UTS UNIVERSITY OF TECHNOLOGY SYDNEY

Dynamic states and spinning plates: Microfoundations of balancing tensions

by Peter Graham

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Certificate of original authorship

I, Peter Graham, declare that this thesis, is submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the Business School at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any other academic institution.

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Undertaking a PhD has been an immensely challenging journey that has changed how I think and feel. Coming from my undergraduate studies, it has taken me by surprise how different an experience a PhD is. Where in the past, my academic goals might stretch out a year ahead of me at most, striving towards a single goal for almost four years has seen a great breadth of good and bad experiences subsumed as part of my PhD. A PhD is so much more than a manuscript and I cannot help but have mixed feelings about the journey.

Since commencing my candidature I have moved out and made a home with someone I love, treasured countless hours with friends, started a company, released an app, built a career, learned to produce music and raised a puppy. I have also seen my company fail, felt a decline in my mental health, struggled with anxiety and feelings of inadequacy, seen loved ones battle illness and lost a dear friend. Undertaking a PhD has laid bare the best and worst aspects of myself and shown me where I need to grow. Most of all, the experience has taught me where my passion lies and that I need to chase it. I am immensely thankful for that and cannot wait for what's next.

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Thesis format

This is a thesis by compilation. The thesis consists of three published/publishable papers linked together by an introduction, literature review, interconnecting notes, discussion and conclusion. It is presented in a single manuscript and is structured so that the introduction, literature review, three papers, discussion and conclusion are separate chapters. The thesis is composed so that the three papers are distinct but connect in a logical and coherent way.

Papers & statement of contribution

This thesis includes the following papers:

	Title	Lead author	Co-author 1	Co-author 2
Paper 1	Tension between leadership archetypes: Systematic review to inform construction research and practice Published in *Journal of Management in Engineering*	Peter Graham	Assoc. Prof. Natalia Nikolova PhD Co-supervisor providing feedback	Professor Shankar Sankaran Subject matter expert providing feedback
Paper 2	Down to the wire: using teaming to balance tensions between continuity and change in projects Submitted to *Organization Studies*	Peter Graham	Professor Emmanuel Josserand PhD Supervisor providing feedback	Assoc. Prof. Natalia Nikolova PhD Co-supervisor providing feedback
Paper 3	Innovators at the edge: How dilemma & paradox mindset shape responses to barriers in the Australian Defence Force Revise and resubmit for the *Journal of Product Innovation Management Special Issue: The Human Side of Innovation Management*.	Peter Graham	Professor Emmanuel Josserand PhD Supervisor providing feedback	Assoc. Prof. Natalia Nikolova PhD Co-supervisor providing feedback

The above-stated information is correct:

Peter Graham	Professor Emmanuel Josserand	Assoc. Prof. Natalia Nikolova	Dr Marco Berti	Professor Shankar Sankaran
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Abstract

The concept of balance holds a prominent position in theories about tensions (Schad, Lewis, Raisch, & Smith, 2016). Tensions are situations involving 'stress, anxiety, discomfort, or tightness in making choices and moving forward' (Putnam, Fairhurst, & Banghart, 2016, p. 68). Through balance organizations can minimize the negative impacts of tensions while maximizing their positive impacts (Miron-Spektor, Ingram, Keller, Smith, & Lewis, 2018; Smith & Besharov, 2019). However, this emphasis on balance is not reflected in theories about how individuals manage tensions. For some individuals, tensions paralyze work, while for others, tensions propel work (Andriopoulos, Gotsi, Lewis, & Ingram, 2018). While theory emphasizes the critical role of individuals in stewarding through tensions, it struggles to explain how individuals balance the contrasting impacts of tension.

In this doctoral research, I investigate the micro-level mechanisms individuals rely on to balance tensions in projects. Projects are an ideal empirical object for unpacking how individuals balance tensions as they create temporary arenas where tensions are frequent and individuals have greater autonomy to act in novel ways. I use three studies to address this aim. Each study focusses on different tensions in different types of projects, and uses a different methodology, standing as a complete paper. Paper 1 is a systematic review of 289 peer-reviewed papers that assesses how tensions between vertical and horizontal leadership paradigms can be balanced in construction projects. Paper 2 is a longitudinal case-study of how tension between continuity and change is balanced during preparations for a city-wide event. Paper 3 is a comparative case-study of how 38 innovators balance tensions between risk and innovation in defense innovation projects. The results of the three papers are used to explore the underlying mechanisms used by individuals to balance tensions.

The theoretical significance of the research is twofold. First, the research contributes a richer understanding of how leadership, teamwork & mindsets serve as micro-level

mechanisms for balancing tensions. Second the research gives new insight into the nature of balancing tensions: that balance requires a blend of stable and dynamic states, that asymmetric tension sometimes require imbalanced responses, and that balancing tensions implicitly involves accumulating tensions. Through a dynamic view of balance, the research shows how tensions persist, become entwined and elicit situational balancing logics. The practical significance of the research rests in highlighting how individuals can balance tensions across a range of situations, a skill that is increasingly valued in organizations today.

Acronyms

ADF – Australian Defence Force

AEC – Architecture, Engineering and Construction

ARMY – Australian Army

BIM – Building Information Modelling

BREEAM – Building Research Establishment Environmental Assessment Method

DEV – Paper 2 target organization (pseudonym)

FFE – Fuzzy-front end

ICT – Information and Communications Technology

IPD – Integrated Project Delivery

IT – Information Technology

JOINT – Australian Joint Operations

LEED – Leadership in Energy and Environmental Design

NPD – New product development

OCB – Organizational Citizenship Behaviour

OHS – Occupational Health and Safety

PBO – Project-based organization

R&D – Research & Development

RAAF – Royal Australian Air Force

Chapter 1. Walking the tightrope: tensions, microfoundations and balance

> In securing Australian national interests, the Australian Defence Force (ADF) undertakes humanitarian assistance missions in a range of dangerous environments. For ADF members carrying out these missions, toxic chemicals pose a clear risk. However, a murkier set of challenges face the ADF member responsible for developing a rapidly deployable sensor for detecting these hazardous chemicals. Having excelled in physics and chemistry, conceiving of the innovative detection system was the easy part for this individual. Their real challenge now, is navigating the project through a messy web of bureaucratic systems, resources and reputational risks that create tensions. Whether their efforts deliver new capabilities, or are swallowed up by strain, conflict and uncertainty, depends on how well they can balance these tensions.

This thesis sheds light on how individuals balance tensions. Tensions are situations involving 'stress, anxiety, discomfort, or tightness in making choices and moving forward', that have become an important component of the messy, fast-paced and uncertain organizing environments seen today (Putnam et al., 2016, p. 68). While much literature emphasizes the role of paradoxes in organizing, which are a specific type of tension necessarily characterized by contradiction, persistence and high interdependence, this thesis looks at tensions to address calls for research capturing a broader range of phenomena (Smith, Erez, Jarvenpaa, Lewis, & Tracey, 2017). In doing so, this thesis addresses both team-based tensions, where interpersonal differences create strain or conflict between team members, and task-based tensions, where contrasting aims create strain or conflict between different tasks (Arvidsson, 2009).

To many, tensions sit at the root of society's most confounding and intractable challenges, spawning wicked problems that elude familiar approaches to problem solving (Coleman, Vallacher, Nowak, & Bui-Wrzosinska, 2007; Fiol, Pratt, & O'Connor, 2009; Smith & Berg, 1987). By inviting difficult dialogues around contrasting perspectives and contradictory agendas, tensions expose people to adversarialism, uncertainty and inaction (Andriopoulos et al., 2018). And while research makes the negative potential of tensions clear, the contrasting influence of tensions as a source of inspiration can also be traced far back through the music of prolific composers (Rothenberg, 1979), texts of great scholars (Lewis, 2000) and legacies of revered leaders (Eisenhardt & Westcott, 1988). Tensions can provoke epiphanies, create ultimatums that demand action, and invite discussion that frames information in new and novel ways (Miron-Spektor et al., 2018). By creating challenging circumstances where alternatives must be constantly assessed and reassessed relative to one another, tensions complexify organizing processes (Burström & Wilson, 2018).

As people organize, tensions become 'nested' across different levels of analysis from the micro level of individuals up to the macro level of whole organizations, or in some circumstances, whole industries or societies (Kornum, Gyrd-Jones, Al Zagir, & Brandis, 2017). This thesis focuses on tensions at the micro level of individuals. Broadly, tensions literature has addressed these individual and collective domains separately, with the latter receiving more attention (Schad et al., 2016). At the macro level of industries and organizations, tensions have been found to challenge existing models of industry governance (Ferrer, Galvão, & Carvalho, 2020), invite debates around ethical practice (Sharma & Jaiswal, 2018) and drive innovation (Quezada, Walton, & Sharma, 2016). Researchers therefore look to understand how structures, processes and practices aggregate within and between groups to influence strategic concerns such as the movement of knowledge between organizations (Rouyre & Fernandez, 2019), the entanglement of strategic goals (Sheep, Fairhurst, & Khazanchi, 2017) and communication

across organizational levels (Kassotaki, Paroutis, & Morrell, 2019). However, at the micro level, we know comparatively less about how individuals experience and respond to tensions (Schad et al., 2016). Many aspects of how individuals think, feel and act towards tensions are only just beginning to be uncovered (Miron-Spektor et al., 2018). Referred to as the 'microfoundations' of tension, this growing field of research focuses on understanding the different factors that influence how individuals participate in the surfacing and persistence of tensions (Schad et al., 2016, p. 38). Three main groups of factors are thought to influence individual responses to tension: organizational factors, process dynamics and cognitive-affective factors. Research into organizational factors considers how factors such as leadership structures and styles, team hierarchies and organizational artefacts constrain or enable micro-level responses to tension (Schad et al., 2016). Research into process dynamics considers how individuals participate in dynamic and aggregative processes that enable tensions to surface, persist and transform over time (Smith et al., 2017). Finally, research into cognitive-affective factors looks to identify the underlying psychological factors that influence individual mindsets towards tensions, and explain how different mindsets translate into differing responses to tension (Miron-Spektor et al., 2018).

While the advance of theory along these lines of enquiry has led to a more complex understanding of the microfoundations of tension, the current corpus is fragmented and researchers highlight a number of important questions remaining (Burström & Wilson, 2018). Over time, the 'divergence and convergence' of theoretical traditions in the tensions literature (paradox, dialectics, dualities etc) has extended theories of change, innovation, power and agency, but has also seen a widening gap between research on collective level responses to tensions, and individual level responses to tension (Smith et al., 2017, p. 311). Research on collective responses relies heavily on the 'meta-theoretical concept of balance' to explain how organizations can make sense of tensions and formulate sustained responses (Schad et al., 2016,

p. 36). Early contributions focused on how the internal operations of an organization could be balanced with external demands for adaptation (Bradach, 1997; Poole & Van de Ven, 1989), which later evolved into theories of organizational ambidexterity discussing how organizations could balance their efforts to exploit existing capabilities while exploring new capabilities (Andriopoulos & Lewis, 2010; Lin, McDonough III, Lin, & Lin, 2013). More recently the focus has shifted to understanding the temporal mechanics of balancing tensions through emergent, oscillating or cyclic processes (Klarner & Raisch, 2013; Smith & Lewis, 2011; Sutherland & Smith, 2011) and explaining how these processes can be aggregated across multiple levels of tension to engender more elastic or hybrid organizational states (Ashforth, Rogers, & Corley, 2011; Cronin, Weingart, & Todorova, 2011; Gümüsay, Smets, & Morris, 2020; Raisch & Tushman, 2016; Smith & Besharov, 2019).

In contrast, the concept of balance has seen little discussion on an individual level (Schad et al., 2016). Instead, individual level literature depicts tension as a 'double-edged sword' that elicits divisive responses from individuals (Andriopoulos et al., 2018; Miron-Spektor et al., 2018). When confronted by tensions, individuals must consider contrasting perspectives, interests and agendas which can alter where they are headed and how they get there (Loch & Sommer, 2019). For some individuals, tensions can trigger anxiety, uncertainty and inaction, while for others, tensions can trigger creativity, learning and innovation (Andriopoulos, Gotsi, Lewis, & Ingram, 2018; Burström & Wilson, 2018; Lenfle, 2011). Tensions constantly tug and pull at individuals, forcing them in different directions which require ongoing 'microshifts' to ensure their work is not derailed (Schad et al., 2016, p. 36). Consequently, scholars routinely describe working with tensions akin to walking on a tightrope (De Keyser, Guiette, & Vandenbempt, 2019; M. S. Feldman, Pentland, D'Adderio, & Lazaric, 2016; Kassotaki et al., 2019; Schad et al., 2016; Sharma & Jaiswal, 2018), yet our understanding of the microfoundations of balancing tensions is currently limited, triggering the

call that ‘future research could explore in greater detail how individuals effectively live within a dynamic state of balance’ (Schad et al., 2016, p. 36). With increasing recognition that ‘tension studies are scattered in the academic community and follow different routes’, the need for concepts which cohere across levels of analysis and demystify the microfoundations of working with tensions is felt widely (Burström & Wilson, 2018, p. 458).

This thesis suggests that balance is just such a concept and holds untapped theoretical value for expanding our understanding of the microfoundations of working with tensions. As a metatheoretical concept, balance has helped ossify connections between contrasting theories of organisational teamwork (Partington & Harris, 1999), leadership (Kenner & Isaak, 2004; Ralf Müller, Packendorff, & Sankaran, 2017; Perrons, 2009), culture (McDonald, 2005) and governance (Book, Eskilsson, & Khan, 2010). In macro-level tensions research, the concept of balance underlies both semi-stable (Sutherland & Smith, 2011) and dynamic models (Smith & Lewis, 2011) of organisational tension. As a concept, balance can be used to describe both how elements are arranged relative to one another and against the overarching objectives of an organisation. In this way, the concept of balance infers an ongoing processes of managing the continual shifting of interdependent elements rather than an outcome or resoultion focussed framework (Schad et al., 2016). For research on the microfoundations of tension, the theoretical potential of balance lies in its focus on phasing in and out of desirable arrangements of interdependent elements in the pursuit of shifting objectives. In organizations, the foundational mechanisms of processes for dynamically balancing tensions are poorly understood (Schad et al., 2016). Individuals routinely exhibit a remarkable propensity for balancing tensions, whether by practice, experience, intuition or sheer luck, and yet there are few studies unpacking the underlying mechanisms by which this is achieved. To develop insights with pragmatic outcomes for individuals working with tensions, further research is needed to understand how the concept of balance plays into the microfoundations of managing tensions.

The aforementioned results in the research question for my study:

How do individuals balance tensions on a micro-level in organizations?

1.1 Towards new microfoundations

To address the research question of this thesis, I draw on the meta-theoretical concept of balance to elaborate three lines of enquiry into the microfoundations of tension, explaining how individuals can a) accommodate tension between contradictory elements, b) dynamically adjust their responses to tension according to emergent conditions, and c) develop mindsets able to adapt to tension. In doing so the thesis demonstrates how organizational factors, process dynamics and cognitive-affective factors comingle at the micro level of individual responses to tensions (Schad et al., 2016). Balance is a useful theoretical lens to study the microfoundations of tensions as it emphasizes the persistence of tension and that the effects of decisions are never unilateral (Salvato & Rerup, 2018). It also highlights the dynamism of elements in tension and the situational nature of individual responses – individuals can only ever address tensions in a specific circumstance and moment (Smith & Lewis, 2011). By using the concept of balance as a unifying theoretical lens to investigate the microfoundations of tension, new insights about how individuals dynamically respond to tensions can be garnered (Schad et al., 2016).

I have chosen to focus specifically on how tensions are balanced in projects. A project is *a unique endeavor to deliver a specific and beneficial change within cost and time constraints* (Turner & Müller, 2003). The justification for this research context is twofold. First, as organizing environments have become increasingly messy, face-paced and uncertain, a concomitant rise in the ubiquity of project-based organizing has been observed (Packendorff & Lindgren, 2014). For organizations grappling with how to build value when the goal-posts constantly move, segmenting work into projects makes more sense than treating every business

activity as ongoing (René M Bakker, Boroş, Kenis, & Oerlemans, 2013). By bundling work into discrete parts, projects create temporary 'arenas' for individuals, resources and action to combine in novel and pointed ways (Söderlund, 2002). As a mainstay of contemporary organizing, projects are therefore an important window into the micro-level experiences of individual workers today. Second, by way of this more turbulent form organizing, projects have been demonstrated to create tension-rich environments in which individuals must constantly navigate interdependent objectives, parallel timelines and contrasting perspectives (Packendorff & Lindgren, 2014). As a result projects offer an ideal research context for this study of micro-level tension management.

Scholars emphasize that projects sink or swim on the backs of key individuals (Brenton & Levin, 2012; Griffin, Price, Vojak, & Hoffman, 2014; Larsson, Eriksson, Olofsson, & Simonsson, 2015). Projects rely on dynamic rosters of members and roles to create a melting pot of ideas, capabilities and interests (Manning & Sydow, 2011; Meyerson, Weick, & Kramer, 1996). While this more specialized and agile approach to work can be advantageous in creative, bespoke or innovative fields (Modig, 2007), it also creates uncertain, unstable and transitory work environments where individuals make pivotal decisions with fewer points of reference (Lenfle, 2011). Given that projects rely on connecting and coordinating people well suited to a specific task, the unique skills, abilities and interests of participating individuals can have a dramatic influence on project outcomes. In civil engineering projects, the leadership styles of project managers are a key determinant of project success (Larsson et al., 2015). In film projects, producers undertake 'nexus work' to broker collaboration and support for projects that otherwise may never get off the ground (Lingo & O'Mahony, 2010, p. 47). And, in new product development (NPD) projects, serial innovators 'champion… projects through the valley of death' from ideation at the fuzzy front end (FFE) through to commercialization (Griffin et al., 2014, p. 1364). Projects also encourage individuals to work together in different

ways. In projects, individuals may feel less organizational affiliation if they are only required to contribute to an isolated project (Bakker, DeFillippi, Schwab, & Sydow, 2016), teams develop trust differently (Ralf Müller et al., 2013), interpersonal relationships can supersede role relationships (Ebbers & Wijnberg, 2009; Grugulis & Stoyanova, 2012), and leaders may be inclined to alter roles or processes more rapidly (Lindgren & Packendorff, 2009).

In the more transient and dynamic work environments created by projects, individuals are the lynchpin keeping work on track and ensuring outcomes are delivered (Blomquist & Müller, 2006; Griffin et al., 2014; Larsson et al., 2015; Lingo & O'Mahony, 2010). As individuals work through projects, they encounter a milieu of contrasting ideas, skills and interests that make tensions commonplace (Ebbers & Wijnberg, 2017). With existing literature demonstrating the pivotal role already played by individuals in stewarding projects forwards (Griffin et al., 2014), it has become clear that as projects grow increasingly replete with tensions, the ways individuals work with tensions may also be a key determinant of project outcomes (Loch & Sommer, 2019). By virtue of the above features, projects are an ideal research context for this thesis. Not only do projects create tension-rich environments suited to investigating the microfoundations of tension, project workers are likely to benefit from this research as the need for concepts to demystify working with tensions is felt most strongly in projects.

1.2 Aims and contributions of this research

The aim of this research is to investigate how individuals balance tensions, looking particularly at the organizational factors, process dynamics and cognitive-affective factors that play into individuals' responses to tensions. According to Burström and Wilson (2018) organizations are replete with tensions, yet existing literature points in different directions to

explain their microfoundations. Therefore, this thesis addresses key questions relating to how organizational factors, process dynamics and cognitive-affective factors underpin micro-level responses to tension. Using the concept of balance as a theoretical lens throughout the research elucidates new insights into common dynamics across the microfoundations of tensions and highlights how individuals can blend responses to tensions to achieve a dynamic state of balance. Each paper in this thesis has been published, or is under review, at a reputable journal. The first study is published in *Journal of Management in Engineering* (Graham, Nikolova, & Sankaran, 2019). The second paper is under review with *Organization Studies.* The third paper is undergoing a revise and resubmit for the *Journal of Product Innovation Management Special Issue: The Human Side of Innovation Management*.

Throughout the thesis, I adopt a subtle realist perspective (Hammersley 1992) and acknowledge that while tensions hold material consequences for organisational actors, they are ultimately a socially constructed phenomenon (Downs et al. 2006). As actors interact in organisations they constantly frame and reframe their understanding of the tensions influencing their work, participating in cyclic process of intepretation and reproduction (Ebbers & Wijnberg, 2017). As Downs et al. (2006, p. 499) describe, when investigating organisational tensions, we 'find process and product are two sides of the same coin', that exploring tensions 'creates circles of reflections' and 'does not solve problems, but rather opens new possibilities and sparks circles of even greater complexity'. In keeping with a socially constructed view of tesions, I adopt a grounded approach to theory building and use, wherever possible, the exact language of actors to convey how tensions are constructed (Charmaz 2014). This is measured against the recognition that while tensions are socially constructed, they exist relative to more rigid social artifacts such as leadership heirarchies, teams and real-world deadlines (Downs et al. 2006). To manage this ontological tension I adopt a methodology centred on accepted practices and agreed standards for establishing the relevance, plausibility and credibility of

claims (Maxwell, 1992; Seale, 1999). By grounding my outlook in the recognition that the social construction of tensions is met by constraints on the gamut of constructions available to actors as imposed by their organising contexts, the subtle realist approach is well suited to building new theories of how actors interpret and respond to tensions.

1.3 Thesis structure

This thesis is organized into seven chapters. In Chapter 2, I first set out the research context, looking at tensions and highlighting distinctions between the related traditions of paradoxes and dualities. I then introduce the concept of balance, before tracing its influence throughout the tensions literatures. The objective of this part of the review is to understand current theories of how tensions are balanced on a collective and individual level, and highlight gaps in individual level literature. First, I focus on how the metatheoretical concept of balance has influenced collective level research, highlighting how contestation between semi-stable and dynamic theories of balance has inspired divergent methods of managing tensions.. I then discuss the limited influence the metatheoretical concept of balance has had on individual level research, highlighting how working with tensions remains highly divisive for individuals. Finally, I explain why divergence between literature addressing organizational factors, process dynamics and cognitive-affective factors in the microfoundations corpus, leaves practitioners ill-equipped to achieve balanced responses to tensions, and therefore requires rethinking.

Chapter 3 introduces the research paradigm of the thesis and offers an overview of the research contexts and methodologies adopted in each paper. Paper 1 focusses on construction projects and is a systematic literature review of 289 peer-reviewed articles using computerized techniques for bibliometric (Perianes-Rodriguez et al. 2016) and thematic analysis (Brereton et al. 2007). The purpose of this methodology is to synthesize a wide body of high quality peer-reviewed articles in order to assess theoretical connections, tease out emerging debates and

inform deeper critical reflection on research in the field (Randhawa et al. 2016). Paper 2 focusses on the organizer of a large Australian event and is a longitudinal case study of how tension between continuity and change is managed throughout a year-long project (Flyvbjerg, 2006; Tsoukas & Chia, 2002). Through the case study approach, I am able to present complex practices used to manage tensions while remaining firmly embedded in the richness of individuals' accounts of the project (Lawrence 1997, p. 20). Paper 3 is a case study spanning 38 innovation projects in the Australian Defence Force (ADF). Again, the case study approach was chosen to allow the richness of individuals' accounts to convey the depth of their experiences within a situated organizational reality while, in this study, also garnering comparative insights about how individuals think and feel towards tensions (Flyvbjerg, 2006; Gerring, 2004; Lawrence, 1997).

