined that the question is not simply about recognizing the opposing demands or choosing one over the other. Instead, my findings suggest that creative producers can strategically respond by being emotionally comfortable with, but actively engaging in, any polarized contradictions they are presented with.

9.3 Limitations and future directions

All studies have limitations that point to future work. First, constrained by the laboratory environments, I was unable to simultaneously measure the individuals' physiological and neurological responses, or apply other equipment, such as an fMRI or EEG, to measure additional biological functions (see Critchley, Elliott, Mathias, & Dolan, 2000; Ohme, Reykowska, Wiener, & Choromanska, 2009 for examples of using multiple methods). Apart from their close relations with the brain, emotion and cognition also function closely together, it having been posited that "Thinking and feelings are inextricably linked most of the time" (Ellsworth & Scherer, 2003: 572). Future research should examine the effects of paradoxical demands on the interplay between emotion, cognition and brain activity in demonstrating how the body and the brain interact when responding to competing demands.

Second, although I conducted inductive investigations in both field and laboratory settings, a generalizability concern still remains. The demands of all three studies were design focused, which might have made them more representative of the creative industries and less so of other industries. Some scholars have argued that technology-driven industries are transforming into creative industries, based on them incorporating creative production (Eisenman, 2013). For example, mobile phone firms are now heavily impacted by the logics of the fashion industry rather than their original scientific and engineering logics, with them engaging more in symbolic production (Djelic & Ainamo, 2005). However, it is still possible that the competing demands in dramatically different industries and jobs might trigger other complexities. Future research should

investigate different industry settings to determine whether the type of competing demands matters.

Third, since the participants of the current three studies were all from East Asia, there is a concern about whether and how culture might matter. Culture plays a critical role in individuals' experiences with paradoxes (Keller et al., 2018; Keller et al., 2017). Future research should, on the one hand, investigate geographically disparate settings and, on the other hand, look into constructs, such as using a middle-ground approach or naïve dialectical thinking, to obtain an understanding of culture's role in shaping the body's responses to paradoxes.

Four, time factors might have brought different complexities that the current studies were not able to address. For example, Cuganesan (2017) found that a defensive approach can be beneficial if organizational actors make strong claims about why they adopted a separation strategy in a longitudinal study. Therefore, future research should examine how time might alter emotional and cognitive processes, using different methods, such as experienced sampling (Uy, Foo, & Aguinis, 2010).

9.4 Conclusions

Despite its limitations, this work has provided an important first step in advancing our understanding of the role of cognition and emotion in individuals' responses to organizational paradoxes. The studies sought to disentangle the body's initial response from individuals' conscious reasoning processes and, at the same time, demonstrated how conscious reasoning can shape the bodily response. Paradoxically, this work has highlighted that the ways in which the mind and body respond to paradoxes are both distinct and interrelated, and that

stress-reducing emotional comforting and high cognitive engagement facilitate a high paradox mindset that results in the successful management of competing demands.

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Appendices

Appendix 1a. Study 1. Interview protocol

Chinese Version

再次感谢您愿意参与我们的学术调研！我们希望了解您在设计过程中如何实现多重目标以及如何处理遇到的困难与挑战，由于学术严谨性要求，整个访谈过程中，我可能会需要针对一些问题反复请教您，先提前感谢您的理解。您有什么疑问吗？如果没有，那我们就开始了。

1. 首先，请您用两分钟简短介绍下您自己、您的公司以及您公司的核心团队成员。
2. 请您回想一个过去两年内由您主导完成的设计项目，简要描述下这个项目概况。
3. 在设计这个项目的方案图时，您遇到过哪些大的挑战？
4. 在这个项目里，您主要想实现哪些目标？
5. 您刚刚提到的某某点（某个挑战），为什么您觉得特别挑战？
6. 在您其他完成的设计项目里，有遇到过不一样的挑战吗？（如有，则重复问题 4 和问题 5）