Chapters 4, 5 and 6 contains the three complete papers. Each paper answers a specific research question related to a specific tension and the central research question is answered by the collective insights from the papers. This approach allows me to investigate each tension closely to understand its influence on individuals, what impact this has on the projects studied and the implications for project-based organizing in the future. Through the unifying lens of balance, the thesis advances a more coherent understanding of the microfoundations of tensions in projects. As such, each of the three papers contributes to building connections across the microfoundations of tensions and offering a new perspective on the underlying mechanisms that enable individuals to dynamically balance tensions.

Paper 1 is titled *Tension between leadership archetypes: Systematic review to inform construction research and practice* and addresses the question: How can leadership styles help individuals to leverage beneficial aspects of tension while avoiding negative aspects? This study was completed in 2017 and helped hone the theoretical focus of my thesis on microfoundations seen through the lens of balance.

Paper 2 is titled *Down to the wire: Using teaming to balance tensions between continuity and change in projects* and addresses the question: How can individuals balance tension between continuity and change? This study helped expand my thinking on how balance could be achieved dynamically throughout a project, and highlighted the significance influence on recurrence, team dynamics and project timeframes on how balance is achieved.

Study 3 is titled *Innovators at the edge: How dilemma & paradox mindset shape responses to barriers in the Australian Defence Force* and addresses the question: How does mindset influence the way individuals characterise and respond to tensions? Completed over a three-year period, this study focuses on the cognitive-affective factors that play into innovators' responses to tensions in projects and drew together my research by showing how balancing contrasting mindsets can work in parallel to organizational factors and process dynamics to improve project outcomes.

Chapter 7 follows with a discussion of the insights emerging from the three papers and combined significance to show how the microfoundations of tensions play out in projects and highlights the salient role of individuals in dynamically balancing this interplay. This chapter concludes this research with a discussion of the overall theoretical and practical contributions of the research, its limitations and an agenda for future tensions research.

Chapter 2. Microfoundations of tension in organizing

In this chapter I review the tensions literatures, introduce the concept of balance and highlight how our understanding of individual level responses to tension could be enhanced through the concept of balance. The chapter is organized into three sections. In the first section, '*Tensions, paradoxes and dualities: foundations and definitions,* I frame the research field by unpacking the foundations of organizational tensions literature, defining tensions within the organization studies literature and distinguishing between tensions, paradoxes and dualities. In the second section, '*Introducing the meta-theoretical concept of balance'*, I introduce the concept of balance as the theoretical lens of this thesis and trace its influence throughout macro level studies of collective responses to tensions. In the final section, '*Elaborating microfoundations through balance'*, I highlight how micro level studies of individual responses to tensions largely focus on the divisive influence of tensions on individuals and have been slower to advance theories of how individuals can balance tensions. Given that I review literature relevant to the three tensions and project contexts investigated in each of the three papers contained in Chapter 4, these narrower bodies of literature will not be addressed in this chapter.

2.1 Tensions, paradoxes and dualities: foundations and definitions

The study of organizational tensions has a long and varied history that covers a range of interconnected theoretical traditions (Smith et al., 2017). Here, three key theoretical traditions will be addressed and distinguished between. First, the emergence of the foundational concepts of interdependence and strain will be outlined. It will then be demonstrated how these foundational concepts can be used to describe a range of situations involving *tensions*, the broadest of the three theoretical traditions address. Subsequently, the concepts of interdependence and strain will be used to demonstrate how the theoretical traditions of paradoxes and dualities diverge from that of tensions to address more specific scenarios. In this

thesis, scholarship from across the paradox, dualities and tensions literatures will be drawn on to develop overarching theory about how individuals respond to a diverse array of situations involving tension. This holistic approach is useful for developing more integrative theories of the practices that sit around tensions and has firm roots in the literature (Cunha & Putnam, 2019).

The above three traditions can be traced back in both Eastern and Western thinking where scholars perceived tensions in many fundamental human experiences. Important tensions in Eastern philosophy included those between life and death, masculinity and femininity, and good and evil. Throughout Eastern writings tensions are depicted as pathways to deeper understandings of the wholeness of aspects of human experience. Whether or not tensions could be removed was not the focus of Eastern scholarship as tensions represented a fundamental interdependence between elements that underpinned the richness of the whole (Schad et al., 2016). By embracing, rather than resisting, experience and contemplation of tensions, Eastern scholars suggested that individuals could transcend to higher states of enlightenment (Legge, 1966). While tensions were thought of similarly in Western philosophy, as ongoing interdependencies involving stress and contradiction, greater emphasis rested on the dialectical dimensions of working through tension (Putnam et al., 2016). Tensions were described as grounds for investigation and debate that would ultimately point to unifying truths about the world (Reeve, 2004). Western philosophers focussed more on how tensions could stimulate the rational and logical faculties of humans in problem solving exercises, rather than stimulate a state of cognitive and affective comfort with a world full of enduring contradictions. While divergent in their treatment of tensions, these foundational writings demonstrated the salience of tensions in the stasis and evolution of society, and gave organizational theorists the foundational concepts of interdependence and strain.

The degree of interdependence involved in tensions can vary dramatically. At the low end of the scale, tensions can emerge between elements that simply exist in parallel without a clear interaction. For example, many organizations accommodate multiple institutional logics that, while not directly related to one another, can induce experiences of tension for those individuals' whose work they inform (Gümüsay et al., 2020; Ramus, Vaccaro, & Brusoni, 2017; Smets, Jarzabkowski, Burke, & Spee, 2015; Uriarte, DeFillippi, Riccaboni, & Catoni, 2019). At the other end of the scale, tensions can emerge from elements in mutually constitutive relationships where changes in one element inherently affect other elements (Burström & Wilson, 2018). For example, a public transport agency looking to roll out a new type of bus may encounter tension between the capacity and comfort of seating on the bus, where increasing the seating capacity may reduce the overall comfort of seats, and vice versa. Across the tensions literature scholars debate the extent to which elements must be enmeshed to be in tension, ranging from connections between distinct elements that effect changes relative to each other (Schad et al., 2016), such as distant elements of an organization which share a common pool of resources (Boswell, Anbari, & Via, 2017), to ontologically conjoined elements that cannot exist in isolation, such as perceptions of stability and instability in organizational structures (Farjoun, 2010). Regardless of the degree to which elements involved in tension are ostensibly linked, when individuals experience tensions they consciously or otherwise engage implicit perceptions of interdependence between the constituent elements (Gümüsay et al., 2020; Jarzabkowski & Lê, 2017).

In addition to interdependency, tensions literature highlights that tensions must induce some sort of strain or conflict to be 'surfaced' and responded to (Smith et al., 2017, p. 311). Without introducing strain or conflict, interdependent relationships can 'remain latent, only becoming salient through environmental conditions or when juxtaposed through individual framing' (Schad et al., 2016, p. 23). Importantly therefore, whether interdependence becomes

felt as a tension is highly situational, depending on a mixture of individual actions and environmental catalysts such as plurality, change and scarcity (Smith & Lewis, 2011). As with interdependence, the degree of strain or conflict introduced by tensions can vary dramatically with tensions inducing only slight strain for certain individuals, and severe strain for others (Stjerne & Svejenova, 2016).

Over time, tensions literature has grown to describe a broad range of situations involving interdependency between elements (Ebbers & Wijnberg, 2017). This has seen theories of paradoxes and dualities emerge to describe specific types of tension. Over time, these theoretical traditions have diverged and converged (Smith et al., 2017), blurring theoretical boundaries and creating confusion about how the schools of thought cohere (Cunha & Putnam, 2019; Hahn & Knight, 2019).

A paradox is a tension involving 'contradictory yet interrelated elements that exist simultaneously and persist over time' (Smith & Lewis, 2011, p. 382). The fundamental distinction from tensions is that the interdependent elements involved in a paradox are inherently contradictory (Schad et al., 2016). As such all paradoxes are tensions but not all tensions are paradoxes. Tensions involving strain but not contradiction between interdependent elements are not paradoxes (Hargrave & Van de Ven, 2017). This is highlighted by Lewis (2000, p. 761) who notes 'the key characteristic in paradox is the simultaneous presence of *contradictory*, even mutually exclusive elements'. This inherent contradiction invites logical loops known as vicious cycles or series of infinite regress, where every step towards resolution of the paradox nullifies the last step creating infinite logical processes (Hargrave & Van de Ven, 2017). Inasmuch, paradoxes are a simultaneously inherent and constitutive phenomenon, forcing researchers to grapple with the confoundingly 'paradoxical nature of the ontology of paradox' itself (Hahn & Knight, 2019, p. 2). A simple example of a paradox at work is the statement 'This statement is false', as the statement cannot be simultaneously true and false. If

we accept the statement as true, then it must be false, which in turn points to the conclusion that it is true. Likewise, if we accept the statement as false, then it must actually be true, leading once again to the conclusion that it is indeed false, and so on *ad infinitum*. And while logicians can deconstruct how this simple semantic paradox creates 'terminological indeterminacy' that contravenes formal logic, most organizational paradoxes present far messier problems (Berti, forthcoming). Common examples of organizational paradoxes include the paradox between long-term adaptability and short-term survival, the paradox between possibilities and constraints, the paradox between diversity and cohesiveness, and the paradox between passion and discipline (Andriopoulos & Lewis, 2010).

Similar to paradoxes, dualities are another specific formulation of tension. Dualities are situations involving absolute interdependency between contradictory elements. This means that elements are mutually constitutive of one another and are 'ontologically inseparable' (Schad et al., 2016, p. 13). For instance, Orlikowski and Scott (2008, p. 446) highlight how materiality and discourse are 'mutually dependent, integrative, and co-evolving over time'. Likewise M. Feldman and Pentland (2003) demonstrate how the ostensive and performative aspects of routines form a duality as without the ostensive dimension routines cannot be recognised and without the performative dimension routines cannot be reproduced. Therefore, for a tension to be considered a duality, elements involved cannot be described in isolation (Graetz & Smith, 2008) as their interdependent relationship depends on a constant state of mutual becoming (Tsoukas & Chia, 2002). While closely linked, dualities and paradox scholars hold differing analytic emphases and therefore focus on different types of tensions. For paradox scholars, the focus remains on contradiction between elements and understanding methods of managing contradiction. For duality scholars, the focus is on the fundamental and constitutive interdependence of elements with less concern for the extent to which those elements form contradictions.

While highlighting the differences between these theoretical traditions is important, as each tradition contributes to a more holistic appreciation of the different types of tension, in the current thesis, I refer primarily to 'tensions'. While further institutionalizing distinctions between the traditions of tensions, paradox and dualities helps build clear roadmaps for research agendas, there is also benefit to avoiding further 'convergence and narrowness' in theories of tension that may prevent scholars 'exploring new terrains' (Cunha & Putnam, 2019, pp. 102-103). Additionally, across the interviews used to collect data for the current thesis, 'tensions' was the phrase most frequently relied on by interviewees to describe situations involving interdependency and strain between elements. Therefore, given that the language of interviewees simultaneously reflects and shapes the reality of tensions in organizations (Sheep et al., 2017), I use the more integrative term 'tensions' throughout the thesis to give an accurate and analogue reflection of interviewee experiences, , with the exception of some sections of Paper 3 where interviewees referred specifically to paradoxes (Gluch & Räisänen, 2012).

2.2 Introducing the meta-theoretical concept of balance

From the above, it is clear that working with tensions requires the management of multiple interdependent elements simultaneously. Naturally, this invites discussions of balance as a means of conceptualising how elements are positioned relative to one another, and it stands to reason that 'if paradoxical tensions are persistent, balancing opposing poles is an ongoing concern' (Schad et al., 2016, p. 36). The connection between tensions and the meta-theoretical concept of balance can be traced back through Eastern and Western thought where balance has been described as a stable state in which connected elements work in concert to create sustained positive outcomes (Legge, 1966). Over time, the pursuit of balance has been described through two main dimensions: arranging elements to achieve beauty and harmony within a given

moment, and arranging elements with moderation in mind so that they could be sustained into the future.

Emphasizing the former, Plato argued that the pursuit of balance was about bringing elements together to create a state of beauty, proportion and truth (Reeve, 2004). Likewise, Aristotle described balance as finding a 'golden mean' that was the virtuous middle way between extremes (Aristotle & Hope, 1962). In contrast the Greek poet Cleobulus emphasized the latter dimension of balance, coining the saying 'moderation is best' (Papageorgakis, 2017) and similarly, Confucian teachings emphasize concept of *zhongyong*, or the 'unwobbling pivot', in which balance is achieved by creating a harmonious state of equilibrium in the mind (Legge, 1966). For millennia the concept of balance has been observed across the natural, social, political and economic spheres, and played a pivotal role in shaping how people think, feel and act towards the world (Maritain, 2005). From atop the doorway at the temple of Delphi to within the humble fortune cookie, the maxim 'nothing in excess' reverberates across cultures and times (Rochat, 2010).

In the study of organizations and management, balance is a recurring concept and has been used to frame thinking on issues ranging from teamwork (Partington & Harris, 1999), to leadership (Kenner & Isaak, 2004; Ralf Müller, Packendorff, & Sankaran, 2017; Perrons, 2009), culture (McDonald, 2005) and governance (Book, Eskilsson, & Khan, 2010). Likewise, the concept of balance has also had a long presence in the tensions literature (Denis, Lamothe, & Langley, 2001; Gibson & Birkinshaw, 2004; Lewis, Welsh, Dehler, & Green, 2002). Earlier studies tend to characterize balance as a semi-stable state that can be temporarily achieved by organizations until rendered unsuitable by internal or external changes (Denis et al., 2001; Gibson & Birkinshaw, 2004; Lewis et al., 2002; Sutherland & Smith, 2011). Many of these studies focused on how organizations could balance their internal operations with external demands for adaptation and innovation (Bradach, 1997; Poole & Van de Ven, 1989). An

automotive manufacturer, for instance, may encounter tension between the 'close supervision [and] detailed prescriptive procedures' required for 'efficient performance of routine tasks', and the 'organic [and] intrinsically motivated' work required for 'the creative performance of nonroutine tasks' (Adler, Goldoftas, & Levine, 1999, p. 47). On an organizational level, it was argued that tension between internal and external demands could be managed structurally through organizational designs which balanced competing objectives, perspectives and processes across different functional units (Bradach, 1997). It was thought that through strategic forecasting, emerging tensions could be dissected down to their constituent elements and organizations could position themselves to pre-emptively balance and accommodate the resulting stresses (Poole & Van de Ven, 1989).

Tushman and O'Reilly III (1996) described this structural approach to balancing tension between elements of an organization geared towards exploiting existing capabilities and elements geared towards exploring new capabilities as structural ambidexterity. Focused on 'structuring a balanced portfolio… that includes radical projects that aim to create new opportunities, as well as incremental innovations that exploit existing competencies', structural ambidexterity emphasizes a more stable view of balance where balance can be achieved over the long term by careful assessment and curation of competing strategic objectives (Andriopoulos & Lewis, 2010, p. 109). Lin et al. (2013, p. 262) echo this finding from a 'non-Western context' where ambidexterity is demonstrated to enhance business outcomes as firms can out survive competitors who encounter the same innovation tensions. However critically, this more stable view of balancing tensions is only sustainable in organizing contexts where change is not completely chaotic and has a degree of predictability. As organizing environments grow increasingly fast-paced and dynamic, conceiving of balance as even a semi-stable state has lost traction. As Lin et al. (2013, p. 275) foreshadowed, 'It will be interesting and important for future research to investigate the ease with which the combining process

takes place and over what time period so that a sense of the sustainability of this advantage may be obtained'.

In contrast, more recent collective level research has focused on temporality and dynamism to show how organizations balance tensions through oscillating and cyclic processes (Gibson & Birkinshaw, 2004; Klarner & Raisch, 2013; Smith & Lewis, 2011). Stemming from March's (1991) model of temporal separation where elements in tension are spread out over time to be dealt with progressively, this line of research emphasizes the ambiguity and uncertainty of tensions that necessarily causes collective responses to be reactive rather than proactive. Rather than exploring how organizations can preemptively embed ambidextrous capabilities into organizational structure, researchers increasingly look to how organizations can adapt agilely to develop contextually relevant ambidextrous capabilities (Gibson & Birkinshaw, 2004). This line of thinking is extended by Andriopoulos and Lewis (2009) who show how product design agencies deploy a range of approaches to accentuate constrains and freedom at different times and encourage an iterative approach to balancing tensions over time. In contrast, Smets et al. (2015, p. 12) introduced a practice view which moves away from sequential models approaches to balancing tensions, and instead highlights how collective responses move 'in a continuous and cyclical process of flux within the moment'. Later research has looked to uncover how layers of interdependence between tensions obscure and complicate collective level responses. For instance Raisch and Tushman (2016) emphasize that because tensions become nested across time and space within organizations they require collective responses to adaptively differentiate and integrate elements in tension so as to sustain but not unmanageably amplify persistent tensions. As tensions evolve they become nested and knotted together, and so understanding how organizations respond requires consideration of how organizations accumulate tensions over time (Smith et al., 2017). This is demonstrated by Chrisman, Chua, De Massis, Frattini, and Wright (2015) who show how family firms

experience a mix of tensions between firm identity and innovation, ability and willingness, and family and non-family governance. Most recently approaches to balancing tensions have been considered in the context of organizational hybridity, where organizations deliberately mix contrasting elements, value systems and institutional logics to achieve a more diverse array of aims (Gümüsay et al., 2020; Smith & Besharov, 2019). In particular, Gümüsay et al. (2020, p. 4) introduce the notion of 'elastic hybridity' as a means of explaining how organizationally instituted polysemy can be recursively blended with polyphony in individual actions to create spaces for working through competing logics. By focussing on how organisations can intentionally deploy ambiguous concepts to create more flexible spaces for improvisation, contestation and interplay between individuals, this research highlights elasticity as a fundamental property of organizational systems for balancing tensions (Gümüsay et al., 2020).

As the more connected and complex nature of tensions is understood, difficult questions emerge around collective processes of organizational identity shaping (Ashforth et al., 2011), dynamic responses to nesting (Klarner & Raisch, 2013) and information feedback loops (Cronin et al., 2011). And so, while there remain many aspects of how tensions are collectively responded to that require further research, existing literature mainly focuses on macro and meso level approaches to balancing tensions. From collective level research we can see that balance is sometimes described as a semi-stable state for tensions to be temporarily brought in and out of (Sutherland & Smith, 2011), while in other studies balance is considered to be an inherently dynamic state requiring constant maintenance (Smith & Lewis, 2011). Despite these differences in exactly how stable balance is, the tensions literature demonstrates that when managing tensions, balance is never an entirely static state that can be left indefinitely once achieved. Rather, tensions scholars describe balance as a*n ongoing process of simultaneously addressing interdependent elements to achieve a desirable outcome* (Schad et al., 2016).

2.3 Elaborating microfoundations through balance

In comparison, we know far less about the underlying mechanisms that allow individuals to balance tensions. While scholars stress that tensions should be studied across multiple levels (Andriopoulos & Lewis, 2009) existing literature tends to investigate how tensions are managed at higher levels of analysis, including macro-culture (O'neill, Pouder, & Buchholtz, 1998), industries (Cattani & Ferriani, 2008; Quezada et al., 2016), inter-organizational groups (Hu, Chen, Gu, Huang, & Liu, 2017; Rutten & Oerlemans, 2008; Sydow, Lerch, Huxham, & Hibbert, 2011) and organizations (Kornum et al., 2017; Seran, Pellegrin-Boucher, & Gurau, 2016). This approach demonstrates the importance of semi-stable or dynamic approaches to balancing tensions on a collective organizational level but does not address foundational questions about how the concept of balance plays into individual cognition, emotion and behaviour, and shapes responses to tensions (Smith et al., 2017). While research on the microfoundations of tension emerged from psychoanalytic traditions focussed on individual cognition, emotion and behaviour, this research largely focusses uncovering the factors that cause individuals to have divergent experiences with tensions.

Early scholars saw how tensions could prove confounding to individuals who were not prepared, or accustomed to, managing messy problems involving interdependent concerns. Of particular concern were the ways tensions impacted an organization's roster of leaders that 'serves as the point of integration between… contrasting agendas' (Smith & Tushman, 2005, p. 524). While literature highlighted the important role of individuals in processes of creating and executing organizational vision (Bass, 1990), tensions were found to create ambiguous situations and impede the ability of individuals to envision and enact organizational change (Smylie & Denny, 1990). When confronted by situations involving tensions, researchers found individuals felt restricted, disengaged, threatened and defensive (Gallagher, Mason, &

Vandenbosch, 2004; Kahn, 1990; Schneider, 1990; Vince & Broussine, 1996). Amongst this earlier literature tensions were largely depicted as a challenge to existing approaches to organizing and were therefore thought of as a constraint to individuals, as something to 'cope' with, rather than flourish through (Beach & Pearson, 1998). Rather than being business as usual, tensions were thought of as diverting individuals away from the task at hand. Leonard-Barton (1992, p. 111), for instance, highlight through a study of new product development (NPD) managers how 'projects become the focal point for tension' and expose project managers to 'microcosms of the paradoxical organizational struggle'.

However, as the microfoundations corpus developed increasing recognition was also afforded to how experiences with tensions could have positive impacts on individuals. By exposing individuals to interdependence tensions heighten the breadth and depth of the decision making processes required to work effectively and ethically (Krupa & Clark, 2009; Moore, 2007). Tensions encourage individuals to adopt a proactive approach to questioning their assumptions about how their actions impact others in their organization (Schneider, 1990). By engaging with issues from multiple perspectives, individuals are exposed to new opportunities for reframing and advancing the goals of their organization (Seo, Putnam, & Bartunek, 2004). In this manner tensions put complementarity front of mind and naturally push individuals towards the adoption of complementary practices (Lewis et al., 2002). Increasingly, scholars recognised how tensions could enhance the motivation and imagination of individuals resulting in new ways of thinking about work (Gallagher et al., 2004). For example, using a social cognition lens Bartunek, Lacey, and Wood (1992) demonstrate how encounters with dilemmas between contradictory leadership strategies evoked new cognitive schemas amongst faculty members of an educational institute that were better adapted to the goals of their organization. Increasingly, microfoundations research highlights the generative aspects of tensions that can empower individuals to thrive at work (Liu, Xu, & Zhang, 2019), deliver

innovative outcomes (Miron-Spektor et al., 2018) and emancipate individuals from institutionalized constraints (Zheng, Kark, & Meister, 2018).

Microfoundations literature clearly demonstrates the divisive and situational role of tensions as a 'double-edged sword' to individuals (Andriopoulos et al., 2018, p. 427). Individuals never encounter tensions in a vacuum, their encounters are always embedded in a broader organizational, temporal and personal context that guides the types of responses they exhibit (Smith et al., 2017). As individuals work, tensions both threaten and support them, sometimes acting as an impediment and other times helping them to progress (Sharma & Jaiswal, 2018). Tensions complicate decisions by opening up new challenges and opportunities that require consideration of multiple connected and changing interests (Loch & Sommer, 2019). To some individuals, being pushed and pulled in different directions by tensions generates a momentum for creativity and innovation, while for others it stifles their imagination and cripples their motivation (Sweetman & Conboy, 2013). For this reason, scholars routinely depict working with tensions like walking on a tightrope (De Keyser et al., 2019; M. S. Feldman et al., 2016; Kassotaki et al., 2019; Schad et al., 2016; Sharma & Jaiswal, 2018): and yet, the concept of balance sees little discussion amongst individual level literature beyond this metaphor (Schad et al., 2016). There has been little research exploring the underlying mechanics that enable individuals to 'walk the tightrope' and balance tensions (R. Müller et al., 2018). While it is clear that 'recent studies in management acknowledge the importance of balancing as a means of addressing tensions', and that tensions have significant impacts on the organizational lives of individuals, to date 'management studies have remained relatively silent about individual approaches' (Schad et al., 2016, p. 36).

Unifying microfoundations research through the concept of balance is an important avenue for developing new insights about how individuals dynamically respond to tensions (Schad et al., 2016). Doing so can help us understand how individual cognition, emotion and

behavior serve as building blocks for larger, collective responses to tension aggregated across organizations and industries. By introducing the meta-theoretical concept of balance into research on the microfoundations of tension, this research highlights how unifying concepts, such as balance, can inform micro-level practice, despite the situational nature of individual experiences of tensions (Smith & Lewis, 2011). This gives researchers a new window into how individuals accentuate the benefits of tensions while mitigating their constraints, and gives practitioners a framework for managing tensions that coheres more closely with higher-level theories of organizational innovation and change. In the following sections of this doctoral study, I explore how individuals balance three salient tensions in project-based organizing environments: tension between vertical and horizontal leadership, tension between continuity and change, and tension between risk and innovation. Through this research, I contribute to literature on the microfoundations of tension.

In my first paper, I focus on understanding how individuals in construction projects can balance tensions between the vertical and horizontal leadership archetypes. In this paper, I contribute to microfoundations literature focussed on the influence of different leadership styles on the management of tensions by highlighting how the vertical and horizontal leadership archetypes foster tensions across construction, and putting forwards the balanced leadership archetype as a potential mechanism for balancing tensions.

In my second paper, I focus on understanding how individuals can balance tension between continuity and change as they move between different phases of projects. In this paper, I contribute to microfoundations literature focussed on the process dynamics of managing tensions by demonstrating how the micro-level role interactions of individuals engaged in three different teaming routines create a distributed capacity for individuals to absorb and balance tension between continuity and change according to the progress of a project.

In my third paper, I focus on understanding the different approaches individuals take to tensions between risk and innovation using the paradox and dilemma mindset. In this paper, I contribute to microfoundations literature by highlighting how, in contrast to existing literature, neither the dilemma mindset nor paradox mindset is preferable for managing tensions in all innovation projects, and rather, how individuals who can develop a more agile mindset enabling them to switch between approaches are better positioned to balance tensions effectively.

Through the three distinct studies of this thesis, I seek to contribute a deeper understanding of the underlying mechanisms involved in individuals balancing tensions. In the discussion, I synthesise the results of the three studies to explain how the concept of balance changes our understanding of the microfoundations of tensions.

Chapter 3. Methodology

In this chapter I describe the research methodology of the thesis. First, I introduce the research paradigm, before providing an account the overall development of the thesis. While this account includes a brief description of the methodology used in each paper, more detailed descriptions can be found within the methodology section of each paper in Chapters 4, 5 and 6.

3.1 Research paradigm

This thesis is authored under the subtle realist paradigm of Hammersley (1992, 1995). Subtle realism is a suitable research paradigm as, at its core, it postulates that researchers are empowered to manage ontological tensions through accepted (albeit reflexive) practice and agreed standards for establishing the relevance, plausibility and credibility of claims (Maxwell, 1992). The central axiom of subtle realism is that language simultaneously describes external realities and constructs new realities (Hammersley 1992). This midway between the positivist and constructivist paradigms grounds researchers in the inherent tension between the self and subject, recognizing that researchers' subjectivity is met by constraints on the gamut of perspectives available to them as imposed by research communities. As Seale (1999, p. 470) highlights, 'although we always perceive the world from a particular viewpoint, the world acts back on us to constrain the points of view that are possible… human communities in practice have created reasonably firm grounds on which plausibility can be judged'. Researchers must therefore uphold a high level of methodological rigor if their findings are to be deemed relevant, plausible and credible (Seale 1999). Accordingly, claims throughout the three publications of the thesis are recognized as my interpretations of external realities that, through methodological rigor, have relevance, plausibility and credibility.

I apply this research paradigm through a practice perspective (Corradi, Gherardi & Verzelloni 2010; Tsoukas & Chia 2002). This perspective purports that all things are

reifications ‘of process, of activity, of change’ and thus, we must first look at the cognitive, affective and physical practices of actors, followed second by how these practices coalesce in processes of interaction, to deeply understand organisational realities (Corradi, Gherardi & Verzelloni 2010; Rescher 1996, p. 10). As such, this research looks to be build theoretical connections across levels of analysis, characterising the practices of individual actors as part of collective processes which respond to tensions as they are experienced. As Langley et al. (2013, p. 5) note, ‘changing in this view is not something that happens to things, but the way in which reality is brought into being in every instant’.

3.2 Thesis development

The development of the three papers of this thesis was an iterative process undertaken over 3 years. Throughout this period the three papers developed in parallel and were collectively informed by insights emerging from the research (Eisenhardt, 1989; Timmermans & Tavory, 2012). Initially, the aim of my research was to understand how individuals can manage innovation tensions in new product development (NPD), engineering and construction projects. However, as Papers 1 and 3 developed, it became clear that opening up my research to investigate how the metatheoretical concept of balance can serve as a foundational principle for individuals across different tensions would facilitate more meaningful comparisons across the papers and advance more integrative insights into the microfoundations of tension (Burström & Wilson, 2018). Given that the tensions studied and formats of each paper in this thesis differ, the methodology adopted in each varies, however, in each instance, a systematic approach has been used to ensure theoretical, descriptive and interpretive validity (Maxwell 1992). Together, the papers offer a broad perspective of how an industry-specific tension surfaces in projects, a longitudinal perspective on how an industry-agnostic tension surfaces in projects and a comparative perspective on how different individuals use the surfacing of tension

to overcome barriers. A summary of the research methodologies and data collected can be found in Table 2 below.

Paper	Research approach	Data	Pages transcribed
1	Scientometric review	289 x bibliometric records (SCOPUS)	NA
2	Longitudinal case-study	12 x semi-structured interviews (54min ave)	363
		7 x meeting observation (3hr & 42min ave)	436
3	Comparative case-study	38 x semi-structured interviews (45min ave)	423
			1,222

Table 2. Total Data Inventory

3.2.1 Paper 1: Scientometric review

Paper 1, entitled *'Tension between leadership archetypes: systematic review to inform construction research and practice',* is a scientometric review of 289 peer-reviewed papers. The paper offers a conceptual review of how the vertical, horizontal and balanced leadership archetypes have informed research and practice in the construction industry. The paper users the VosViewer scientometric package to combine a bibliometric review with systematic analysis and identify trends in the characterisation and utilisation of vertical, horizontal and balanced leadership practices in construction projects (Booth, Sutton & Papaioannou 2016). In doing so, findings are referenced against contemporary challenges facing the construction industry to develop a research agenda identifying gaps in best practice across the three leadership archetypes and theorise approaches for managing the tension they create. As part of this discussion, the paper explores how construction firms can engage with duality between vertical and horizontal leadership through the balanced archetype to maximise project

outcomes in uncertain environments. Particular consideration is afforded to how the micro-level control practices mobilised by project managers can be integrated into a broader organisational experience of tension which leverages the benefits of all three leadership approaches (Simmons, Clegorne & Woods-Wells 2017). On this basis, I theorize how the emerging framework of balanced leadership sheds light on the management of tensions in construction projects.

Paper 1 developed as a means of offering an initial review of a salient tension in projects and highlights growing demand for more balanced approaches to tension. In the context of construction projects, Paper 1 points towards balanced leadership as a useful micro-level mechanism for surfacing tensions between vertical and horizontal leadership in a manageable and beneficial manner. However, being a systematic review, I was not able to explore the process dynamics of balancing tensions thoroughly in Paper 1 and so Paper 2 was developed with this aim.

3.2.2 Paper 2: Longitudinal case-study

Paper 2, entitled '*Down to the wire: using teaming to balance tensions between continuity and change in projects'*, is a case-study using teaming (Edmondson 2012) as a lens to explore the ways that members of temporary organisations balance tension between continuity and change throughout a project. Data for the paper was drawn from a project-based organization tasked with the annual delivery of a major celebratory event in an Australian state capital. The unique structural context of the organisation provides an ideal research environment for studying the interplay between continuity and change through projects. The organisation reforms annually, with an initial team of only six members. This workforce then grows substantially throughout the year to a size of 141 members until the event is delivered

and its members disband until the following year. This creates a unique environment in which new and old members, project demands, practices and stakeholders are continually thrust together in new combinations. As a result, the organisation consistently accommodates tensions between continuity and change. Data was collected through filmed non-participant meeting observation, recorded semi-structured interviews and organisational artefact collection. Data was coded using an abductive hermeneutic approach inspired by Charmaz (2011, 2014). NViVO11 was used to conduct an initial open coding phase, followed by an interactive, focussed coding phase and a final stage of theoretical development (Charmaz 2014).

By presenting a longitudinal case-study of how teaming is used to manage tensions between continuity and change, Paper 2 offers an in-depth examination of the processes involved in achieving a dynamic balance. The paper demonstrates how achieving a dynamic balance involves both gradual and sudden change. On the one hand, actors would slowly adapt their roles and teams, gradually adjusting the balance between maintaining continuity and introducing change, while on the other hand, actors would respond interact in such a manner at certain moments that sudden shifts in the balance between maintaining continuity and introducing change would occur. Throughout Paper 2, it is clear how micro-level interactions compete and coalesce throughout projects to aggregate in both gradual shifts and sudden punctuation in the balance between maintaining continuity and introducing change. Having addressed how balance informs the organizational and processual microfoundations of managing tensions in projects, Paper 3 was developed to address cognitive-affective microfoundations.

3.2.3 Paper 3: Comparative multi-case-study

Paper 3, entitled '*Innovators at the edge: How dilemma & paradox mindset shape responses to barriers in the Australian Defence Force'* is a case-study of how 38 innovators with a dilemma mindset, paradox mindset or combination of both mindsets surface tension between risk and innovation in the Australian Defence Force (ADF). These innovators were each responsible for a different innovative project. Some projects were small and in early stages of development while others were multi-decade, multi-billion-dollar projects. Data collection occurred iteratively over the three-year period between 2017 and 2019, resulting in 38 semi-structured interviews. Innovators provided detailed examples of experiences with barriers, milestones and changes that revealed their different approaches to surfacing tensions. Data was analyzed in NViVO 11 using a three-stage abductive process (Charmaz 2011, 2014). First, I established which innovators had experienced barriers and categorized the types of barriers experienced. Next, data was analysed individually to establish whether each innovator exhibited a dilemma mindset, paradox mindset or combination thereof. Finally, I compared how innovators with a dilemma mindset, paradox mindset or combination of the dilemma & paradox mindsets described responses to barriers. This final phase of analysis pulled together the identified mindsets and responses to barriers into a coherent theoretical framework to reveal how innovators can use a dilemma mindset, paradox mindset or balance of both mindsets to respond to barriers in innovative projects.

As the last paper of the thesis, I used Paper 3 to hone in deepest on the mindsets individuals working through tension, with the aim of understanding the different ways they think, feel and act towards tension. As Paper 3 developed, it reinforced that in some circumstances, tensions are asymmetric and involve imbalanced elements, power relationships and timeframes. The paper shows that in order to progress projects in such circumstances, individuals must learn when to adopt an imbalanced approach to tension that looks to avoid

individuals, elements or ideas at the centre of tension. Additionally, by focussing on the cognitive-affective factors involved in balancing tensions, Paper 3 encouraged me to revise my thinking around how individuals accumulate tensions and whether transcending tensions really is akin to walking a tightrope.

Chapter 4. Tension between leadership archetypes: systematic review to inform construction research and practice (Paper 1)

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ABSTRACT

In the literature on construction projects, the role of project managers in maintaining control over tasks and activities has been theorised comprehensively, placing a firm focus on vertical forms of leadership. Increasingly, construction firms are challenged with unprecedented operational uncertainty, brought about by changes to project environments, technology and labour. Similar challenges in other contexts have led to growing research on shared or horizontal approaches to leadership, which have been particularly effective in making organisations more agile in uncertain environments. Through a systematic review of 289 peer-reviewed articles on leadership in construction, this paper considers the extent to which traditional vertical approaches to leadership are supplemented with horizontal and emerging balanced approaches to leadership across six bodies of construction leadership research. It contends that despite evidence for the increasing implementation of horizontal leadership practices on construction projects, vertical leadership theory dominates construction leadership research. In comparison, there is a dearth of research addressing horizontal leadership and scarce consideration of balanced leadership. Based on the review, stronger integration of the balanced leadership archetype in research on leadership in construction is proposed as a logical means of advancing leadership theory in relation to six research vectors.

KEYWORDS
Construction projects, project management, vertical leadership, horizontal leadership, balanced leadership, literature review

INTRODUCTION

Few other fields in organisation studies have been explored as extensively as leadership. As Northouse (2015) observes, 'leadership is a topic with universal appeal', and one that, according to Wheatley (2010), 'has intrigued us since people began organising'. Defined broadly as an 'influence process', leadership is a pervasive phenomenon that cuts to the core of both how groups operate moment-to-moment and how they survive long-term (Denis et al. 2012). By exploring how different approaches to leadership drive or constrain success, researchers have been able to promote more informed research agendas that align emerging industry needs with theory and practice.

Research on leadership in construction projects has largely mirrored major evolutions in the broader discourse on leadership (Allport 1937; Bass 1991; Carlyle 1840; Fiedler 1964; Skinner 1938). Leaders have long been regarded as a key driver of performance and are considered integral to the effective delivery of projects (Quang et al. 2015). In particular, research has focussed on the roles of key individuals such as senior executives (Biggs et al. 2013; Gu and London 2010; Toor 2011), project managers (Larsson et al. 2015; Potter et al. 2018; Tabassi et al. 2016) and foremen (Jeschke et al. 2017; Kines et al. 2010; Mitropoulos and Cupido 2009) in fulfilling a broad spectrum of functions from stakeholder engagement to on-site safety reporting in construction projects. The hierarchic decision-making control of these individuals is seen as key to delivering high quality outcomes on budget and within schedule (Larsson et al. 2015; Love et al. 2016). By establishing a clear chain of command, leaders can maintain influence over all aspects of project delivery from supply chains (Guo et al. 2017) to risk management (Karakhan and Gambatese 2017). Through a clear line of leadership, information can reach relevant decision makers up and down the line rapidly (Dubey et al. 2015). Further, the ability of these leaders to use this information to develop grander visions of how their organizations will operate more innovatively, sustainably and

ethically is seen as a long-term competitive differentiator (Chang et al. 2016; Simmons et al. 2017; Zhang et al. 2017).

With a large and rapidly growing body of leadership research, a number of perspectives have been put forward as to what the ideal leadership traits, behaviours and styles for leaders in construction are (Simmons et al. 2017). For example, Chan et al. (2014) identify transformational leadership as a desirable driver of innovation in construction leaders, noting that 'with charismatic, inspirational, intellectually stimulating, and individualized consideration leadership, a transformational leader motivates followers to achieve higher levels of performance by nurturing their personal value systems and facilitating their creative ways of thinking'. Alternately, Liu and Chan (2017) put forward contingent reward leadership as a desirable leadership style for stimulating innovation in construction, noting that 'contingent reward leadership influences innovation through inducing compliance'. Similarly contrasting perspectives can be found across every domain of construction leadership research. However, overwhelmingly existing research characterizes the fundamental nature of leadership in construction as a vertical influence process in which individuals enact leadership hierarchically over followers (Simmons et al. 2017).

Emerging challenges to construction leadership

The construction industry is undergoing significant changes that bring into question the effectiveness of this traditional vertical approach. Chief among these is the increasing social and technical complexity of projects (Yan et al. 2019).

Socially, construction projects are becoming more complex in both how firms engage and manage their workforces (Ball 2014; Pesämaa et al. 2018) and how they engage externally with clients and community stakeholders (Adapa 2018; Xavier et al. 2017). As Pesämaa et al. (2018) highlight, while traditionally construction firms have applied a routine set of processes

for coordinating projects, increasingly projects 'involve multiple temporary teams of actors adapting to diverse demands and on-site conditions' requiring new approaches to coordination centred on organizational learning and collaboration. Emerging research indicates that organizational learning and collaboration stem primarily from the horizontal diffusion of information between peers (Perra et al. 2017). With increasing environmental complexity, construction firms also face similar challenges when it comes to their external engagement with clients, regulators, partners and community stakeholders (Adapa 2018). It has been suggested that traditional vertical leadership practices are not well suited to complex and dynamic environments where firms primarily require collaboration and agility. As Xavier et al. (2017) argue, the sharing of leadership responsibility amongst teams is important if construction firms are 'to deal with the complexity of environmental issues; to integrate seemingly contradictory outlooks; to understand and address the expectations of a wide range of actors and to profoundly change organizational practices'.

From a technical perspective, the way construction projects are being delivered is also rapidly changing, leading to an overall more complex delivery ecosystem for leaders to navigate (Lines et al. 2017). With planning and delivery frameworks such as building information modelling (BIM) (Wu and Issa 2014) and integrated project delivery (IPD) (Esther Paik et al. 2017) burgeoning, the managerial competencies expected of construction leaders are expanding. Simultaneously, industry shifting innovations such as big data and site automation have put a wealth of information at the fingertips of leaders with the potential to both empower and cripple decision making (Bilal et al. 2016). As Bilal et al. (2016) describe,'facilities utilise advanced automation and integration to measure, monitor, control, and optimise building operations and maintenance. They provide adaptive, real-time control over an ever-expanding array of building activities in response to a wide range of internal and external data streams'. To an extent, these shifts have emerged in response to the tightening requirements of leading

sustainability accreditation frameworks such as Leadership in Energy and Environmental Design (LEED) (Abdallah and El-Rayes 2016) and Building Research Establishment Environmental Assessment Method (BREEAM) (Tabassi et al. 2016) that add another layer of critical thinking to the role of project leaders. Recent research is indicating that seamlessly integrating these complex computerized and human systems is beyond the competencies of most leaders and requires a degree of organic collaboration between teams beyond that currently observed in the industry (Iorio and Taylor 2015). Indeed, in the case of IPD, the sharing of leadership authority is considered absolutely neccesary for a constellation of firms, partners and stakeholders to engage concertively (Esther Paik et al. 2017).

Exploring new possibilities for construction leadership

As the construction industry forges its path into this increasingly innovative, integrated and complex world, it is important it is equipped with leadership frameworks that accurately reflect the diverse array of leadership practices implemented. In light of the above challenges, this may require revision of the dominance of vertical leadership perspectives that have underpinned research on leadership in construction until now. As Tabassi et al. (2014) note, 'the nature of the industry, changing requirements of construction works and the complexity of most of the processes in a construction organization places them beyond the control of any one individual'.

However, construction leadership research has significantly lagged behind broader leadership research in theorizing the value and impact of different forms of leadership on projects' processes and outcomes. In leadership research, the recognition that vertical leadership requires rethinking can be traced back as far as the 1950s and has led to the development of a horizontal leadership archetype in which leadership influence is mobilised collectively and non-hierarchically (Denis et al. 2012; Gibb 1954). In this rich body of

literature, horizontal leadership can take many forms, including 'emergent leadership' (Beck 1981), 'collaborative leadership' (Rosenthal 1998), 'co-leadership' (Heenan and Bennis 1999), 'collective leadership' (Denis et al. 2001), 'distributed leadership' (Gronn 2002), 'shared leadership' (Pearce and Conger 2002) and 'lateral leadership' (Day et al. 2004). While there are nuanced differences between these perspectives, they all fundamentally feature a departure from the vertical leader-follower binary that has dominated leadership research (Bolden 2011).

Overall, proponents of these approaches argue that horizontal leadership is well suited to complex and dynamic environments as it has been found to facilitate organisational agility and innovativeness more effectively than vertical leadership (Cavaleri and Reed 2008; Pearce and Sims 2002; Toegel and Jonsen 2016). For example, Kaviani et al. (2017) study horizontal leadership in relation to Six Sigma teams working on healthcare projects. Centrally, they contest that horizontal leadership should be implemented in contexts with a high degree of environmental complexity where ongoing change management is required as it improves the ability of teams to communicate, adapt and innovate. Likewise, Galli et al. (2017) design an experimental approach for identifying antecedents to horizontal leadership in engineering design teams. They argue that as organizations rally in response to volatile industry demands, horizontal leadership should be implemented as it creates ‘an atmosphere that consists of high levels of involvement, cooperation, shared understandings about team goals and purpose, and a sense of recognition’. Additionally, horizontal leadership has been demonstrated to be effective in situations where agile project management methods are employed, particular in software development (Bäcklander 2018; Dybå et al. 2014; Li et al. 2018; Moe et al. 2015; Moe et al. 2019; Xu and Shen 2018). For instance, Li et al. (2018) consider integrated software development teams employing agile project management practices and highlight how ‘shared leadership provides the opportunity for team members to utilize their expertise and identify the best solution for a problem’. Given the growing presence of agile approaches in construction

projects, it is important to consider whether the benefits demonstrated by horizontal leadership in other agile contexts are translatable (Mendez 2018; Saini et al. 2018). While it is likely that even in agile construction projects a degree of vertical leadership will continue to be required (De Marco 2018), overall, horizontal leadership literature demonstrates a wide range of benefits offered by the archetype for projects facing complex and dynamic environments increasingly found in construction (Denis et al. 2012).

Research on leadership in projects has so far said little about how vertical and horizontal leadership practices interact and what the impact of this interaction is on projects (Müller et al 2018a). A small number of researchers have started examining how horizontal leadership approaches are implemented in construction and have found that reconciling a project manager's formal leadership authority with informal leadership emerging amongst project teams can bring complex organisational tensions to the fore (Chan et al. 2014). Conflicting views on how different work teams should coordinate their work on-site may arise, inhibiting efficient interaction between experts (Lindgren and Packendorff 2011). In practice these tensions can prove detrimental to large projects, inciting relational strain, project lag, misguided outputs and resource overruns (Abdul Rahman et al. 2013; Doloi 2012; Larsson et al. 2015). This makes the need to investigate the interaction of vertical and horizontal leadership in construction evident. However, currently, construction lacks a mature agenda for researching and implementing the combination of vertical and horizontal leadership approaches (Simmons et al. 2017). Across other industries the same tension between vertical and horizontal leadership has prompted calls for a new approach to leadership based in 'patterns of practice which fuse or coalesce hierarchical and heterarchical elements of emergent activities' (Harris and Gronn 2008). In response, researchers have recently proposed a third, balanced leadership archetype, that aims to simultaneously leverage both vertical and horizontal leadership through practices which manage the tensions resulting from the

combination of multiple leadership approaches (Drouin et al. 2018; Müller et al. 2018a; Pretorius et al. 2017; Yu et al. 2018).

According to the balanced leadership approach, project managers serve as a central conduit between a pool of strategic leaders and the project team, facilitating agile decision making between senior and team-level leadership (Müller et al. 2018b). The approach sees teams progress independently through a sequence of phases where empowerment, self-management and shared mental models are used to create shared socio-cognitive space; a common mental space between teams and project managers which supports interaction between vertical and horizontal leaders (Müller et al. 2018a; Yu et al. 2018). This shared socio-cognitive space has been found to enable six key practices that encourage effective interaction between vertical and horizontal leaders: enabling consensus building, developing team competence, fostering knowledge transfer, defining a control layer, building strategic agility and enabling localized autonomy (Drouin et al. 2018; Müller et al. 2016; Yu et al. 2018). While research on balanced leadership is in its infancy with only a handful of researchers studying its applications, early findings indicate it offers a valuable lens for conceptualising and managing the integration of vertical and horizontal leadership in project-based organizations operating in complex environments (Drouin et al. 2018).