English Version

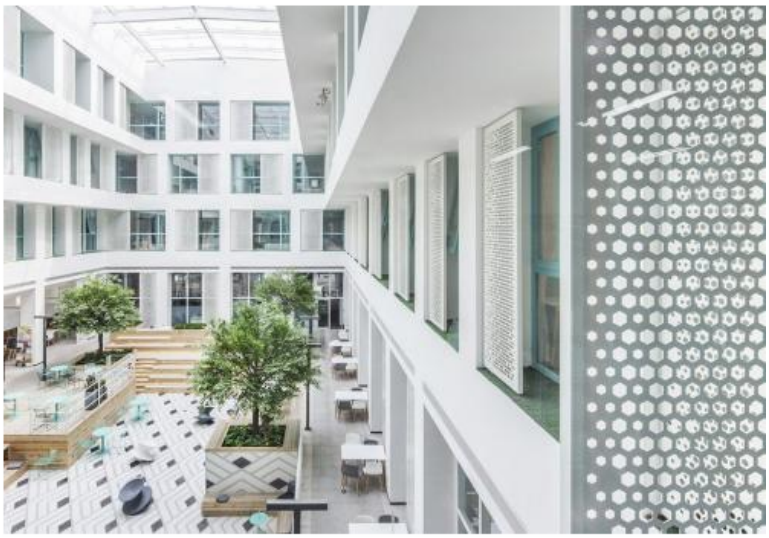
Thanks again for willing to participate in our research! We would like to know how you fulfill multiple purposes and handle the difficulties and challenges during your design process. During the interview, I might need to ask back-and-forth towards some questions raised, and I seek your kind understanding in advance. Do you have any question for me before we start? If not, then we will start.

1. First, please briefly introduce yourself, your studio/firm and your core team members within two minutes.

2. Please recall a typical completed design project within past two years and briefly introduce this project.
3. What are the key challenges you experienced during designing for this project?
4. What are the key purposes you tried to fulfill?
5. About the challenge A that you just mentioned, why was it challenging? (Ask on each challenge that the interviewee provided earlier)
6. In your other completed projects, have you met different challenges? What are they? Why were they challenging? (Stop when the interviewee cannot list new challenges)

Appendix 1b. Study 1. A sample rating question on the design (on commercial viability)

以下是一青年公寓改建项目建成后中庭处的照片。
Below are pictures of the courtyard of a youth-targeted apartment rebuilt project.



请您仔细看图，根据您所看到的该青年公寓项目的**设计**，您觉得该设计在多大程度上是**"富有商业价值的"**？请在下列1-9个不同程度中勾选出您觉得合适的评价，其中，1=非常不符合，5=不确定，9=非常符合。

您的判断对我们研究很重要，请您提供您最诚恳的看法，答案没有任何对错。

Please read the pictures carefully. Based on the design of this apartment that you see from the pictures, to what extent do you think the design is commercially viable? Please rate the extent to which you agree or disagree at below. 1 = strongly disagree, 5 = uncertain, 9 = strongly agree.

Your judgement is very important to our research. Please provide your judgement genuinely. There is no right or wrong of the answer.

1 = 非常不符合

2

3

4

5 = 不确定

6

7

8

9 = 非常符合

Appendix 2. Paradox mindset scale

English version (developed by Miron-Spektor et al., 2018)

1. I often experience myself as simultaneously embracing conflicting demands.
2. When I consider conflicting perspectives I gain a better understanding of an issue.
3. Accepting contradictions is essential for my success.
4. Tensions between ideas energize me.
5. I enjoy it when I manage to pursue contradictory goals.
6. I am comfortable dealing with conflicting demands at the same time.
7. I am comfortable working on tasks that contradict each other.
8. I feel uplifted when I realize that two opposites can be true.
9. I feel energized when I manage to address contradictory issues.

Chinese version (translate-and back-translated by two native speakers from China)

1. 我常感觉自己同时欣然接受相冲突的需求。
2. 考虑相互冲突的观点让我对问题有更好的理解。
3. 接受矛盾对我的成功至关重。
4. 不同观点带来的紧张感能够给我能量。
5. 我喜欢设法追求相互矛盾的目标。
6. 我能自在地同时处理相互矛盾的需求。
7. 我能自在地同时处理相互冲突的任务。
8. 当我发现两个对立面可以同时存在时，我感觉很振奋。
9. 当我成功处理了相互矛盾的事件时，我感到振奋。