Towards a three-archetype leadership paradigm in construction

Given the potential positive impact of horizontal and balanced leadership approaches on construction projects, it is important to review how the different leadership archetypes have been discussed in construction research so far and consider their implications for future research. To achieve this, construction leadership research must be synthesized to understand first, what the key concerns of the field are, and second, how vertical, horizontal and balanced leadership have been discussed in relation to each of these concerns. In order to categorize the

literature against these three leadership approaches a classification scheme has been developed (see Table 1 below). The classification scheme considers how the archetypes differ across three key ontological dimensions of leadership as described in the integrative ontology of Drath et al. (2008). First, the scheme considers how leadership is described in each archetype. Flowing from this, the scheme then considers how leadership manifests according to each archetype. Third, the scheme considers the level/s of leadership influence once it has manifested. Finally, to aid in categorization, the scheme also sets adjectives commonly used throughout the literature to describe vertical, horizontal and balanced leadership.

Ontological dimension	**Vertical leadership**	**Horizontal leadership**	**Balanced leadership**
Leadership is described as	A process of influence between a leader and followers (Hollander, 1992) The behaviour an individual adopts when he is directing a group towards a goal (Hemphill & Coons, 1957) A person who attempts to influence other people towards a certain outcome (Korman, 1971) A process of social influence in which an individual guides a group towards a goal (Bryman, 2013)	An emergent processes of social interaction (Davis & Eisenhardt, 2011) A collective group property (Paunova, 2015) A group activity enacted through relationships and not individual action (Bennett & Anderson, 2003) A collection of people operating in multiple influential and interdependent roles (Pearce & Conger, 2002)	Individual and group/shared interaction guided by structures, processed and shared frameworks that create a shared social-cognitive space (R Müller et al., 2016) An iterative approach involving five events, each outlining specific roles for vertical and horizontal leaders. The five events are: nomination, identification, selection, horizontal leadership and its governance, and transition (R. Müller et al., 2018)
Leadership manifests through	Great individuals (Carlyle, 1840) Individuals who naturally possess a particular set of traits (Allport, 1937) Individuals who exhibit particular behaviours (Skinner, 1938) Individuals who are able to adapt their leadership to suit the circumstances at hand (Fiedler, 1964) Individuals who can offer followers extrinsic rewards for achieving goals (Bass, 1990) Individuals who can create transformation by motivating followers towards a common vision (Bass & Riggio, 2006) Individuals who exemplify positive behaviour and build authentic relationships with followers (Toor & Ofori, 2008)	Interaction between many individuals (Davis & Eisenhardt, 2011) Diads, triads and constellations of leaders (Denis et al., 2001) Networks of mutually dependent individuals (Carson, Tesluk, & Marrone, 2007) Subconscious relays of influence over time (Spillane, Camburn, & Stitziel Pareja, 2007) Distributed functions that architect the culture of an organization (Schein, 2010) The social architecture of an organization (Bolman & Deal, 2017)	Vertical and horizontal leaders interacting during five events (R Müller et al., 2016) Teams and key individuals who span boundaries between teams (R. Müller et al., 2018)
Leadership influence moves between	Individuals on different levels of a hierarchy (Ramthun & Matkin, 2012)	Individuals on the same level of a hierarchy or between individuals cooperating without hierarchy (Denis, Langley, & Sergi, 2012)	Groups of individuals on the same levels of a hierarchy and between groups on different levels of the hierarchy (R. Müller et al., 2018)
Common adjectives include	Vertical, transactional, transformational, visionary, authentic, consultative, authoritarian, executive, individual, structured, directive, person-centred, autocratic, hierarchic	Horizontal, shared, collective, distributed, collaborative, dispersed, diffuse, lateral, non-hierarchic, emergent, organic, interactionist, team-centred, non-binary	Balanced, integrated, hybrid, socio-cognitive, mixed, multi-level, iterative, situational, recurring, generative, cyclic

Table 1. Leadership archetype classification criteria

To date, no study has systematically reviewed the distribution of construction leadership research across these three archetypes to set out a research agenda (Simmons et al. 2017) that can inform further research as well as industry practice. By understanding the key dimensions of construction leadership research and systematically assessing how they draw on vertical, horizontal and balanced leadership according to the classification criteria set out above, gaps in construction leadership theory can be identified and compiled into a robust research agenda. Such a research agenda can guide future research on leadership in construction towards extending existing frameworks and models to better align leadership research with different contexts and changing requirements of work. In addition, with this agenda, further research can support practitioners in facing emerging challenges, such as increasing pressure for programmatic engagement of stakeholders (Adapa 2018; Yan et al. 2019) or the need to rapidly share cutting-edge technical knowledge across teams (Ni et al. 2018; Zhang et al. 2018c). This could help practitioners better address the ever-increasing social and technical complexity of leading construction projects.

With this research objective in mind, this review will first set out its three-stage systematic review methodology. Next, results from the bibliometric analysis will be presented, identifying key clusters of leadership research in construction, before these clusters will be synthesized into a robust research agenda. Finally, the implications of this research agenda for construction leadership theory and practice will be discussed before limitations of the study are flagged and directions for future research highlighted.

METHODOLOGY

To offer as thorough, objective and meaningful a review of construction leadership literature as possible, this paper adheres to a three-stage systematic review methodology (Randhawa et al. 2016). Overall, the systematic review synthesizes a wide body of high quality

peer-reviewed articles in order to offer a rigorous assessment of theoretical connections that can inform deeper critical reflection on existing research in a field (Randhawa et al. 2016). The theoretical underpinnings of the approach are widely recognized in the literature (Booth et al. 2016; Brereton et al. 2007; Kitchenham et al. 2009; Pawson et al. 2005). The methodology is designed to minimize researcher influence on findings by setting out agreed standards for establishing the relevance, plausibility and credibility of research claims (Pawson et al. 2005). It prioritizes the implementation of a transparent process for sample selection and analysis over the overall breadth of a sample (Booth et al. 2016). Lastly, the systematic review methodology involves computerized techniques for bibliometric analysis (Perianes-Rodriguez et al. 2016), the development of clear criteria to inform thematic analysis (Brereton et al. 2007), and comparison of analyses between multiple authors (Booth et al. 2016).

In the current review, literature is first collected according to sampling criteria which set boundary conditions on the study while ensuring the relevance and quality of the sample (Booth et al. 2016). Second, the entire sample undergoes bibliographic-coupling analysis to identify key bodies of theory in relation to leadership in construction (Boyack and Klavans 2010). Finally, aggregative thematic analysis is used to draw out salient themes from key citations in each body of research and synthesize key questions for future construction leadership research. Through this comparison key touchpoints between leadership archetypes and construction leadership theory are identified and the value of integrating the bodies of research is assessed.

Literature sampling

Sample literature for this review was collected via a four-stage sampling process. First, Scopus was used to search for an initial sample. Scopus is the largest abstract and citation database of peer-reviewed literature available representing between 18,000 and 22,000 journals

(Aghaei Chadegani et al. 2013). This was done by conducting searches for journal articles published in English since 1997 in the field of construction which contained either 'leadership', ‘leader’ or ‘leading’ in either their title or keywords. This search returned a total of 375 articles. To ensure the sample remained relevant to the objective of this review, the results of this search were then restricted using Scopus subject area fields to articles stemming from a business, management, decision sciences or sociological framing. This ensured a number of results discussing leadership in the context of technical advances in software, biomedical, industrial, chemical and materials sciences were excluded from the results. Further, to ensure sample literature was of reasonable quality, only journals with a H-index of 5 or greater were included. Finally, the abstracts of all articles were reviewed separately by all three authors according to exclusion criteria to ensure articles in the sample were relevant (Randhawa et al. 2016). The exclusion criteria required any articles which did not explicitly concern construction or did not have leadership as their analytic focus be removed from the sample. Examples of removed papers include: papers focussed on military leadership (Abrahms and Mierau 2017; Cohen and Scheinmann 2014; Keller and Matusitz 2015), political leadership (Chedia 2014; Cohen and Scheinmann 2014; Woltjer 2015), and papers that only mentioned leadership in passing (Annan et al. 2015; Bruyelle et al. 2014; Holly et al. 2017) or in the context of industry leadership on an institutional level (Morrison and Rabellotti 2017; Niskanen et al. 2014; Wang and Liu 2012). This sampling process can be seen below in Figure 1 and resulted in the removal of 85 results leaving a final sample of 289 articles from 79 journals. The final list of sample literature can be seen in Table 2 below.

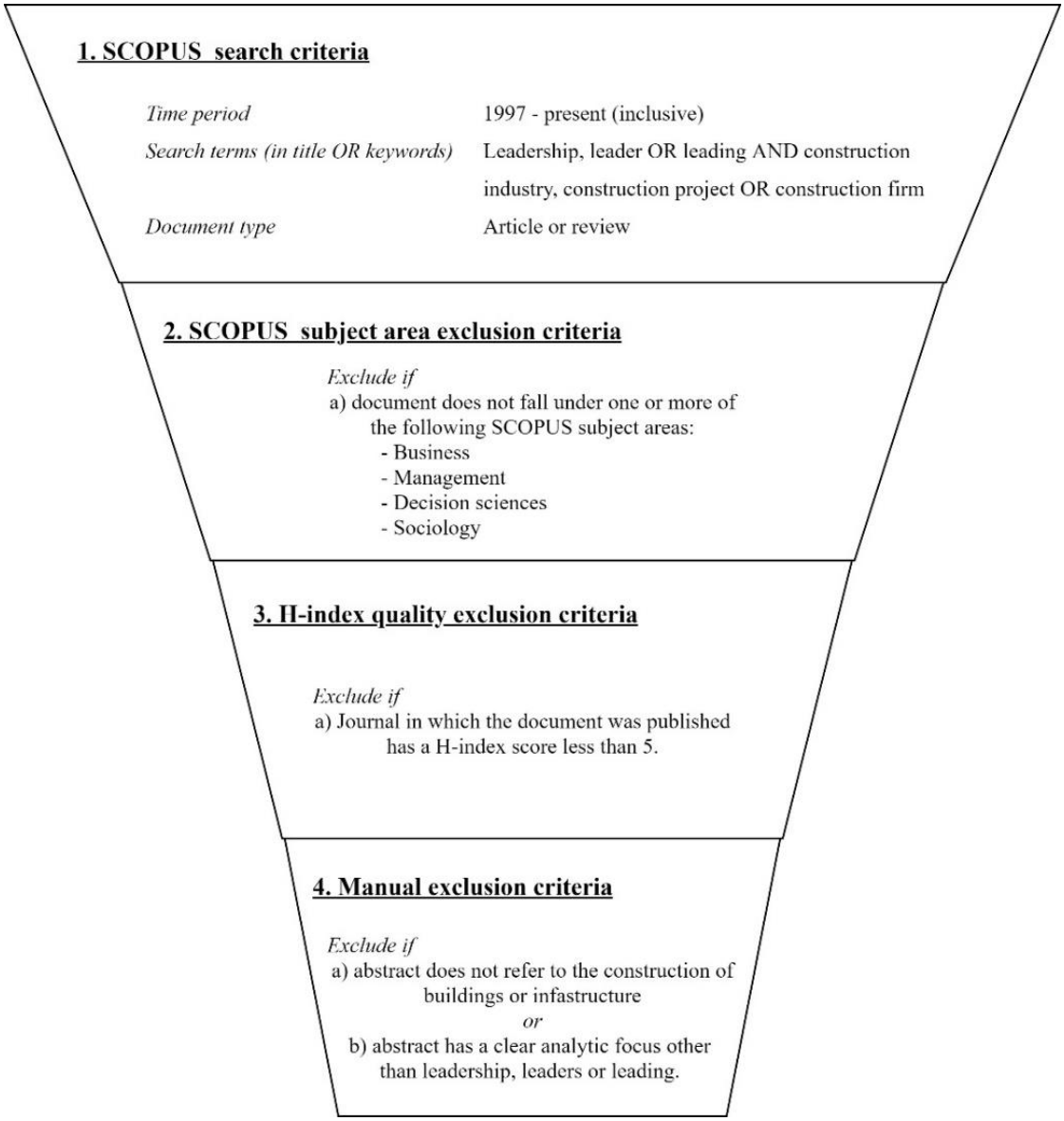

Figure 1. Sampling process

1st Author	Year	Abbreviated Title	Journal
Abdallah M.	2016	Multiobjective optimization model for	J Manage Eng
Afsar B.	2018	Linking ethical leadership and moral voice:	Leadersh. Organ. Dev. J.
Aktas B.	2015	Green building certification process of	J Manage Eng
Almaian R. Y.	2016	Analyzing Effective Supplier-Quality-	J Manage Eng
Ameh O. J.	2014	The leadership profile of Nigerian	Sci. Iran.
Ammeter A. P.	2002	Leadership, team building, and team member	EMJ Eng Manage J
Andersen L. P.	2018	Social identity, safety climate and self-	Constr. Manage. Econ.
Andrews A.	2006	A framework to identify opportunities for ict	Electron. J. Inf. Technol.
Antonio R. S.	2013	A proposal for improving safety in	Saf. Sci.
Attallah S. O.	2017	Multicriteria Decision-Making Methodology	J Archit Eng
Aucoin B.M.	2018	Missing pieces in strategic planning and	IEEE Eng Manage Rev
Azab M. A.	2010	Structural sustainability techniques for RC	World Acad. Sci. Eng.
Badger W.	2009	Profiling the leadership of project managers	Int. J. Constr. Educ. Res.
Ballensky D.	2003	On the road to cooler cities: The cool roof	Constr Specifier
Barjot D.	2013	"Why was the world construction industry	Constr. Hist
Bartleson K.	2016	Better young than never: The what, why, and	IEEE Eng Manage Rev
Becker K.	2014	Fostering successful career paths in	Pract Period Struct Des
Bennett L.	2006	Political leadership and stadium development	Int. J. Urban Reg. Res.
Bergeron H. E.	1998	Leadership and the professional engineer	J Manage Eng
Biggs H. C.	2013	Interlocked projects in safety competency and	Saf. Sci.
Biggs S. E.	2013	Safety leaders' perceptions of safety culture in	Saf. Sci.
Bonham M. B.	2013	Leading by example: New professionalism	Build Res Inf
Bossink B. A. G.	2004	Effectiveness of innovation leadership styles:	Constr. Innov.
Briscoe G. H.	2004	Client-led strategies for construction supply	Constr. Manage. Econ.
Bröchner J.	2009	Construction metaphors in Aristotle:	Constr. Manage. Econ.
Burstein D.	1999	What every CEO should know about strategic	J Manage Eng
Butler C. J.	2006	Emotional intelligence and leadership	J Manage Eng
Chan A. T. S.	2005	Impact of perceived leadership styles on work	J Constr Eng Manage
Chan E.	2011	Implementation of enterprise resource	Int. J. Manag. Project Bus.
Chan E.	2008	Impact of leadership and power on successful	Int. J. Hum. Resour. Dev.
Chan I. Y. S.	2014	Role of leadership in fostering an innovation	J Manage Eng
Chang Y. F.	2016	Understanding innovations in Malaysia's	Asian J. Technol. Innov.
Cheng E. W. L.	2015	Use of safety management practices for	Int. J. Injury Cont. Saf.
Cheng J. C. P.	2015	A non-linear case-based reasoning approach	Build. Environ.
Cheung S. O.	2001	A satisfying leadership behaviour model for	Int. J. Proj. Manage.
Chiang Y. H.	2008	Volume building as competitive strategy	Constr. Manage. Econ.
Chih Y. Y.	2017	Feeling Positive and Productive: Role of	J Constr Eng Manage
Chinowsky P.	2007	Learning organizations in construction	J Manage Eng
Chiu C.-H.	2016	Coordinating Supply Chains with a General	IEEE Trans Eng Manage
Choi B.	2017	Construction Workers' Group Norms and	J Manage Eng
Choi S.	2009	Correlation between innovation and	Can. J. Civ. Eng.
Chowdhury T.	2013	Impact of senior design project for the	Eur. J. Eng. Educ.
Clauson D.	2013	Greening: The built environment: ASTM	Stand News
Conchie S. M.	2013	Supervisors' engagement in safety leadership:	Saf. Sci.
Cross S.	2018	Lead yourself	IEEE Eng Manage Rev
Cross S.E.	2018	Build your own leadership model	IEEE Eng Manage Rev
Cross S.E.	2018	What Kind of Leader Do You Want to Be?	IEEE Eng Manage Rev
Custovic E.	2016	From engineer to manager, mastering the	IEEE Eng Manage Rev
Da Silva L.	2009	Review of the LEED points obtained by	J Archit Eng
Dainty A. R. J.	2005	Competency-based model for predicting	J Manage Eng
Dall'O G.	2013	On the integration of leadership in energy and	Energies
Daniel L.	2015	Safety leadership defined within the	Constr. Econ. Build.
Davidson K.	2013	Tocci Building Cos. grows into national BIM	ENR
Dawood N.	2008	Measuring the effectiveness of 4D planning as	Electron. J. Inf. Technol.
Del Vecchio J. A.	1997	TQM ... reengineering ... what now?	J Manage Eng
Delaney T.	2003	Don't put all your (green) eggs in one basket -	Constr Specifier
DeVilbiss C. E.	2000	Partnering is the foundation of a Learning	J Manage Eng
Dewlaney K. S.	2012	Prevention through design and construction	Constr. Manage. Econ.
Dewlaney K. S.	2012	Safety risk quantification for high	J Constr Eng Manage
Dey S. S.	2015	Public agency performance management for	J Manage Eng
Dingsdag D. P.	2008	Understanding and defining OH&S	Saf. Sci.
Dixon C.	2003	Effective Strategies for Leed™	Constr Specifier
Doan D. T.	2017	A critical comparison of green building rating	Build. Environ.
Dossick C. S.	2010	Organizational divisions in bim-enabled	J Constr Eng Manage
Dumiak M.	2016	As brexit dust settles, european leaders and	ENR
El-Adaway I. H.	2014	Managing the LEED analysis for the new civil	J Manage Eng
El-Gohary K. M.	2014	Factors influencing construction labor	J Manage Eng
Ellis L. A.	2011	A way forward: Assessing the demonstrated	Leadersh. Manage. Eng.
Elzarka H. M.	2009	Best practices for procuring commissioning	J Manage Eng
Enshassi A.	2009	Factors affecting the performance of	J. Civ. Eng. Manage.
Esther Paik J.	2017	Interorganizational Projects: Reexamining	J Manage Eng
Evans M.	2008	Heathrow Terminal 5: Health and safety	Proc. Inst. Civ. Eng. Civ.
Famakin I. O.	2016	Effect of path-goal leadership styles on the	Int. J. Constr. Manage.
Farr J. V.	1997	Leadership development for engineering	J Manage Eng
Fellows R.	2003	Leadership style and power relations in	Constr. Manage. Econ.
Lizarralde G.	2013	Understanding differences in construction project	Constr. Manage. Econ.
Love P. E. D.	2016	Praxis of rework mitigation in construction	J Manage Eng
Lukiyanto K.	2018	Leadership style that effective and capable to	Int.J. Civ. Eng. Technol.
Lutz R.A.	2017	Leadership and management or leading and	IEEE Eng Manage Rev
Mahmoudi S.	2014	Framework for continuous assessment and	Saf. Health Work
Manley K.	2006	The innovation competence of repeat public	Constr. Manage. Econ.
Marín L. S.	2017	Promoting construction supervisors' safety-	J Constr Eng Manage
Martin H.	2014	Pinpointing safety leadership factors for safe	J Constr Eng Manage
Marvel M.R.	2018	Self-leadership and overcoming the time	IEEE Trans Eng Manage
Master R. C.	2004	Sustainable building design goes mainstream -	Constr Specifier
Matinaro V.	2015	Virtual design and construction: Innovation	Int. J. Innov. Learn.
Mazzetto S.	2018	Multidisciplinary Collaboration in Project	J Prof Issues Eng Educ
McKew H.	2011	Tomorrow's environment: Positive attitude +	Eng syst
McManamy R.	2004	Leaders step up in public arena	Public Works
Menches C. L.	2007	Women in construction-tapping the untapped	J Constr Eng Manage
Meng J.	2015	Relationships between top managers' leadership	Eng. Constr. Archit.
Mikaelsson L. Å.	2017	Integrated planning for sustainable building	J. Civ. Eng. Manage.
Miller D. M.	2000	Leadership and organizational vision in	J Manage Eng
Mills T.	1999	Vertically integrating a capstone experience: A	J. Constr. Educ.
Mitchell S. O.	2006	Ed Davenport: Masonry construction's industry	Masonry Constr. World
Mitropoulos P.	2009	The role of production and teamwork practices in	J. Saf. Res.
Mohamed S.	2011	System dynamics modelling of construction	Eng. Constr. Archit.
Morello A.	2018	Exploratory Study of Recruitment and Retention	J Prof Issues Eng Educ
Murata F. M.	2013	Cross-cultural leadership for global construction	Proc. Inst. Civ. Eng.:
Nasvik J.	2004	Becoming great	Concr. Constr. World
Nguyen L.D.	2017	Knowledge Areas Delivered in Project	J Manage Eng
Nguyen T. H.	2010	Evaluating sustainability of architectural designs	Open Construct. Build.
Ni G., Cui Q.	2018	Knowledge-Sharing Culture, Project-Team	J Manage Eng
Nicholson T.	2008	Demand in Middle East and Asia drives market	ENR
Odusami K. T.	2002	Perceptions of construction professionals	J Manage Eng
Odusami K. T.	2003	The relationship between project leadership,	Int. J. Proj. Manage.
Ofori G.	2015	Nature of the construction industry, its needs and	J. Constr. Dev. Ctries.
Ofori G.	2012	Leadership and construction industry	J. Constr. Dev. Ctries.
Ofori G.	2009	Research on cross-cultural leadership and	Constr. Manage. Econ.
Ofori-Kuragu J. K.	2016	The case for a construction industry council in	J. Constr. Dev. Ctries.
Oladinrin O. T.	2016	Critical Enablers for Codes of Ethics	J Manage Eng
Opoku A.	2015	Leadership style of sustainability professionals in	Built Environ. Proj. Asset
Opoku A.	2015	Organizational leadership role in the delivery of	Built Environ. Proj. Asset
Oyewobi L. O.	2016	The impact of rework and organisational culture	J. Eng. Des. Technol.
Ozorhon B.	2014	Integration and leadership as enablers of	J Manage Eng
Ozorhon B.	2017	Critical Success Factors of Building Information	J Manage Eng
Ozorhon B.	2016	Investigating the Components of Innovation in	J Manage Eng
Ozorovskaja R.	2007	Leadership and cultures of lithuanian and Dutch	J Constr Eng Manage
Pais C. L. A.	2010	Self-managed teams in the auto components	Team Perform. Manage.
Papajohn D.	2017	MARS: Metaframework for Assessing Ratings of	J Manage Eng
Parkin J.	1997	Choosing to lead	J Manage Eng
Pesämaa O.	2018	Role of Performance Feedback on Process	J Manage Eng
Pham N. T.	2006	Facilitators of organizational learning in design	Learn. Organ.
Pheng L. S.	1997	Ancient Thai battlefield strategic principles:	Int. J. Proj. Manage.
Philips A.	2004	The value of green landscape architecture - A	Constr Specifier
Pirzadeh P.	2017	Understanding the Dynamics of Construction	J Manage Eng
Polesie P. M. A.	2012	Reducing the use of resources in medium-sized	Constr. Manage. Econ.
Post N. M.	2007	Baseball park in nation's capital is on its way to	ENR
Potbhare V.	2009	Emergence of green building guidelines in	J. Eng. Des. Technol.
Potter E. M.	2018	Emotional intelligence and transformational	J. Financ. Manag. Prop.
Powers E. M.	2005	Donor relations: Cash-strapped schools rely on	ENR
Pries F.	2004	The role of leaders' paradigm in construction	Constr. Manage. Econ.
Pryke S.	2015	The effect of leader emotional intelligence on	Constr. Manage. Econ.
Pushkar S.	2018	A comparative analysis of gold leadership in	Appl. Sci.
Rajagopalan S.	2018	Leadership Simplified: Leaders Must SLEEP	IEEE Eng Manage Rev
Rajendran S.	2009	Impact of green building design and construction	J Constr Eng Manage
Ramakrishnan R.	2007	Introspection on professional performance of	Indian Concr J
Randeree K.	2012	Leadership - Style, satisfaction and commitment:	Eng. Constr. Archit.
Rapp R. R.	2014	Leadership success within disaster restoration	J. Emerg. Manage.
Riley D. R.	2008	Embedding leadership development in	J Prof Issues Eng Educ
Rojas E. M.	2013	Identifying, recruiting, and retaining quality field	J Manage Eng
Rowlinson S.	2015	Construction accident causality: An institutional	Saf. Sci.
Rozgus A.	2005	AEC leaders of the peak	Public Works
Rubin D. K.	2005	Stantec pushes big plans - Carefully - For	ENR
Samberg S.	2011	Method for evaluation of sustainable	Transp Res Rec
Savelsbergh C. M. J.	2015	Does team stability mediate the relationship	Int. J. Proj. Manage.
Schor D.	2017	Experiential leadership training for young	IEEE Eng Manage Rev
Senaratne S.	2015	The role of team leadership in achieving LEED	Built Environ. Proj. Asset
Senaratne S.	2015	Construction project leadership across the team	Built Environ. Proj. Asset
Shen W.	2017	Critical success factors in Thailand's green	J. Asian Archit. Build.

Continued overleaf

1st Author	Year	Abbreviated Title	Journal
Filos E.	2009	Advanced ICT under the 7th EU R&D	Electron. J. Inf. Technol.
Fiolet J. C.	2016	Risk-chasing behaviour in on-site construction	Constr. Manage. Econ.
Fortunato Iii B. R.	2012	Identification of safety risks for high-	J Constr Eng Manage
Gabriel E.	1997	Lean approach to project management	Int J Proj Manage
Galli B.J.	2018	What Risks Does Lean Six Sigma Introduce?	IEEE Eng Manage Rev
Gaynor G.	2017	Taking the lead and managing innovation	IEEE Eng Manage Rev
Genega S. G.	1997	Leadership is essential to managing success	J Manage Eng
Gharehbaghi K.	2003	The construction manager as a leader	Leadersh. Manage. Eng.
Giraldo D.	2010	Washington state's I-405 project: Women in	Leadersh. Manage. Eng.
Giritli H.	2013	The interplay between leadership and	Int. J. Proj. Manage.
Giritli H.	2004	Leadership styles: Some evidence from the	Constr. Manage. Econ.
Godfrey Ochieng	2009	Framework for managing multicultural project	Eng. Constr. Archit.
Gonchar J.	2005	Rapidly evolving rating system draws:	ENR
Good M. L.	1998	Collaborations subcommittee keynote address	J Manage Eng
Grill M.	2017	Supervisors and teachers' influence on	Empir. Res. Vocat. Educ.
Grisham T.	2008	Temporary project cultures	Int. J. Hum. Resour. Dev.
Gu N.	2010	Understanding and facilitating BIM adoption	Autom Constr
Gunawansa A.	2014	A comparison of climate change mitigation	Sustainable Dev.
Gushgari S. K.	1997	Skills critical to long-term profitability of	J Manage Eng
Hallowell M. R.	2013	Enterprise risk management strategies for state	J Manage Eng
Hart S. D.	2014	Conceptual models for infrastructure	J Manage Eng
Hay M. A.	2004	Lighting Design for Sustainable Buildings	Constr Specifier
Hellmund A. J.	2008	Facing the challenges of integrated design and	Energy Eng
Hensey M.	1999	Why and how of facilitative leadership	J Manage Eng
Ho P. H. K.	2016	Analysis of Competitive Environments,	J Manage Eng
Hoffmeister K.	2014	The differential effects of transformational	Saf. Sci.
Holt R.	2000	Total quality, public management and critical	Int. J. Qual. Reliab. Manage.
Hu Y.	2015	Understanding the determinants of program	J Manage Eng
Hu Y.	2015	From construction megaproject management	J Manage Eng
Huff W.	2006	Specifying for water efficiency	Constr Specifier
Hunter P.	2006	Changing approaches to health care prompt	ENR
Ibrahim C. K. I. C.	2015	Establishment of quantitative measures for	J Manage Eng
Idoro G. I.	2009	Clients' perception of construction project	J. Eng. Des. Technol.
Ites A.	2006	New heights of conservation: MRL elevators	Constr Specifier
Janzen A.	2006	Innovations from brandenburg brand leader	Betonwerk Fertigteil Tech
Jeschke K. C.	2017	Process evaluation of a Toolbox-training	Saf. Sci.
Jiang W.	2017	The impact of transformational leadership on	Sustainability
Jitwasinkul B.	2016	A Bayesian Belief Network model of	Saf. Sci.
Judy S.	2018	Pond's culture builds a basis for success	ENR
Kaman V. S.	1999	Going to the future to develop transportation	J Manage Eng
Kapp E. A.	2012	The influence of supervisor leadership	Saf. Sci.
Karakhan A. A.	2017	Integrating Worker Health and Safety into	J Constr Eng Manage
Karakhan A. A.	2017	Identification, quantification, and	J Constr Eng Manage
Karallis T.	2009	Making mentoring stick: A case study	Action Learn. Res. Pract.
Karallis T.	2011	Building better futures: Leveraging action	Educ. Train.
Kasapoğlu E.	2014	Leadership styles in architectural design	J Constr Eng Manage
Kerdngern N.	2017	Influence of contemporary leadership on job	Intern. J. Eng. Bus. Manage.
Khosravi Y.	2014	Factors influencing unsafe behaviors and	Int. J. Occup. Saf. Ergon.
Khullar Relph M.	2011	Green building Booms in India	ENR
Kines P.	2010	Improving construction site safety through	J. Saf. Res.
Kissi J.	2012	Examining middle managers' influence on	Constr. Innov.
Klemens T.	2005	Go ahead, take the LEED	Concr. Constr. World Concr.
Knauseder I.	2007	Learning approaches for housing, service and	Constr. Manage. Econ.
Koh T. Y.	2010	Empiricist framework for TQM	J Manage Eng
Larsson J.	2015	Leadership in civil engineering: Effects of	J Manage Eng
Lee T. S.	2005	Superior-subordinate relationships in Korean	J Manage Eng
Leonard J.	2004	Masonry construction's industry leader of the	Masonry Constr. World
Leonard M.	2003	Leed™ Takes off at George C. Marshall	Constr Specifier
Leotta A.	2017	Management accounting and leadership	Qual. Res. Account.
Li A. S.	2016	Strategies for Foreign Construction-Related	J Manage Eng
Limsila K.	2008	Performance and leadership outcome	Eng. Constr. Archit.
Lindebaum D.	2011	'it's good to be angry': Enacting anger in	Hum. Relat.
Lines B.C.	2017	Drivers of Organizational Change within the	J Manage Eng
Lines B.C.	2017	Implementing Project Delivery Process	J Manage Eng
Ling F. Y. Y.	2012	Careers development in construction firms:	Eng. Constr. Archit.
Lingard H. C.	2009	Group-level safety climate in the Australian	Constr. Manage. Econ.
Linowes J. G.	1998	Leadership in transition: Preparing your firm	J Manage Eng
Liu A.	2003	The power paradigm of project leadership	Constr. Manage. Econ.
Liu A. M. M.	2017	Understanding the Interplay of Organizational	J Manage Eng
Liu A. M. M.	2006	A power-based leadership approach to project	Constr. Manage. Econ.
Shiplee H.	2011	Delivering London 2012: Health and safety	Proc. Inst. Civ. Eng. Civ.
Shoop B.L.	2016	Setting the conditions for others to succeed	IEEE Eng Manage Rev
Siddiqi K.	2006	Benchmarking adaptive reuse: A case study of	Int. J. Environ. Technol.
Siew R. Y. J.	2018	Green Township Index: Malaysia's sustainable	Proc. Inst. Civ. Eng.Eng.
Simmons D. R.	2017	Leadership Paradigms in Construction: Critical	J Manage Eng
Singh A.	2009	Leadership grid between concern for people and	Leadersh. Manage. Eng.
Singh A.	2010	Leadership flexibility space	J Manage Eng
Singh A.	1999	Assessment of organizational change for public	J Manage Eng
Skeepers N. C.	2015	A Study on the Leadership Behaviour, Safety	Procedia Manuf.
Skipper C. O.	2006	Assessment with 360° evaluations of leadership	Leadersh. Manage. Eng.
Skipper C. O.	2006	Influences impacting leadership development	J Manage Eng
Skipper C. O.	2008	Leadership development and succession planning	J Manage Eng
Skopek J.	2006	Understanding green globes™ sustainable design	Constr Specifier
Slates K.	2008	The effects of leadership in the high hazard	Leadersh. Manage. Eng.
Slattery D. K.	2011	Leadership characteristics of rising stars in	Int. J. Constr. Educ. Res.
Spatz D. M.	1999	Leadership in the construction industry	Pract Period Struct Des
Styhre A.	2011	The overworked site manager: Gendered	Constr. Manage. Econ.
Styhre A.	2007	Coaching the site manager: Effects on learning	Constr. Manage. Econ.
Sui Pheng L.	1997	East meets West: leadership development for	J. Manage. Psychol.
Sunindijo R. Y.	2007	Emotional intelligence and leadership styles in	J Manage Eng
Sunindijo R. Y.	2012	How project manager's skills may influence the	Int. J. Proj. Organ. Manag.
Tabassi A. A.	2014	Transformational leadership and teamwork	J. Manage. Dev.
Tabassi A. A.	2016	Leadership competences of sustainable	J. Clean. Prod.
Tener R. K.	1997	Leading program for undergraduate engineers	J Manage Eng
Terouhid S. A.	2016	People capability: A strategic capability for	J. Model. Manage.
Tombesi P.	2006	Good thinking and poor value: On the	Build Res Inf
Toor S. R.	2008	Leadership skills and competencies for cross-	Int. J. Hum. Resour. Dev.
Toor S. U. R.	2011	Differentiating leadership from management: An	Leadersh. Manage. Eng.
Toor S. u. R.	2008	Leadership for future construction industry:	Leadersh. Manage. Eng.
Toor S. U. R.	2008	Taking leadership research into future: A review	J Prof Issues Eng Educ
Toor S. U. R.	2008	Developing construction professionals of the 21st	J Constr Eng Manage
Toor S. U. R.	2009	Authenticity and its influence on psychological	Constr. Manage. Econ.
Toor S. U. R.	2010	Positive Psychological Capital as a Source of	Int. J. Proj. Manage.
Toor S. U. R.	2011	Impact of aspirations and legacies of leaders in	Eng. Constr. Archit.
Toor S. U. R.	2011	Women leaders breaking the glass ceiling in	J Prof Issues Eng Educ
Toor S. U. R.	2009	Ineffective leadership: Investigating the negative	Eng. Constr. Archit.
Tran N.	2009	Strategies for design and construction of high-	Transp Res Rec
Tuchman J. L.	2008	Strong owner leadership can: Optimize project	ENR
Tulacz G. J.	2010	The Top 100 Green Contractors	ENR
Tuohy P. G.	2015	Closing the gap in building performance:	Archit Sci Rev
Umar T.	2017	Briefing: Defining safety leadership in	Proc. Inst. Civ. Eng.
Verstraete T.	2017	Assessing business model relevance for business	Int. J. Entrepreneurship
Wakeman Iii T. H.	1997	Engineering leadership in public policy	J Manage Eng
Walesh S. G.	2000	Engineering a new education	J Manage Eng
Wallhagen M.	2011	Design consequences of differences in building	Build Res Inf
Wan Muda W. H. N.	2016	Developing a leadership capability for team	J. Tech. Educ. Train.
Waziri A. Y.	2015	The influence of transformational leadership	Asian Soc. Sci.
Weingardt R. G.	1997	Leadership: The world is run by those who show	J Manage Eng
Weingardt R. G.	2000	Leaving a legacy	J Manage Eng
Wen Lim H.	2018	Impact of Safety Climate on Types of Safety	J Manage Eng
Williams Jr Q.	2010	The impact of a peer-led participatory health and	J. Saf. Res.
Wong J.	2007	An investigation of leadership styles and	Constr. Manage. Econ.
Wu C.	2015	Roles of owners' leadership in construction	Int. J. Proj. Manage.
Wu C.	2017	Leadership improvement and its impact on	Int. J. Proj. Manage.
Wu C.	2016	How safety leadership works among owners,	Int. J. Proj. Manage.
Wu W.	2014	BIM execution planning in green building	J Manage Eng
Wu W.	2016	Pedagogy and assessment of student learning in	J. Inf. Technol. Constr.
Xia B.	2015	Design-build contractor selection for public	J Manage Eng
Yan H.	2019	Critical Success Criteria for Programs in China:	J Manage Eng
Yang J.	2017	Sustainability evaluation of the Great Wall of	Civ. Eng. Environ. Syst.
Yengst C. R.	2003	Terex - From a follower to an industry leader	Diesel Progr Int Edit
Yudelson J.	2005	Understanding the marketplace for green	Constr Specifier
Zhang B.	2017	Causes of Business-to-Government Corruption in	J Manage Eng
Zhang L.	2018	The mediation role of leadership styles in	Int. J. Proj. Manage.
Zhang L.	2018	Perceiving interactions and dynamics of safety	Saf. Sci.
Zhang L.	2016	Perceiving interactions on construction safety	J Manage Eng
Zhang Y.	2018	How does transformational leadership promote	Sustainability
Zheng J.	2017	Impacts of leadership on project-based	Sustainability
Zilke J. P.	2015	Shifting sands and shifting grounds: Analysis and	J Manage Eng

Table 2. Consolidated sample literature

Bibliographic coupling analysis

In order to accurately map the research front of literature addressing leadership in construction the current review uses bibliographic coupling. Bibliographic coupling determines the relatedness of publications based on the number of references they share (Boyack and Klavans 2010). This allows the identification of trends and relationships within a scientific discourse with rigour and objectivity (Gmür 2003). It has been demonstrated that of the three pure citation-based methods for mapping research fronts (co-citation analysis, bibliographic coupling and direct citation), bibliographic coupling is most accurate (Boyack and Klavans 2010). In the current paper, VOSviewer (VOS) has been used to identify the bibliographic coupling of publications represented in the sample. While bibliographic coupling cannot offer precise theoretical insights regarding the state of knowledge in construction leadership, it is able to provide high-level insights into the connectedness of publications within a sample and so has been used to contextualise more in-depth analysis and discussion (Boyack and Klavans 2010).

In the bibliographic coupling map output by VOS, citations are clustered according to Louvian grouping principles (Blondel et al. 2008). When given a set of bibliometric data, VOS will first produce a matrix in which the similarity of citations in the dataset is determined by calculation of the frequencies with which citations appear relative to one another (Van Eck and Waltman 2009). Next, VOS calculates the optimum arrangement of citations. This is defined as the arrangement in which the distance between any two citations most accurately represents their similarity established in the matrix and the weighted sum of the squared Euclidean distances between all pairs of citations is minimized (Van Eck and Waltman 2009). Using this arrangement, VOS outputs a coloured bibliographic coupling map to graphically represent how frequently citations are cited and how they are clustered based on their similarity to other citations. Given the complexity of the network output by VOS, outlining clusters for black and

white reading proved impractical and so the figure is not presented in this review. The purpose of these clusters is to indicate groups of citations with high internal affinity which may indicate the presence of a particular perspective, discipline or theoretical frame (Perianes-Rodriguez et al. 2016). It is beyond the purview of this review to explore the functions by which VOS clusters and maps citations in greater depth as this has been well established in scientometric literature (Van Eck and Waltman 2009).

Aggregative thematic analysis

Once bibliographic coupling analysis had been completed, the abstracts of all papers contained in the resulting clusters underwent aggregative thematic analysis in order to identify the overriding topics addressed by literature in each cluster (Tranfield et al. 2003). This process involved the first and second author developing an initial set of codes that provide literal descriptions of concepts contained within the paper abstracts (for instance 'informtion & communications technology', 'total quality management' or 'rework mitigation'). Subsequently, the first and second author independently reviewed these codes to identify similar or overlapping concepts and build an aggregated set of themes that accurately depict the substantive focus of each cluster. The themes identified by the first and second author aligned closely for all clusters with the exception of cluser 2 where the themes of 'Innovation' and 'Sustainability' were both deemed to accurately depict the substantive focus of the cluster. Given the frequency of articles simultaneously addressing innovation and sustainability in cluster 2, the first and second author agreed that the theme 'Innovation and Sustainability' suitably reflects the research in cluster 2. Based on this thematic analysis, summaries of findings were produced for each cluster which are presented in the results.

Finally, using the categorizonation criteria set out above in Table 1, articles were read in full to identify where authors discussed vertical, horizontal and balanced leadership (Denis

et al. 2012). A research agenda was then developed for each of the six clusters identified based on this categorization and key concerns highlighted by the most recent literature within the cluster. Given that it is the intention of this review to provide a clear indication of the distribution of construction leadership research across the three leadership archetypes, articles were not allowed to span archetypes where they may have alluded to multiple archetypes. Instead articles were categorized based on the leadership archetype discussed most frequently. This scenario arose only a small number of times and always involved articles focussed on vertical leadership that occasionally drew on concepts from horizontal leadership theory. For example, Zhang et al. (2018a) primarily discuss vertical leadership in relation to IPD, however, they also draw on concepts such as 'collaboration' and 'integration' to describe how vertical leadership must engage with the delivery team. The above process resulted in the research agenda found at the end of the results in Table 4.

RESULTS

Of the 289 articles subject to bibliographic coupling analysis, VOS identified that 197 articles share references with at least one other article in the sample. This indicates that 93 articles within the sample did not share references. Contained in the network of 197 connected articles are 6 clusters. These clusters represent groups of articles citing each other more frequently than articles outside of their cluster and give an indication of the boundaries between theoretical perspectives. Lists of all articles contained in the six clusters can be found in Table 3 below. These lists are sorted by number of citations (C). As can be seen in Table 3, C1 is the largest cluster by number of articles (n=40) and citations (n=713). Overall, however, articles from the sample are distributed reasonably evenly across the clusters indicating that all six theoretical perspectives are well established.

Cluster 1		Cluster 2		Cluster 3		Cluster 4		Cluster 5		Cluster 6	
Article	**C**	**Article**	**C**	**Article**	**C**	**Article**	**C**	**Article**	**C**	**Article**	**C**
Kines (2010)	113	Gu (2010)	249	Dainty (2005)	79	Briscoe (2004)	105	Dossick (2010)	125	Odusami (2003)	53
Williams Jr. (2010)	55	Limsila (2008)	48	Enshassi (2009)	73	Manley (2006)	43	Butler (2006)	62	Chan (2005)	46
Rajendran (2009)	52	Hu (2015b)	32	Odusami (2002)	70	Chinowsky (2007)	39	Ammeter (2002)	54	Giritli (2004)	37
Kapp (2012)	48	Wu (2014)	31	Toor (2008b)	63	Devilbiss (2000)	38	Chan (2014)	19	Fellows (2003)	33
Dingsdag (2008)	45	Ozorhon (2014)	30	El-Gohary (2014)	54	Godfrey Ochieng (2009)	28	Toor (2009b)	15	Liu (2006)	31
Hoffmeister (2014)	39	Wallhagen (2011)	25	Sunindijo (2007)	53	Pham (2006)	28	Kissi (2012)	14	Wong (2007)	30
Fortunato Iii (2012)	38	Bossink (2004)	23	Lindebaum (2011)	50	Dawood (2008)	20	Koh (2010)	13	Giritli (2013)	28
Mitropoulos (2009)	31	Doan (2017)	21	Toor (2009a)	31	Styhre (2011)	20	Lee (2005)	13	Ozorovskaja (2007)	23
Conchie (2013)	30	Potbhare (2009)	20	Menches (2007)	28	Pries (2004)	17	Larsson (2015)	12	Liu (2003)	20
Lingard (2009)	30	Aktas (2015)	17	Skipper (2006a)	27	Chiang (2008)	14	Tabassi (2016)	11	Cheung (2001)	19
Biggs (2013b)	25	Tuohy (2015)	17	Skipper (2006b)	24	Holt (2000)	12	Savelsbergh (2015)	10	Randeree (2012)	19
Khosravi (2014)	22	Cheng (2015b)	16	Toor (2010)	22	Knauseder (2007)	12	Zheng (2017)	10	Ofori (2009)	11
Mahmoudi (2014)	20	Hu (2015a)	13	Toor (2008d)	19	Love (2016)	8	Spatz (1999)	9	Toor (2008a)	11
Dewlaney (2012b)	19	Ibrahim (2015)	11	Ofori (2012)	17	Ofori (2015)	8	Pais (2010)	6	Parkin (1997)	6
Dewlaney (2012a)	17	Tombesi (2006)	10	Ellis (2011)	12	Oladinrin (2016)	8	Bröchner (2009)	3	Kasapoğlu (2014)	5
Mohamed (2011)	16	Ozorhon (2017)	9	Toor (2008c)	11	Andrews (2006)	7	Jiang (2017)	3	Singh (2010)	5
Wu (2016a)	14	Xia (2015)	9	Skipper (2008)	9	Choi (2009)	6	Tabassi (2014)	3	Sui Pheng (1997)	4
Rowlinson (2015)	12	Bonham (2013)	6	Sunindijo (2012)	8	Lizarralde (2013)	6	Chih (2017)	2	Chan (2011)	3
Wu (2015)	12	Abdallah (2016)	5	Toor (2011a)	6	Oyewobi (2016)	4	Liu (2017)	2	Ameh (2014)	2
Shiplee (2011)	11	Dall'o' (2013)	5	Antonio (2013)	5	Styhre (2007)	4	Zhang (2018c)	2	Chan (2008)	2
Biggs (2013a)	10	Senaratne (2015a)	5	Chowdhury (2013)	4	Weingardt (1997)	4	Rapp (2014)	1	Grill (2017)	1
Jitwasinkul (2016)	9	Dey (2015)	4	Meng (2015)	4	Almaian (2016)	3	Simmons (2017)	1	Grisham (2008)	1
Martin (2014)	7	Idoro (2009)	3	Slattery (2011)	4	Ho (2016)	3	Waziri (2015)	1	Murata (2013)	1
Karakhan (2017b)	6	Papajohn (2017)	3	Leotta (2017)	3	Li (2016)	3	Zhang (2018a)	1	Zhang (2017)	1
Rojas (2013)	6	Wu (2016b)	3	Mikaelsson (2017)	3	Ling (2012)	3	Esther (2017)	1	Singh (2009)	1
Opoku (2015b)	5	Matinaro (2015)	2	Opoku (2015a)	3	Ofori-Kuragu (2016)	1	Afsar (2018)	1		
Shen (2017)	5	Pirzadeh (2017)	2	Pryke (2015)	3	Polesie (2012)	1	Skeepers (2015)	1		
Karakhan (2017a)	3	Verstraete (2017)	2	Toor (2011c)	3	Terouhid (2016)	1				
Fiolet (2016)	2	Ozorhon (2016)	2	Becker (2014)	1	Zilke (2015)	1				
Wu (2017)	2	Famakin (2016)	1	Karallis (2011)	1	Pesämaa (2018)	1				
Andersen (2018)	1	Senaratne (2015b)	1	Lukiyanto (2018)	1	Kerdngern (2017)	1				
Cheng (2015a)	1	Siew (2018)	1	Potter (2018)	1	Ni (2018)	1				
Daniel (2015)	1	Chang (2016)	1	Toor (2011b)	1	Nguyen (2017)	1				
Jeschke (2017)	1	Mazzetto (2018)	1	Wan Muda (2016)	1						
Umar (2017)	1	Morello (2018)	1								
Wen Lim (2018)	1	Pushkar (2018)	1								
Marín (2017)	1										
Choi (2018)	1										
Zhang (2018b)	1										
Total	**713**		**630**		**694**		**451**		**395**		**393**

Table 3. Article clusters ranked by citations (C)

Cluster 1 - Safety

Literature in cluster 1 focuses on leadership as the most important factor influencing safety on construction projects. Overall, contributions to the cluster characterise leadership as a vertical process whereby leaders maintain assessment, reporting and behavioural standards through a combination of hard enforcement of conduct and softer curation of safety culture. For example, Kines et al. (2010), who make the central contribution to this cluster, investigate whether a relationship exists between the incidence of work-related accidents and leader-based verbal safety communication. To do so they identify vertical 'leader-worker exchanges' in construction projects where supervisors communicate safety expectations to workers (Kines et al. 2010). Centrally, they find that 'coaching construction site foremen to include safety in their

daily verbal exchanges with workers has a significantly positive and lasting effect on the level of safety' (Kines et al. 2010). This characterisation of safety leadership as a vertical practice is the dominant paradigm informing research throughout the cluster (Dingsdag et al. 2008; Hoffmeister et al. 2014; Jitwasinkul et al. 2016; Kapp 2012; Khosravi et al. 2014). For example, studying four large commercial construction contractors, Kapp (2012) finds that in positive safety climates, transformational and contingent reward leadership practices improve safety outcomes. Similarly, Dingsdag et al. (2008) consider safety leadership to be a competence enacted by individuals on construction sites, identifying site Occupational Health and Safety (OHS) advisors and site foremen as being primarily responsible for safety outcomes as indicated by their subordinates.

This cluster does contain some research considering how horizontal forms of leadership could simultaneously contribute to safety leadership in construction projects. For example, Williams Jr et al. (2010) find that a horizontal peer-led approach to informing safety culture is an effective way of improving safety outcomes in groups of Latino day construction workers and would ideally coexist alongside vertical leadership practices (Williams Jr et al. 2010).

Similar hybrid approaches to safety leadership are raised by a number of authors in the cluster, indicating that responsibility for safe working environments should be distributed and then reinforced by key individuals, such as site OHS officers and foremen. However, a framework clearly describing the interaction between vertical and horizontal approaches to leadership in safety is yet to be outlined (Biggs et al. 2013; Conchie et al. 2013; Lingard et al. 2009; Mitropoulos and Cupido 2009). An analysis of recent contributions to the cluster helps identify specific research avenues needing to be addressed. First, the interaction between group leadership, social safety climate and accident self-reporting is yet to be fully understood (Andersen et al. 2018). As Andersen et al. (2018) indicate, hard forms of safety leadership such as punishments for safety misdemeanours, may not prove as effective as softer methods of

curating a social climate conducive to strong safety outcomes. Future research needs to consider how 'managerial actions to strengthen workers' social identification with [a] construction project… may lead to the development of a stronger safety climate at the construction site level' (Andersen et al. 2018). The role of self-motivation and self-leadership is also emerging as an important research avenue for construction safety leadership theory (Wen Lim et al. 2018). As self-leadership theory develops, it is important that research considering self-leadership in construction takes into account multi-dimensional characterisations of worker motivation and how these interface with extant vertical leadership practices and shifting group dynamics (Wen Lim et al. 2018; Zhang et al. 2018b).

Overall, research in Cluster 1 considers the vertical leadership of individuals, such as OHS officers or foremen, as critical to strong safety performance. However, recent research has begun considering how vertical leadership may be complemented by horizontal leadership practices, such as team-leadership or self-leadership, but is yet to present a framework that clearly describes this interaction (Andersen et al. 2018; Paunova 2015; Wen Lim et al. 2018). In the balanced leadership framework, horizontal leaders are empowered to foster consensus and workgroup culture at the team level through reflexive communication between teams, project managers and organisation-wide leadership (Müller et al. 2018a). In the framework, the localised autonomy of horizontal leaders to self-manage at a team-level is tempered by their connection to a centralised control layer of permanent vertical leaders (Müller et al. 2018a). In practice, this would see workgroup leaders afforded temporary authority to establish social safety cultures for their workgroup to identify with, while ensuring these cultures remain linked to sitewide safety standards enforced by vertical leaders such as foremen and project managers.

Therefore, to better understand how vertical leaders can drive safety outcomes through horizontal self-leadership and identification with social safety cultures, future research should build on Andersen et al. (2018) and identify drivers of consensus building within specific on-

site workgroups (estimators, electricians, labourers etc). Examples of drivers include storytelling, training or shared technical knowledge (Rowlinson and Jia 2015; Williams Jr et al. 2010). Such research will provide site managers, project managers and supervisors insight into how workgroup autonomy can be balanced with vertical safety oversight, offering a new perspective on how workgroup cultures interact with site level safety.

Cluster 2 – Innovation & sustainability

Cluster 2 focusses primarily on how leadership can drive innovation in construction leading to stronger sustainability outcomes. Again, the most frequently cited research in this cluster characterises leadership vertically (Bossink 2004; Gu and London 2010; Limsila and Ogunlana 2008; Ozorhon et al. 2014). However, unlike the other clusters where citations are distributed relatively evenly across the articles contained, cluster 2 is dominated by one contribution in particular which attracts nearly 40% of all citations in the cluster: Gu and London (2010). Gu and London (2010) analyse the readiness of the Architecture, Engineering and Construction (AEC) industry to leverage Building Information Modelling (BIM), particularly in relation to sustainable building design, across three dimensions: technology, processes and people. They find a high degree of variance in the readiness of AEC firms to leverage BIM, and propose a framework for BIM adoption, the Collaboration BIM Decision Framework (Gu and London 2010). In the framework, interdisciplinary groups of leaders collaborate to enable BIM adoption across four key domains: work processes, resourcing, scoping/project initiation and tool mapping (Gu and London 2010). While the degree of vertical leadership required throughout the model varies, central authorities such as senior executives, clients and BIM managers play crucial roles in spearheading BIM adoption (Gu and London 2010). Understanding the implications of BIM for sustainable construction leadership is a

recurring concern within the cluster and remains the focus of ongoing research (Tuohy and Murphy 2015; Wallhagen and Glaumann 2011; Wu and Issa 2014).

Research in Cluster 2 also explores the role of vertical leaders in construction innovation more broadly (Limsila and Ogunlana 2008; Ozorhon et al. 2014). Ozorhon et al. (2014), for instance, consider how key individuals such as clients, managing directors and contractors, can be 'innovation champions' in construction projects by setting an empowering example for subordinates. As they note, 'open leaders empower their employees and encourage their creativity: they form an environment that is conducive for innovation' (Limsila and Ogunlana 2008; Ozorhon et al. 2014). Despite evidence from other industries of the benefits of horizontal leadership practices for innovation outcomes (Davis and Eisenhardt 2011; Lindgren and Packendorff 2011; Zhou 2014), there is barely any discussion of horizontal leadership practices in the cluster. The only mention of horizontal leadership comes from Idoro (2009) who flags shared leadership between construction project managers and bank representatives on Nigerian construction projects as hindering project progress and undermining leadership integrity. Given the innovation outcomes achieved through implementation of horizontal leadership practices in entrepreneurial teams (Zhou 2014), R&D teams (Lindgren and Packendorff 2011), ICT developers (Davis and Eisenhardt 2011), healthcare teams (Kaviani et al. 2017) and design teams (Galli et al. 2017), greater research is needed to understand how horizontal leadership may be combined with existing vertical leadership practices to drive similar outcomes in construction projects.

Overall, research in this area has been reticent to draw on emerging leadership theory with many studies focusing on how longstanding vertical leadership practices support or inhibit emerging innovation and sustainability outcomes (Gu and London 2010; Limsila and Ogunlana 2008; Ozorhon et al. 2014). While it is clear vertical leaders are indispensable as champions of innovation adoption, there has been a lack of research considering how distributed leadership

practices complement the role of vertical leaders in facilitating innovation adoption (Gu and London 2010; Wu and Issa 2014). Consideration of balanced leadership theory may encourage greater exploration of how such practices support or inhibit innovation and sustainability outcomes in construction while remaining cognisant of the demonstrated benefits of vertical leadership. For example, future research should consider how building strategic agility by distributing decision making authority horizontally across an assembly of site-level leaders could improve the capacity of construction firms to capitalise on forefront innovation and sustainability frameworks. In particular, researchers should consider whether factors that have been found to influence the readiness of senior leaders to distribute decision making authority in other contexts, such as career expectations, project risk, age and power distance, are equally relevant in construction (Galli et al. 2017; Müller et al. 2018b; Paunova 2015). Advancing construction research in this way will reveal how vertical, horizontal and balanced leadership practices can be best leveraged to accommodate the observed rapidly changing innovation and sustainability agendas.

Cluster 3 – Leadership competence

Cluster 3 also focusses predominantly on vertical leadership. The cluster draws together strands of broader leadership theory, all of which characterise leading as an individual activity, to critically reflect on key leadership competencies needed to succeed in construction. Overall, research in the cluster indicates that the leadership of project managers is a key determinant of project performance and that the most effective project managers demonstrate an ability to adapt their competencies in response to the peculiarities of different project teams, locations and objectives (Enshassi et al. 2009; Odusami 2002). Enshassi et al. (2009), for example, find that a project manager's leadership skills are the paramount driver of performance and client satisfaction on construction projects. Looking more specifically at what skills leaders require,

Dainty et al. (2005) develop a competence-based model comprised of 12 core competencies desired for construction project managers. Of these competencies, superior performing project managers exemplify self-control, flexibility, client-oriented focus, impact and influence, and team leadership (Dainty et al. 2005). In a similar study, Odusami (2002) identifies decision making, communication, leadership and motivation, and problem solving as the four most important competencies for effective construction project managers. These studies play a valuable role in informing which competencies are prioritised during the education and selection of project managers, but do not consider how enactment of these competencies may extend beyond individual project managers in practice.

Of note in cluster 3 are the contributions of Toor (2011; 2008a; 2008b; 2008c; 2009; 2010; 2011a; 2011b) that collectively attract over 22% of citations in the cluster. While these contributions address construction leadership from varying perspectives, a consistent thread throughout them is the notion of authenticity as a core leadership competence. Toor and Ofori (2008b) describe authentic leaders as leaders who 'understand their purpose, practice solid values, lead with heart, establish connected relationships, and demonstrate a high level of self-discipline'. Throughout his contributions to the cluster, Toor considers how more authentic approaches to leadership can combat critical sentiment around construction project governance, generating 'a fresh perspective of implicit leadership drives, suitable leadership behaviours for construction projects, practical and authentic performance standards, effective leadership interventions that can help to accelerate leadership development, influence of leadership on project outcomes, influence of leadership on followers and organizational outcomes in the long-term' (Toor and Ofori 2008b). This research is largely 'focused on executives, project managers, site managers, quantity surveyors' (Toor and Ofori 2008b), and the authors note that 'it is important to analyze authentic leadership at all levels of construction organizations. Such examinations at dyadic, group, and organizational levels also have the

potential to enhance the understanding of authentic leadership in the construction industry'. Recent research has begun to consider the need for authenticity across other on-site leadership roles such as foremen and supervisors, however the role played by authenticity in integrating vertical and horizontal sources of leadership is yet to be studied (Wan Muda et al. 2016). This could render valuable insights regarding the effectiveness of authentic leadership in situations where contrasting purposes, practices and underlying values exist between horizontal leaders.

In sum, cluster 3 demonstrates that leadership competence is considered an individual quality in construction. Recently, recognition has been given to the possibility of individual competencies coalescing in team-level competencies, however, the way in which these team-level competencies enable or constrain the integration of vertical and horizontal sources of leadership is unknown (Wan Muda et al. 2016). In contrast, a team-based approach to leadership competence is fundamental to balanced leadership where a focus is placed on a 'candidate's identity, construction and positioning relative to other candidates for horizontal leadership' (Müller et al. 2018b). In other project-based organisations this approach has been found to provide a broad range of leadership competencies across a team by flexibly drawing on a pool of horizontal leaders (Galli et al. 2016).

Therefore, it may be valuable for future research in this cluster to distinguish between competencies that are essential in vertical leaders, such as, for example, communication or self-control (Dainty et al. 2005; Odusami 2002), and competencies that deliver benefit when distributed across workgroups, such as technical proficiency or negotiation (Wan Muda et al. 2016). In practice, this line of research could inform a new perspective on leadership competence in construction firms, prioritising the identification of groups of leaders who collectively share a diverse and dynamic set of competencies tailored to the project at hand rather than searching for individual leaders with perhaps only some of the necessary competencies.

Cluster 4 – Organisational learning

Research in cluster 4 is the most diverse, however the strongest focus of the cluster is on organisational learning (Almaian et al. 2016; Chiang et al. 2008; Chinowsky et al. 2007; DeVilbiss and Leonard 2000; Knauseder et al. 2007; Love et al. 2016; Pham and Swierczek 2006; Pries et al. 2004; Styhre 2011; Styhre and Josephson 2007). This body of research accounts for 41% of citations in the cluster and will be the focus of this discussion. This research contemplates how different leadership approaches support organisational learning in construction projects.

Chinowsky et al. (2007), for example, compare the learning techniques and technologies of construction and non-construction firms to develop an organisational learning maturity model for construction firms. The model argues that leading for organisational learning requires a somewhat hybrid approach where individual leaders leverage their influence to champion change, followed by distributed organisational learning in response to a new shared vision. However, other than time elapsing, the authors do not explain the mechanisms through which vertical leadership enables distributed learning and so emphasis in their model remains on the vertical leadership of senior executives in facilitating leadership exchange. As Chinowsky et al. (2007) note, 'executive support is the key first step to a successful implementation of a learning organization culture'. Adopting a similar view, DeVilbiss and Leonard (2000) suggest that combining vertical transformational leadership with distributed group processes is critical to effective organisational learning. However, their research lacks critical reflection on the impact of specific aspects of group processes and transformational leadership on organisational learning. Therefore, their partnering framework does not clearly distinguish how vertical and horizontal leadership facilitate organisational learning (DeVilbiss and Leonard 2000).

As cluster 4 demonstrates, organisational learning has recently emerged as a salient concern in the construction industry (Love et al. 2016). Extant literature considers how vertical leaders influences organisational learning and in doing so overlooks how horizontal leaders could either contribute to, or potentially detract from, this influence. This stands in stark contrast to broader organisational learning literature that recognizes organisational learning as collective capacity, so that 'the ideal leader might recognize his or her limitations and share the leadership of organizational learning with colleagues' (Vera and Crossan 2004).

Currently, understanding how this sharing of responsibility for organisational learning should occur in construction is challenging as research identifying precisely how horizontal leadership practices contribute to organisational learning in projects is lacking. Horizontal leadership theory indicates that a combination of horizontal leadership and vertical lines of communication is required to facilitate organisational learning, however, no framework has been proposed for achieving this combination (Denis et al. 2012).

Outside of construction, the balanced leadership archetype explains organisational learning through the notions of mental models and knowledge transfers. It suggests that, while individuals may work in independent teams, they share loose mental models that inform interaction and the transfer of tacit knowledge. Müller et al. (2018a) describe this process as 'a generative dance' between horizontal and vertical leadership, in which 'the horizontal leader interacts with the vertical leader over a period of time to develop the project forward and… re-shape, or even abandon their actions and interactions'. On a construction site, this approach may manifest as shared learning in workgroups (for instance, estimators, joiners or electricians) facilitated by mid-level managers (for instance site managers, superintendents and project managers) who actively relay learnings to senior off-site leaders. Through this information relay, micro-level learning is inducted and disseminated across the organisation while being validated through vertical leaders (Drouin et al. 2018).

Future research should look to establish empirically how factors such as organisational risk tolerances, resourcing constraints and conflicting knowledge cultures might enable or inhibit the relay and induction of on-site knowledge through mid-level managers (Chinowsky et al. 2007; Godfrey Ochieng and Price 2009; Oladinrin and Ho 2016). Advancing construction leadership research in this manner would establish more clearly how vertical and horizontal leadership practices should be combined to maximize organizational learning.

Cluster 5 – Vision and external engagement

Cluster 5 looks at the ability of leaders to collaborate with co-workers and external stakeholders through a shared vision. Contributions to the cluster draw on transformational leadership theory (Jiang et al. 2017; Tabassi et al. 2014; Waziri et al. 2015; Zhang et al. 2018c) and emotional intelligence theory (Butler and Chinowsky 2006; Chih et al. 2017; Lee et al. 2005; Zhang et al. 2018a). While still firmly focussed on vertical leadership, research in this cluster also considers horizontal and balanced leadership approaches. Broadly, it is argued that horizontal leadership practices positively impact the effectiveness of vertical leadership in bringing about organisational change (Jiang et al. 2017; Spatz 1999; Tabassi et al. 2014). For example, Jiang et al. (2017) focus on vertical leadership, finding that organizational citizenship behaviour (OCB) has a mediating effect on the effectiveness of transformational leadership initiatives designed to improve sustainability outcomes in Chinese construction. Importantly, key OCB behaviours identified, such as 'helping', 'sportsmanship', 'individual initiative', 'civic virtue' and 'self-development', align closely with behaviours commonly associated with shared leadership and self-leadership indicating the possibility of a relationship between the approaches in the context of OCB (Denis et al. 2012; Jiang et al. 2017). Similarly, Zhang et al. (2018a) indicate that leader emotional intelligence is positively associated with both transformation leadership and integrated project delivery (IPD), a form of external engagement

requiring cooperation between internal and external stakeholders (Zhang et al. 2018a). As a construct, IPD aligns closely with pooled leadership in which responsibility over project critical factors is distributed horizontally across a collaborative leadership team. However, Zhang et al. (2018a) primarily consider whether vertical laissez-faire leadership can stimulate collaborative IPD in construction projects and do not consider horizontal forms of leadership.

Contrastingly, Spatz (1999) considers horizontal leadership, indicating that construction firms can pursue their competitive vision most effectively when teams self-lead through shared-leadership. In particular, teams must exhibit communication, honesty, quality, respect and mutual support in order to maintain a consistent vision within and outside of the organisation (Spatz 1999). Likewise, offering a more balanced consideration of both vertical and horizontal leadership approaches, Tabassi et al. (2014) conceptualise leadership as primarily a dynamic *group* process involving mutual influence geared towards the achievement of goals. They suggest that the paramount goal for transformational leaders in construction is 'developing followers into leaders, inspiring followers to go beyond their own self-interest and giving employee empowerment', thus explicitly recognizing the role of vertical leaders in fostering horizontal leadership (Tabassi et al. 2014).

Based on literature in Cluster 5, what is lacking currently from research addressing vision and external engagement in construction is a clear understanding of how different forms of horizontal leadership influence interactions with clients, contractors, regulators, council representatives and other stakeholders (Tabassi et al. 2014; Zhang et al. 2018a). Such research would give a more holistic indication of the mediating influence of mechanisms such as team building, sensemaking, trust, self-leadership and emotional intelligence on the relationship between construction leadership and external engagement (Butler and Chinowsky 2006; Denis et al. 2012; Zhang et al. 2018a). While recent research has indicated that organizational citizen behaviour (OCB) positively influences leadership vision and external engagement on

construction projects, it does not establish clearly what aspects of OCB can be considered leadership behaviours and the effect produced by each of these aspects (Zhang et al. 2018a). Overlaps with horizontal leadership theory are frequent in cluster 5, however no studies identify horizontal leadership practices contributing to leadership vision and external engagement, and so there is no consideration as to how these might integrate with extant vertical leadership practices (Jiang, Zhao & Ni 2017; Tabassi et al. 2014; Waziri, Ali & Aliagha 2015; Zhang et al. 2018c).

Two practices from the balanced leadership archetype are relevant for considering how vertical and horizontal leadership practices can operate cohesively to improve leadership vision and external engagement: enabling consensus building and defining a control layer. First, through 'group meetings for consensus finding, one-on-one meetings, use of task forces, delegation of leadership and decision making authority', balanced leadership offers a flexible framework centred on building consensus around a shared vision (Müller et al. 2018a). Second, the practice of defining a control layer demonstrates how vertical leaders can govern horizontal leaders without curbing autonomy (Müller et al. 2016).

Therefore, to understand how construction firms integrate vertical and horizontal leadership practices around vision and external engagement, researchers could study how existing consensus finding processes are delegated to workgroups, and subsequently, the mechanisms by which site leaders establish trust and control over these workgroups. In light of the focus of cluster 5, understanding how OCB fits into workgroup level consensus making and how transformational leaders maintain trust and control onsite would be promising starting points for future research (Tabassi et al. 2014; Zhang et al. 2018a). As vertical and horizontal forms of leadership coexist more frequently on construction projects, advancing this research avenue would equip practitioners with a clearer understanding of where responsibility for external engagement lies (Tabassi et al. 2014).

Cluster 6 – Leader-follow power dynamics

Literature in cluster 6 considers construction leadership from the perspective of leader-follower power dynamics and examines the role of both vertical and horizontal leadership practices. This discussion is particularly salient for construction moving forwards as shifts away from vertical leadership carry inherent challenges to traditional authorities such as project managers and site supervisors (Giritli and Oraz 2004; Kasapoğlu 2014). Citations in the cluster are evenly spread and overall, research in the cluster indicates that leaders who rely on establishing relational, consultative power rather than directive, autocratic power have greater influence on their followers and on project performance (Fellows et al. 2003; Liu et al. 2003; Liu and Fang 2006; Odusami et al. 2003). This is supported by findings by Odusami et al. (2003) who indicate a stronger relationship between power diffused, consultative leadership styles and project performance than non-consultative autocratic styles in construction projects. Likewise, studying Chinese construction projects, Liu and Fang (2006) identify two dimensions of leadership power: power oriented towards performance and power oriented towards maintaining role structure. Overall, they find that performance-oriented leadership power results in the distribution of leadership power and elicits higher project performance through stronger subordinate commitment (Liu and Fang 2006).

While there is some consensus that sharing of power in construction projects through consultative leadership styles has a positive influence on performance, recent research does not sufficiently describe which leadership responsibilities are beneficial to distribute and which are not (Kasapoğlu 2014). Singh and Jampel (2010), for instance, argue that 'leadership exists and exercises itself at all levels of the organization' and that 'leadership skills can be built by delegating more work to individuals through increased workload and delegation of adequate power'. However, their research does not describe what constitutes 'adequate power' to provide subordinates and how a balance between inadequate, adequate and excessive

distribution of power can be maintained (Singh and Jampel 2010). This is a key gap across the power dynamics literature and so a framework is needed that better describes how project managers, supervisors and other leaders can maintain a suitable balance of power with subordinates (Ameh and Odusami 2014; Giritli et al. 2013; Singh and Jampel 2010).

Overall, a gradual shift away from a focus on autocratic leadership to a more consultative approach has been observed in construction (Liu and Moskvina 2016) and this shift is reflected across cluster 6 (Fellows et al. 2003; Randeree and Chaudhry 2012; Singh and Jampel 2010). While it has been established that a more consultative leadership style 'creates emotional bonds and harmony between the leader and the group and improves positive communication' (Kasapoğlu 2014), ambiguity remains with regard to the types of responsibilities (e.g. supplier management, external engagement, task scheduling) that can be distributed horizontally and how a balance between centralized control and team freedoms can be achieved (Ameh and Odusami 2014; Giritli et al. 2013; Singh and Jampel 2010).

In contrast, the balanced leadership archetype describes how responsibilities can be distributed flexibly while ensuring the remits of horizontal leaders align with project needs. Authority to identify and empower horizontal leaders is retained by permanent vertical leaders to ensure consistency and alignment with firm strategy (Yu et al. 2018). For such an approach to be effective in construction, this control layer of permanent vertical leaders would need to reserve power to grant leadership authority to workgroup members dependent on their capabilities and the needs of the project, requiring an acute understanding of the power dynamics at play.

In sum, future research should explore methods for mapping and understanding complex power dynamics within workgroups where temporary horizontal leaders operate in conjunction with vertical authorities (Grisham and Srinivasan 2008; Singh and Jampel 2010). Such research could use the model of Liu and Moskvina (2016) found in Cluster 6 as a starting

point, and in doing so, advance a more granular understanding of the effects of balancing leader power dynamics in construction.

Cluster synthesis

Summarizing insights from the above systematic review, Table 4 below represents how the six research clusters on construction leadership relate to the vertical, horizontal and balanced leadership archetypes. On this basis, vectors for future research are outlined for each cluster. The vectors address a broad range of emerging concerns within construction leadership research and have a practical focus on improving performance outcomes in construction projects.

Cluster	Vertical leadership	Horizontal leadership	Balanced leadership	Research vectors
Safety	• Hard control over safety through the setting of assessment, reporting and behavioural standards (Kines et al. 2010) • Soft control over safety through verbal leader-worker exchange (Kines et al. 2010) • Managing safety cultures through coaching and contingent reward schemes (Kapp 2012) • Leaders as on-site safe work exemplars (Dingsdag et al. 2008) • Both transactional and transformational leadership behaviours are positively associated with safety outcomes except for active management-by-exception (Hoffmeister et al. 2014) • Good safety leadership facilitated by individual's discipline, values, vision, honesty, engagement, demonstration and promotion relating to safety outcomes (Daniel 2015)	• Within-group homogeneity & between-group variation encouraging group-level safety climates (Lingard et al. 2009) • Pooled supervisory support improves leadership engagement in safety outcomes (Conchie et al. 2013) • Task-demand capability model for high reliability crews (Mitropoulos and Cupido 2009)	• Vertical leaders fostering peer-led safety cultures within teams (Williams Jr et al. 2010)	• How do vertical leaders in construction drive safety outcomes by enabling identification with social safety cultures and horizontal self-leadership? (Andersen et al. 2018; Rowlinson and Jia 2015; Wen Lim et al. 2018; Williams Jr et al. 2010)
Innovation & sustainability	• BIM adoption across work processes, resourcing, scoping/project initiation & tool mapping (Gu and London 2010) • Availability of effective leaders, qualified staff and information/technology are critical success factors for BIM implementation (Ozorhon and Karahan 2017) • Senior leaders should serve as innovation champions by demonstrating creativity, vision and long-term commitment to innovation (Ozorhon et al. 2014)	• Shared leadership constraining innovation through miscommunication and ambiguous authority (Idoro 2009)	*Not represented*	• How does the horizontal distribution of leadership responsibilities influence the readiness of construction firms to capitalize on the ongoing evolution of innovation and sustainability frameworks? (e.g. BIM adoption, LEED certification etc)? (Doan et al. 2017; Pushkar 2018; Wu and Issa 2014)
Leadership competence	• Superior project managers exemplify self-control, flexibility, client-oriented focus, impact/influence and team leadership (Dainty et al. 2005) • Superior project managers exemplify decision making, communication, leadership and motivation, and problem solving (Odusami 2002) • Authentic leadership achieved through purpose, values, heart, relationships and self-discipline is the paramount leadership competency (Toor and Ofori 2008) • Managerial competence focussed on modelling and enabling expected behaviours is more desirable than an ability to encourage others through shared vision (Slattery and Sumner 2011).	• Leadership as a multi-directional social process informed by team composition and project variables (Toor and Ofori 2008) • Family-led firms as a form of pooled-leadership (Leotta et al. 2017)	*Not represented*	• What competencies are essential in vertical leaders and what competencies can be distributed across workgroups? How can this information inform a team-based approach to leadership competence in construction? (Dainty et al. 2005; Odusami 2002; Toor and Ofori 2008; Wan Muda et al. 2016)
Organisational learning	• Organisational learning maturity model in which vertical leaders leverage influence to induce learning around a shared vision (Chinowsky et al. 2007) • Transformational leadership is integral to inducing group-level initiative and organisational learning (DeVilbiss and Leonard 2000) • Client leadership complements effective firm leadership to accelerate development of advanced innovation competence and supply chain integration (Manley 2006)	*Not represented*	*Not represented*	• What aspects of vertical and horizontal leadership encourage organisational learning in construction and how do factors such as organisational risk tolerances, resourcing constraints and conflicting knowledge cultures mediate this relationship? (Chinowsky et al. 2007; Godfrey Ochieng and Price 2009; Oladinrin and Ho 2016)
Vision & External engagement	• Transformational leadership, comprised of idealized influence, inspiration, motivation, intellectual stimulation and individualised consideration, has a positive influence on ICT adoption (Waziri et al. 2015) • Emotional intelligence as a driver of performance in construction executives (Butler and Chinowsky 2006) • Vertical leadership style as an antecedent of IPD between internal and external stakeholders (Zhang et al. 2018) • Organisational citizenship as a mediator of external engagement through transformational leadership (Jiang et al. 2017)	• Self-managed teams exhibiting shared leadership through communication, honesty, quality, respect and mutual support are essential for maintaining an internally and externally consistent vision (Spatz 1999)	• Leadership must be a dynamic group process instigated by vertical leaders and implemented by horizontal leaders (Tabassi et al. 2014).	• How do vertical leaders establish trust and control with horizontal leaders while delegating consensus finding processes used to improve vision and external engagement? What are the mechanisms that mediate the impacts of these processes and how do they operate when leadership stems from both vertical and horizontal sources? (Esther Paik et al. 2017; Jiang et al. 2017; Spatz 1999; Tabassi et al. 2014; Zhang et al. 2018)
Power dynamics	• Effective project managers demonstrate a combination of authoritative leadership and technical expertise resulting in lower levels of delegation (Giritli and Oraz 2004) • Performance-oriented expression of leader power elicits higher performance than structure-oriented expressions of leader power (Liu and Fang 2006) • Leadership power should be maintained at all levels of an organisation through delegation (Singh and Jampel 2010). • Lower power-distance leadership styles such as consultative or supportive leadership achieve stronger follower-perceived performance and group satisfaction (Fellows et al. 2003)	*Not represented*	*Not represented*	• How do vertical leaders in construction empower horizontal leaders while retaining control over redistribution of leadership authority as project circumstances change? What methods are available for mapping and understanding complex power dynamics within workgroups where temporary horizontal leaders operate in conjunction with vertical authorities? (Ameh and Odusami 2014; Giritli et al. 2013; Liu and Moskvina 2016; Singh and Jampel 2010)

Table 4. Tri-archetype research agenda for construction leadership

DISCUSSION

The current review has been inspired by 'the call for better leadership [that] can be heard throughout the engineering and construction communities' (Simmons et al. 2017). While it is evident that construction leadership practice is changing, research has lacked a robust research agenda to ensure changes are commensurate with emerging challenges, creating a disconnect between theory and practice (Simmons et al. 2017). As the industry responds to challenges in the six areas highlighted by this review, it is critical researchers and practitioners alike are bolstered with more than a single leadership framework to inform the delivery of projects. To address this gap, this review has systematically sampled, synthesized and analysed 289 relevant articles to produce a tri-archetype research agenda aligned to these challenges. In doing so, it makes key contributions to leadership theory in construction and to research in engineering management more broadly.

From a theoretical perspective, this review demonstrates that construction leadership research does not sufficiently explain how the vertical and horizontal leadership archetypes can be successfully integrated despite growing evidence of traditional forms of vertical leadership being supplemented by new types of leadership in practice (Tabassi et al. 2014). The vertical leadership archetype has dominated construction leadership research with only a small number of studies considering the horizontal leadership archetype. Given the thoroughly developed body of horizontal leadership literature found in broader research (Denis et al. 2012) as well as evidence of horizontal leadership in practice (e.g., Harris and McCaffer (2013), this demonstrates both a lag in construction leadership theory and a valuable opportunity to more deeply integrate construction leadership research with contemporary leadership practice. Research in other project industries has found horizontal leadership practices to boost team coordination (Carte et al. 2006; Galli et al. 2016; Hsu et al. 2017; Sullivan et al. 2015), increase the ability of organisations to cope with change (Chreim et al. 2010; Kempster et al. 2014;

Rambe and Dzansi 2016) and enhance innovativeness and creativity (Hu et al. 2017; Kakar 2017; Lee et al. 2015; Sun et al. 2016; Wu and Cormican 2016). Importantly, horizontal leadership has also been found to dramatically improve the effectiveness of agile approaches to project delivery in other industries (Bäcklander 2018; Dybå et al. 2014; Li et al. 2018; Moe et al. 2015; Moe et al. 2019; Xu and Shen 2018). With construction projects increasingly taking advantage of more flexible agile methods (De Marco 2018; Mendez 2018; Saini et al. 2018), it is imperative that more research is conducted to establish what horizontal leadership practices are currently being used in the industry, whether their effects are comparable to other project-based industry contexts and what other leadership practices may be valuable to implement moving forwards. The current review sets out a clear agenda for this research.

Despite the benefits of horizontal leadership, researchers have warned that horizontal leadership practices should not supersede the valuable roles vertical leaders play, but rather, be integrated to enhance organisational leadership holistically (Müller et al. 2018b). As Denis et al. (2012) echo, 'the field of leadership does not necessarily gain by moving from a view of leadership as individual heroism toward an equally naive democratic ideal in which leadership is an organizational quality shared by all'. Research in other contexts has highlighted tension between vertical and horizontal leadership which could make their integration challenging. Largely, tensions arise from the shift in control required when moving from a leader–follower paradigm to a leader to leader paradigm (Gronn 2002). Ongoing challenges also rise once vertical and horizontal leadership are operating in conjunction. For both archetypes to exist simultaneously, a high degree of trust is required amongst team members, otherwise, challenges to leadership legitimacy can impede work (Kakar 2017).

The current review shows that these tensions between vertical and horizontal leadership are understudied in construction research which limits the usefulness of extant research for organizations seeking to (further) integrate horizontal leadership practices. The research

agenda put forward by this review identifies six key areas where a more rigorous theoretical conception of the integration of horizontal leadership practices is crucial: building culture and consensus around worker safety identities (Andersen et al. 2018; Choi et al. 2017; Wen Lim et al. 2018; Wu et al. 2016), integration of technical innovations and sustainability frameworks with extant delivery processes (Bilal et al. 2016; Ozorhon and Karahan 2017; Papajohn et al. 2017; Pushkar 2018), tailoring leadership competence to anticipated project demands (El-Gohary and Aziz 2014; Mikaelsson and Larsson 2017; Wan Muda et al. 2016), transmission of knowledge throughout teams (Love et al. 2016; Ni et al. 2018; Oladinrin and Ho 2016), establishing trust and vision in external engagement (Afsar and Shahjehan 2018; Esther Paik et al. 2017; Liu and Chan 2017; Zhang et al. 2018a) and finally, managing transient shifts in on-site power dynamics (Ameh and Odusami 2014; Liu and Fang 2006; Liu and Moskvina 2016). By identifying these six emerging research areas, this review draws together a diverse range of theoretical perspectives to bring much-needed structure to the future of construction leadership research.

The findings of this review should be seen as a stepping stone towards bringing construction leadership research in line with broader leadership theory. In response to the repeated finding that the use of horizontal leadership practices in construction is currently theoretically underdeveloped, this review considers how the emerging balanced leadership archetype may have utility for construction researchers looking to understand how vertical and horizontal leadership practices can coexist effectively. At its core, the archetype is concerned with rapidly connecting the efforts of permanent or semi-permanent vertical leaders with those of temporary horizontal leaders through a framework spanning from the inception to the completion of projects (Müller et al. 2018a). It is the suggestion of this review, based on research linking balanced leadership to positive outcomes in transferring knowledge, consensus building and organizational agility, that the balanced leadership archetype has

relevance to the challenges faced in construction. Overall, the findings of this review signpost a new direction for construction leadership research and practice that responds to the suggestion that 'construction might benefit from more contemporary frames that foster a more holistic view' on leadership (Simmons et al. 2017).

While the analytic focus of this review is limited to the construction industry, its findings have significance for the broader body of knowledge in engineering management. Research indicates that leaders across the broader field of engineering face many of the same challenges described throughout this review. Lines and Reddy Vardireddy (2017), for instance, study a wide range of engineering professions, arguing that 'to adopt organizational change has become a core competency'. They cite how key technical developments including 'building information modelling', 'virtual design', 'e-document management', 'modular techniques' and 'advanced work packaging' are disrupting traditional operating and competitive environments, requiring stronger leadership (Lines and Reddy Vardireddy 2017). Likewise, Perry et al. (2017) highlight the incompatibility of existing frames of thought around engineering leadership given the increasingly collaborative and interdisciplinary nature of projects, leading to the suggestion that 'a revised leadership development model is needed'. Given the evidence that engineering faces a similar set of leadership concerns to those identified in the context of construction, it is likely the findings of this review, which recommend balanced leadership as a promising approach that enables the integration of vertical and horizontal leadership practices, are relevant to the development of leadership research agendas across a broad range of engineering professions (Hartmann et al. 2017; Kameo 2017; Knight and Novoselich 2017; Lines and Reddy Vardireddy 2017; Perry et al. 2017; Rosch and Imoukhuede 2016; Stephens and Rosch 2015).

This research agenda may also herald significant change for practitioners in construction which could be extended to practitioners in engineering contexts. While the six

research vectors identified in this review consistently indicate that construction leadership theory is significantly lagging behind practice within and beyond construction, the review offers insight into what may be expected of construction leaders in the future. With firmer theoretical frameworks around the sharing of responsibilities, the roles of existing leaders in construction, such as executives, project managers, site managers and foremen, will be reframed as they become increasingly valued as expert integrators in a complex web of leaders rather than as experts in a particular discipline. Therefore, as the industry moves away from task-oriented leadership towards more co-operative approaches, vertical leaders will need to complement their deep technical competence with an ability to integrate a wide range of information, foster collaboration, share responsibilities and exert control through softer, less formal means such as relationships and social cultures (Shirazi et al. 1996). Leaders' professional development efforts need to be tailored towards becoming proficient in these softer practices associated with building team competence for knowledge sharing and problem solving. As Clarke (2012) echoes, 'the problem is one of developing an enhanced problem-solving capacity that necessitates high levels of knowledge sharing, and a greater potential for more rapid and effective responses to escalating events through emergent leadership capabilities'.

This review highlights a lag in construction leadership theory accurately reflecting current practice. As theory catches up and develops stronger frameworks to describe horizontal and balanced leadership practices in construction, it is important that consideration is given to identifying where tension may arise between these archetypes. For instance, tension may arise as formal and informal leadership authorities share power in different arrangements (Shirazi et al. 1996). The training and development of future leaders changes in response to the increasing transience of leadership positions available (Fellows et al. 2009) and information must be increasingly shared horizontally between leaders (Harris and McCaffer 2013). It is therefore

crucial that construction leadership theory supports vertical and horizontal leaders by providing frameworks that inform what leadership responsibilities should be distributed, how they are to be distributed and when they can be distributed. The emerging balanced leadership approach provides relevant insights into the practices vertical leaders can adopt to facilitate horizontal leadership in a way that avoid tensions and more research in this area will provide further valuable insights to practitioners. Further, vertical leaders must develop stronger capabilities for facing complex power dynamics in their organizations so that they can adapt their leadership to match transient distributions of decision-making authority. With significant changes on the horizon for construction firms, it is hoped the research agenda outlined by this review will inform forthcoming leadership research and guide practitioners towards practices better suited to the challenges identified.

It is important to highlight some limitations of this review. First, while the bibliometric review methodology used in this paper has been found to identify connections between articles more accurately than through an entirely manual review, it can never offer a perfectly objective assessment as researcher input will inevitably be required in the sample selection stage (Booth et al. 2016; Boyack and Klavans 2010). In the current paper researcher influence has been minimized through clearly defined search parameters, journal quality controls and the independent comparison of abstracts with exclusion criteria by each author (Randhawa et al. 2016). Second, while there is evidence to suggest that the results of this review hold relevance beyond the construction industry (Lines and Reddy Vardireddy 2017; Perry et al. 2017), the sampling process implemented ensures the results presented and the associated research agenda refer explicitly to the construction industry. Given that similar leadership concerns have been identified throughout the broader body of research in engineering management, it is important that future studies conduct similar systematic reviews across other engineering industries to establish parallels and differences in professional practice and needs more acutely. Finally, as

this review is conceptual in nature, it can only theorize potentially valuable directions for construction leadership theory and practice. Further empirical research will be needed to establish the extent to which a balanced leadership framework is already being implemented in construction practice and evaluate its efficacy with regard to emerging challenges along the six vectors identified in this review. Such research would not only advance construction leadership research but also the new and rapidly growing body of balanced leadership research.

CONCLUSION

With construction leaders facing increasingly complex challenges, recognition of the need for more diverse frames in construction leadership research has seen increasing use of horizontal leadership practices. The key challenge for construction research will be keeping up with this move away from traditional conceptions of leadership centred on vertical leaders, to develop more integrative frameworks that incorporate both vertical and horizontal leadership practices in a cohesive and practical manner. This review has systematically identified six areas in which there is ambiguity about what construction leadership will look like in the future. In response, the review has provided key research questions to spur on further research and inform practice. While construction leadership research must incorporate many different approaches, consideration of the balanced leadership framework as proposed in this review outlines a promising avenue for future research and practice.

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Chapter 5. Down to the wire: using teaming to balance tensions between continuity and change in projects (Paper 2)

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ABSTRACT

This article adopts a teaming perspective to analyze how tension between continuity and change informs teamwork in DEV (a pseudonym), a project-based organization tasked with the delivery of a large Australian celebratory event. By triangulating the accounts of key actors with observation of important meetings we demonstrate how teamwork responds to the mixing of unique and routine elements of the project causing heightened tension between continuity and change. Principally we find that teamwork shifts through three main approaches throughout the year: teaming for stability, balanced teaming and teaming for speed. Our findings challenge extant descriptions of the way in which teamwork unfolds in project-based organizations and contribute a tension-driven perspective of the connection between teams, teaming and the mixing of unique and routine project aspects.

KEYWORDS
Events projects, teaming, tensions, balance, continuity, change

INTRODUCTION

In this study we consider how a teaming is used to balance tension between continuity and change throughout projects in project-based organizations (PBOs). Broadly, teamwork can be defined as a dynamic process encompassing all aspects of interaction between actors while they pursue a common goal (Salas, Shuffler, Thayer, Bedwell, & Lazzara, 2015). Within this definition, teaming is used to describe a form of dynamic coordination between individuals without clear team structures (A. Edmondson, 2012). In particular, we consider the influence of tension between continuity and change on teaming, and inversely, how teaming is used to balance tension between continuity and change. Described in paradox literatures as the change-stability paradox, tension between continuity and change can be defined as a constant interaction between new forces introducing variability and the inertia of existing forces (Farjoun, 2010, Klein et al. 2006). Continuity and change are described as highly interdependent forces (Sutherland & Smith, 2011) that each create the environment in which the other becomes possible (Schad, Lewis, Raisch, & Smith, 2016).

Projectification is seeing actors collaborate in increasingly transient ways, changing the nature of work across a swathe of industries (René M Bakker, 2010). PBOs facilitate a degree of specialization often not possible in traditional permanent organizations, making them ideally suited to projects requiring creative solutions to bespoke problems (René M Bakker, Boroş, Kenis, & Oerlemans, 2013; Skilton & Dooley, 2010) radical innovation (Keegan & Turner, 2002; Rutten & Oerlemans, 2008) and highly flexible approaches to delivery (Karrbom Gustavsson & Hallin, 2015; Kim, Lee, Kim, & Kim, 2006). As a result, PBOs are prevalent amongst film crews and casts (Cattani & Ferriani, 2008), construction crews (Walker 2015), event organizers (Emery, 2010) and product innovation cells (Lenfle, 2016). Further, through projects such as the Hoover Dam (Sovacool, Gilbert, & Nugent, 2014) and the Channel Tunnel (Cicmil, Hodgson, Lindgren, & Packendorff, 2009), project-based organizations have seized

the attention of practitioners and scholars alike, however, there is still much to learn about how they achieve such exceptional results.

In particular, researchers have looked to understand how teamwork unfolds in PBOs throughout projects (René M Bakker et al., 2013). In this literature two contrasting lines of inquiry have emerged. One, characterizes PBOs as entirely transient and so focusses on how teams work together in the absence of aspects of continuity found in traditional permanent organizations such as stable role structures, accepted practices and interpersonal familiarity (Gann & Salter, 2000; Grabher, 2004; Modig, 2007). The other, argues that most PBOs remain connected to some form of enduring operational context and so considers how teams use continuity in membership, roles and practices (Bechky, 2006; Lindner & Wald, 2011; Manning & Sydow, 2011; Valentine & Edmondson, 2014). However, this juxtaposition has come under criticism as researchers increasingly find PBOs that find a balance between transience and permanence, accommodating a complex tension between continuity and change (Bakker, DeFillippi, Schwab, & Sydow, 2016; Stjerne & Svejenova, 2016).

In broader project research, the emerging concept of teaming is being increasingly applied to understand how teamwork unfolds in these dynamic situations (A. C. Edmondson & Harvey, 2017; Matthews, Whittaker, Moran, Helsley, & Judge, 2012; Zhu, Huang, & Contractor, 2013). Unlike a traditional conception of teams, teaming does not rely on stable, bounded teams to delineate discrete centers of teamwork and instead, see individuals draw on affective and cognitive skills to flexibly coordinate teamwork on an ongoing basis (Mortensen, 2015). Under a teaming perspective, teamwork is free to cross disciplinary and organizational boundaries as it is played out by members rather than being imposed by static role structure (A. C. Edmondson & Harvey, 2018). In projects, teaming has been found to increase the ability of actors to respond to unanticipated change (Noll, Razzak, Richardson, & Beecham, 2016), deliver creative outcomes (Kliem, 2013) and innovate (A. C. Edmondson & Harvey, 2017).

However, the literature addressing teaming in projects is still in its infancy and many questions remain about how teaming unfolds in specific organizational settings (A. C. Edmondson & Harvey, 2017). In particular, we do not yet know how teaming is used to balance the afore mentioned tension between continuity and change found in many PBOs (Benishek & Lazzara, 2019). This is a significant gap as research highlights that the members of PBOs must seamlessly integrate new and old relationships, roles, practices and interdependencies to maximize the efficiency with which they can deliver projects (Manning & Sydow, 2011). This places members at the center of a challenging tension between developing enduring teamwork processes that retain utility across different PBOs, and tailoring teamwork to the precise needs of a particular project at a particular time (René M Bakker et al., 2013). By exploring how teaming can be used to balance tension between continuity and change throughout projects, researchers can advance a deeper understanding of how actors of PBOs are able to work together effectively across different projects (Arvidsson, 2009). With projects playing an increasingly salient role in global organization, it is pressing that researchers better understand the temporal dynamics of managing tension between continuity and change through teaming in PBOs.

Therefore, the current paper adopts a teaming perspective (A. Edmondson, 2012) to answer the question: how is teaming used to balance tension between continuity and change throughout projects in PBOs? To address this question, the paper is organized as follows. First, we critically assess the research front pertaining to teamwork in PBOs, organizational tension and teaming. Following this, our research methodology is described, data inventory presented and final coding structure introduced. To embed the reader in how actors experience tensions throughout projects, our results are presented in an organizational narrative following the lifecycle of DEV, a PBO that repeatedly reforms and grows from 6 to 141 members to deliver an annual Australian event before disbanding. We recount how different teaming routines

developed as new members gradually joined DEV creating a dynamic balance of continuity and change in the size, heterogeneity, interdependency and stability of the organization's membership. We then present findings, principal of which being the use of three distinct teaming routines to alter the balance between continuity and change throughout the project, before discussing the theoretical and practical significance of our findings. Finally, we highlight important limitations of our study and propose future research avenues to advance teaming research in PBOs. Overall, the research advances both our understand of how teamwork unfolds in PBOs and teaming theory more generally. First, we offer a new perspective on how teamwork unfolds in PBOs by highlighting the integral role played by teaming routines in balancing tension between continuity and change as projects progress. Second, we advance teaming theory by highlighting the temporal dynamics of teaming across recurrent projects, demonstrating how teaming routines progressively emerge in response to project life cycles. Our findings hold important implications for how researchers and practitioners engage with teaming and tensions in PBOs.

LITERATURE REVIEW

Teamwork in PBOs is dynamic, ambiguous and messy (René M Bakker et al., 2013). PBOs bring together actors with different experiences, skill sets, and expectations to work on what are often, challenging projects requiring bespoke approaches to delivery (Burke & Morley, 2016). While some of these actors may have worked together previously in other organizations (Manning & Sydow, 2011), often actors in PBOs are unfamiliar with one another (Bechky, 2006). In order to meet their deadlines, these actors must not only master the abilities necessary to deliver the project, but also develop working relationships with a pastiche of familiar and unfamiliar colleagues who each bring unique perspectives to the table (Jacobsson & Hällgren, 2016; Meyerson, Weick, & Kramer, 1996). Despite these challenges, actors in

PBOs must be simultaneously efficient and creative, exploring both the known and the unknown to deliver routine and non-routine projects on time (Graetz & Smith, 2008). In exploring how teams get work done in these challenging circumstances, researchers have highlighted the contrasting approaches of different PBOs, with some focused on tailoring their approach to each project and others focused on maintaining enduring processes across projects (René M Bakker, 2010). In this review of the literature we will first consider these two approaches, before highlighting how a teaming perspective may offer greater insight into the delicate balance of continuity and change in PBOs.

For PBOs that take on non-routine projects without substantial connections to a permanent parent organization, an ongoing series of projects or a tight knit professional network, teamwork is characterised as emergent, unstable and transitory (Grabher, 2004; Manning & Sydow, 2011; Saetrevik, 2015; Tyssen, Wald, & Spieth, 2013). In these PBOs a dynamic roster of members and roles is drawn on to create a melting pot of new ideas, capabilities and interests (Manning & Sydow, 2011; Meyerson et al., 1996). In extreme instances, these organizations may form spontaneously in response to sudden crises, spawning teams of unfamiliar actors with no norms to inform how they will work together (Saetrevik, 2015). These teams have been referred to by a range of names including action teams (Wildman et al., 2012), rapid response teams (R. J. DeFillippi, 2002) and impromptu teams (Jacobsson & Hällgren, 2016). Without pre-existing knowledge regarding process or team structure to draw on, these teams must instead respond to emergent needs through shared socio-cognitive resources developed *in situ* (René M Bakker et al., 2013). For instance, Faraj and Xiao (2006) find that during crises in temporary trauma centers, teams shift from reliance on expertise-based teamwork and instead, rely on emergent 'dialogic coordination practices' that facilitate rapid contestation of ideas, sensemaking and flexible approaches to teamwork.

Generally, the literature characterizes this lack of pre-existing norms as a distinct advantage when dealing with bespoke, novel or uncertain work as the structure and processes of teams can remain fluid, adapting to ensure the efforts of actors align to emerging needs (Tyssen et al., 2013). Therefore, in this literature, change is considered not only inevitable for teams, but as the driving force behind teamwork, creating opportunities for competitive advantage through adaptation, learning, and disruption (Modig, 2007). With the social and structural fabric of teams under constant negotiation, tasks requiring drastic change are not considered threats but as opportunities to be absorbed by agile approaches to teamwork (Bechky & Okhuysen, 2011). Under this paradigm, teamwork in PBOs is defined not by established roles, relationships and process but by pivotal periods of change in which teams must respond to new tasks, project ecologies and epistemic networks (Grabher, 2004).

In contrast, for PBOs that take on routine projects or are connected to some sort of enduring organizational context such as a parent entity, a series of prior projects or a professional network of familiar actors teamwork is described as being underpinned by common cognitive resources that persist across different projects (Bechky, 2006; Ebers & Maurer, 2016; Grugulis & Stoyanova, 2012; Lindner & Wald, 2011). By supporting recurrent processes, these resources enable teams to better leverage talent synergies (Starkey, Barnatt, & Tempest, 2000), institutionalize creative thinking (Cattani & Ferriani, 2008), and gradually inculcate rewarding behavioral norms (Grugulis & Stoyanova, 2012; Schwab & Miner, 2008). This perspective responds to the reality that often, the teams of PBOs will draw on a common pool of individuals either through parent organizations or industry networks, who, when operating under demanding schedules, leverage pre-existing socio-cognitive resources to streamline project delivery (Ebers & Maurer, 2016). For instance Stjerne and Svejenova (2016, p. 1772) highlight how some film projects benefit from preexisting knowledge past down a

parent organizations such as ‘abilities and networks for accessing resources, as well as with knowledge and experience of defining work processes’.

Likewise, teams can draw on preexisting knowledge when actors have repeatedly collaborated across multiple projects such as in the film industry where latent networks of professionals are loosely bound by relational contracts, shared knowledge and interpersonal familiarity (Birnholtz, Cohen, & Hoch, 2009; Ebbers & Wijnberg, 2009; Ebers & Maurer, 2016). In these PBOs, it is also more common for projects to involve routine tasks. Bechky (2006), for instance, depicts how routine aspects of projects in the film industry embed *a priori* assumptions regarding normative team structures that inform how teamwork unfolds. For example, the routinized expectation that all film sets require a cinematographer embeds *a priori* assumptions about how camera operators will work with a team (Bechky, 2006). These assumptions are then routinely reinforced on the job as actors interact. As she notes, “generalized role structure that is communicated from project to project both contributes to coordination and helps provide the continuity within which crew members accomplish their work” (Bechky, 2006, p. 9). In light of this finding, Lindner and Wald (2011, p. 10) suggest that PBOs succeed by leveraging long-term relationships that develop transferable “knowledge cultures” emulating the continuity created by “organizational routines and organizational memory”. This more stable approach to teamwork in which tacit knowledge, unspoken procedure and professional relationships are leveraged across projects is considered instrumental in some PBOs (Ebers & Maurer, 2016). So, while it is not contested that PBOs undergo change, the literature also indicates that many teams use continuity as a driver of success.

Tension in PBOs

Exemplified by the dual reliance of PBOs on enduring processes and tailored adaptation is the notion that teamwork in PBOs is influenced by continuing and changing aspects of the work environment such as actors, roles, processes and practices. However, by focusing on how actors in PBOs use *either* continuing or changing aspects of their work environment to their advantage, existing literature has largely shied away from exploring how combinations of continuing and changing aspects in work environments can generate tension for actors engaged in teamwork (Stjerne & Svejenova, 2016). As a result, this separation between the bodies of literature considering how teams either maintain the status quo or introduce change has come under criticism for inadequately conveying the tension, dynamism and often chaotic reality of working in PBOs (Langley, Smallman, Tsoukas, & Van de Ven, 2013). As R. DeFillippi and Sydow (2016, p. 13) highlight, the presence of 'separate routines for managing the familiar versus more innovative elements of [a] project… assumes that the overall project is decomposable into such components and can have dissimilar operating routines for managing them'.

Likewise, it has been suggested that existing literature is insufficiently sensitive to the temporal dynamics of teamwork in PBOs: how actors relate to each other, their roles and a project as it progresses (René M Bakker et al., 2013; Bechky, 2006). This has seen calls for "a closer exploration of the dynamics of role change … in order to understand the emergent patterns of stability in organizations" (Bechky, 2006, p. 16). Recognizing dynamic project-long processes that underpin actor interactions is an important step towards ensuring PBO research has a truly temporal understanding of how teamwork synergies and contradictions emerge (Bakker 2010; see also research on organizational practices (Gehman, Trevino, & Garud, 2013) and project dynamics (Bresman, 2013; Bruns, 2013; Van Oorschot, Akkermans, Sengupta, & Van Wassenhove, 2013)). As Langley et al. (2013, pp. 4,11) point out, to avoid quixotic static

characterizations which overlook the often messy and unstable reality of organizational phenomena, we need "more insightful contributions on the process of change in organization."

While a growing body of theory has develop around tensions in broader literature concerning project-based organizations, teamwork in PBOs remains underdiscussed (Arvidsson, 2009; Bres, Raufflet, & Boghossian, 2018; Burström & Wilson, 2018; Stjerne & Svejenova, 2016; Uriarte, DeFillippi, Riccaboni, & Catoni, 2019). To an extent, the work of Arvidsson (2009) might be considered the nascence of this literature. In studying projectified matrix organizations 'where line functions and projects live side-by-side in mutual co-dependence' Arvidsson (2009, p. 98) identifies differences in organizing principles between the permanent and temporary parts of the organization, organizational size and complexity, access to resources, knowledge boundaries and employee identities all to be sources of tension. While not demonstrated by the study's data, a key proposition made by Arvidsson (2009, p. 105) is that 'tensions are hypothetically a major source of advantage since they can stimulate synergies, creativity and learning'. This agentic view of tension contrasts with both the enduring and ephemeral perspectives of teams as actors are empowered to identify and foster tension between the continuous and changing aspects of their work.

The perspective is also reflected by Stjerne and Svejenova (2016) who investigate the emergence of tensions between a permanent organization in the film industry and a series of temporary projects. Central to their findings is the notion that tensions between the permanent organization and temporary projects can be leveraged through boundary work in which actors balance the strategic interests of the permanent organization and projects to delivery a satisfactory degree of creative distinctiveness to each project (Stjerne & Svejenova, 2016). In finding this balance they note that tensions from previous projects, referred to as 'shadows of the past', could impose constraints on the creative direction of current projects that could only be alleviated by key actors within the permanent organization who could span or challenge

organizational boundaries (Stjerne & Svejenova, 2016, p. 1784). In this manner, the research indicates that where tensions are perceived to be embedded in continuous organizational story despite the transience of individual projects, they may prove challenging for actors to manage from within projects, requiring actors with influence over how projects connect (Stjerne & Svejenova, 2016). While this research makes significant contributions to our understanding of how tensions transmute as they span multiple projects, it is exclusively conducted from the vantage point of the permanent organization and so does not demonstrate how actors within PBOs can balance tension between continuity and change through teamwork. As Stjerne and Svejenova (2016, p. 1787) suggest 'further research should examine the relationship from a project team's perspective, as that may provide new and diverging insights on potential tensions'.

Rounding out the broader tensions literature is the research of Bres et al. (2018), Burström and Wilson (2018) and Uriarte et al. (2019). Focusing on organizational pluralism, Bres et al. (2018) synthesizes literature pertaining to a range of emerging organizational forms to consider how the typifying aspects of organizational forms give way to tension. Two sources of tensions are identified in relation to teamwork in PBOs: the need 'to build trust quickly between experts', and the 'permeability of organizational boundaries whereby members enter and exit more easily than in traditional bureaucracies' (Bres et al., 2018, pp. 372, 377). However, being a theoretical synthesis, Bres et al. (2018) does not empirically demonstrate how either source of tension influences teamwork and so calls for subsequent research to more deeply interrogate the identified sources of tension.

Similarly, Uriarte et al. (2019) explores the history of an Italian pop culture festival, studying how macro and micro institutional logics can become sources of tension. On the micro level, three dimensions of tension are identified: tension between the cultural and commercial aspects of the festival, tension between the public and private aspects of the festival and tension

between festival traditions and proposed innovations (Uriarte et al., 2019). This last tension in particular is relevant to our understanding how tension between continuity and change informs teamwork in PBOs. Principally, Uriarte et al. (2019) finds that the introduction of new actors to the lead organization can introduce tension due to perceived or actual intentions to alter continuing festival traditions. In response therefore, it is suggested that PBOs should consider 'strengthening unity through improved transversality' as a means of managing this tension, however, the study focusses on transversality primarily from an organizational culture perspective and does not demonstrate its implications for teamwork (Uriarte et al., 2019, p. 328).

Finally, Burström and Wilson (2018, p. 458) offer a holistic exploration of 'the texture of tension' in inter-organizational product development projects. Centrally they find that tension is induced by strategic dilemmas that give rise to complexity, uncertainty and equivocality in form of 12 key factors, one of which being 'changes in project scope, technologies, or work relationships' (Burström & Wilson, 2018, p. 462). This tension manifests throughout organizing, learning and performing which actors are able to sense and respond to through cognitive and emotive responses (Burström & Wilson, 2018). Following consideration of the significance of all 12 factors in the studied organizations, the study proposes a three-part model comprised of a) precursors to tension, b) manifestations of tension and c) sensing/responding to tension. While the research of Burström and Wilson (2018) offers a thorough examination of how various factors give rise to tension in product development projects, it does not address the question of how tension between the continuing and changing aspects of a project can be balanced using teamwork. Further, as 'tension dynamics depend on the type of project that is initiated and managed', it is likely that texture of tension observed in the study's technically specialized, multi-organization project would vary dramatically from that observed in other PBOs (Burström & Wilson, 2018, p. 482).

While not directly addressing the research question of the current paper, the above three studies establish a firm theoretical basis for understanding how continuity and change affect PBOs. In sum, they indicate that tensions manifest in PBOs largely due to specific factors in the organizations context, and that, despite most responses to tension being geared towards mitigation, tensions can be leveraged to expedite, improve or redirect project delivery. What they do not establish however, is how aspects of continuity and change coalesce within a PBO throughout a project, and how this process can be balanced through actors' approaches to teamwork. The current paper builds on these studies and addresses the above theoretical gap.

Teaming as a mechanism for balancing tension

Based on the above literature it is evident that generally, team-oriented research in PBOs does not consider how aspects of continuity and change coalesce in tension, and likewise, tension oriented research focusses on tensions between broader institutional logics and is yet to demonstrate how teamwork can be used to balance tension between continuity and change. In other research contexts, teaming has been introduced to bring together the theoretical domains of tension and teamwork (A. C. Edmondson & Harvey, 2017). Teaming sees individuals draw on their affective and cognitive skills to coordinate interaction without the need for stability or boundedness in either who they work with or how they work (A. Edmondson, 2012). To date, the teaming perspective has been applied across a range of disruptive organizational contexts including virtual organizations (Dixon, 2017), online sociam l communities (Muller et al., 2012), cross-departmental steering bodies (Myers, 2015), human-machine interfaces (Peters, 2019), health-care systems (Valentine, Nembhard, & Edmondson, 2015) and multinational enterprise meta-teams (Santistevan & Josserand, 2019).

This rapid growth in interest has seen the concept refined to distinguish between three key modes of teaming: tight teaming, viscous teaming and fluid teaming (Santistevan &

Josserand, 2019). Tight teaming occurs when teamwork unfolds under clear boundaries, a clear task and somewhat clear membership (Santistevan & Josserand, 2019). Viscous teaming occurs when team membership and boundaries become unclear, and finally, fluid teaming occurs when team membership, boundaries and the task at hand are all unclear (Santistevan & Josserand, 2019). By separating our understanding of teamwork from the necessity for team stability and boundedness the teaming perspective represents a more flexible framework for understanding teamwork under a dynamic balance of continuity and change (Benishek & Lazzara, 2019).

In this manner, the teaming concept is relevant to understanding how teamwork unfolds in PBOs as they experience tension between continuity and change. Therefore, this paper looks to apply the teaming perspective to the research question: how does tension between continuity and change interact with teamwork throughout projects in PBOs?

METHODS

We adopt a longitudinal case study design (Flyvbjerg, 2006; Tsoukas & Chia, 2002) to investigate how teaming is used to balance tension between continuity and change in DEV, a PBO in the events industry. We use actor accounts of a year-long project to embed the reader in experiences of tension between continuity and change. In doing so, we chronologically explore how teaming evolved over the duration of the project as aspects of continuity and change coalesced in varying degrees. The case study approach was selected to present complex practices while remaining firmly embedded in the richness of the actors' accounts of reality. As Flyvbjerg (2006, pp. 238-239) notes, case studies provide a means for researchers to "enter this reality and explore it inside and out," and do so with "a sensitivity to the issues at hand that cannot be obtained from theory." Second, this approach facilitates in-depth consideration of both the target organization and its broader context. As Gerring (2004, p. 345) notes, "the

utility of the single-unit study rests partly on its double functions. One wishes to know both what is particular to that unit and what is general about it." Third, it enables us to open the "black box" of an organization and describe the processes and relationships at play within (Lawrence 1997, p. 20).

Research setting

For well over a decade, DEV has been tasked with the delivery of an event that runs for approximately twelve hours on a single day and is attended by over 1 million patrons. Celebrations are spread across an Australian state capital with sites hosting a range of activities including dancing, live music, artistic displays and public speeches. In addition to overseeing the delivery of the event, DEV is also responsible for coordinating broadcasting of the event online and with major Australian broadcasters. While the event only last for a single day, the immense scale and complexity of the project requires that DEV begin preparations almost a year in advance.

DEV is a suitable case-study for this research as it is comprised of teams that can be described as both ephemeral and enduring. This is due to the uncommon mix of contextual embeddedness and task routinization found in DEV. While the organization is established by a permanent parent organization, it operates at a distance year-to-year with no members coming from the parent organization and only one member, the Head Producer, ever reporting directly to the parent organization. Despite this the organization remains somewhat contextually embedded, having reformed annually for over a decade. The event also presents a unique mix of routine and non-routine elements. Overall the purpose, scale and duration of the event sees little change year to year, however, smaller stylistic and technical changes are common such as the adaptation of a site to accommodate a debut act, or the development of a new digital delivery channel. Finally, layered over this is the highly dynamic and heterogeneous

composition of the organization. Each year, organizational membership burgeons near the event with an initial team of less than 10 members growing to well over 100 members. In the year we conducted our study the organization grew from 6 core members to 141 members seeing over 65% of members work for less than half a year. Membership is a mix of permanent, temporary, causal, and secondment positions with members stemming from a diverse array of disciplines including management, marketing, accounting, public relations, information technology (IT) and stage production. There are also many contractors and volunteers who repeatedly work with the organization to deliver various aspects of the event. This organizational structure can be seen below in Figure 1 which has been constructed based on a formal organizational chart provided by DEV during the year it was studied.

In this manner, DEV exhibits some extreme features, such as its fast project cycles, rapid team growth and high personnel turnover, however these features serve to heighten tension between continuity and change and are therefore desirable given our research question. The blend of contextual embeddedness, task routinization and dynamic membership exhibited by DEV creates a highly complex environment for actors to operate in, meaning a significant amount of their time is spent managing tensions. While some continuity persists year-to-year it is frequently challenged by non-routine aspects of the project and a constant onboarding of new actors. It is this dynamic melding of enduring and ephemeral elements that amplifies tension between continuity and change in DEV and makes the organization, while extreme in some aspects, a highly suitable case-study to understand how teaming responds to tension between continuity and change in PBOs.

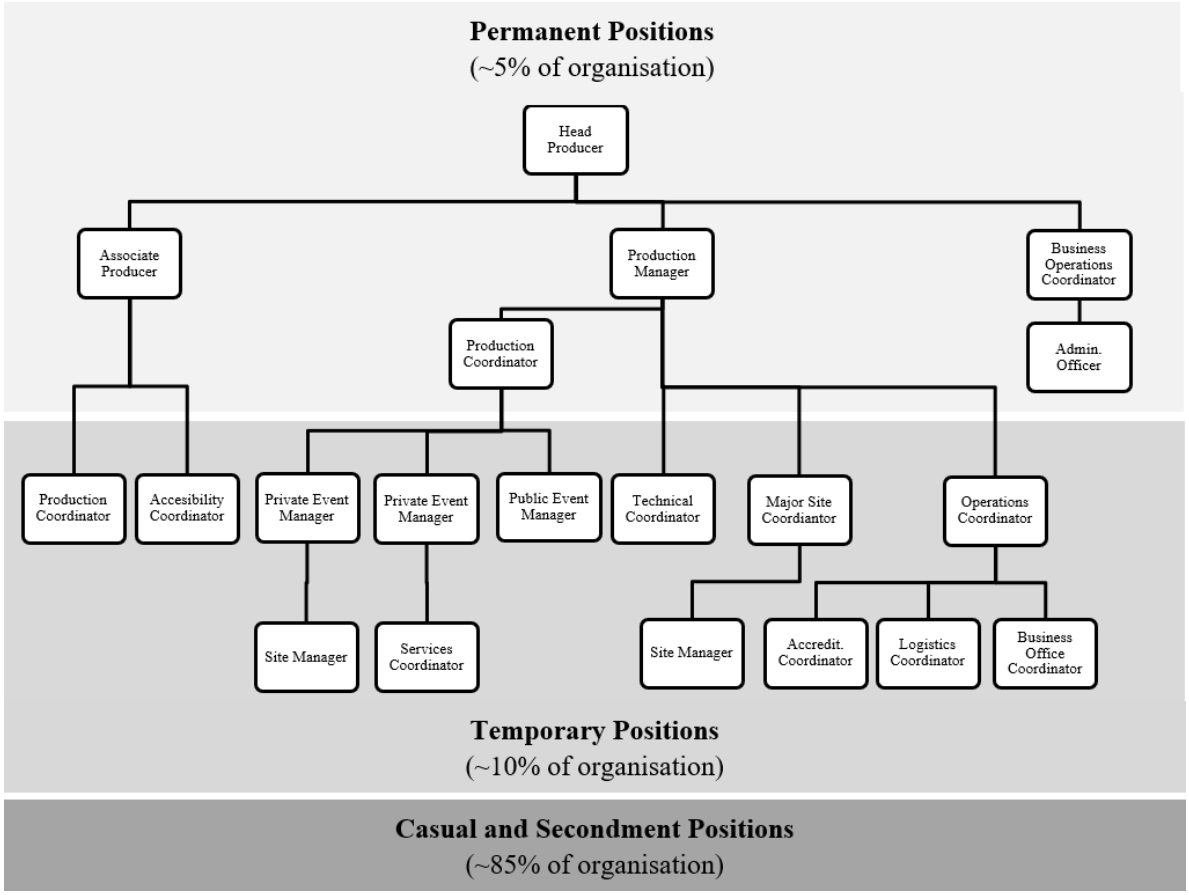

Figure 1. Breakdown of roles in DEV

Research design & theory development

We adhere to a grounded approach informed by Charmaz (2014) that interrelates data collection and analysis in an integrative theory-building process. This approach employs accepted grounded practices including iterative coding, comparative analysis, and theoretical saturation to facilitate the emergence of theoretical constructs that "carry the weight of the analysis" as descriptors of phenomena occurring across an entire data inventory (Charmaz, 2011, p. 164). Our grounded approach saw data collected and analyzsed over three stages of theory development that resulted in 67 first-order concepts, 15 second-order themes and three aggregate dimensions describing the overarching teaming phases exhibited by actors. The three stages of this grounded approach are described in detail overleaf. In order to embed the reader in actors' experiences of tension, we present the results in an organizational narrative that

conveys both the underlying project chronology and the concatenation of teaming phases (Flyvbjerg, 2006; Tsoukas & Chia, 2002).

Seeing as the core team of DEV were the only team that existed for the entire duration of the project our analysis centers on their account of how teaming unfolded across the organization. We interviewed the following members from the core team: head producer, production manager, associate producer, business operations coordinator, production coordinator and administrative assistant. To corroborate our findings from the core team, we also interviewed the following temporary members: primary site coordinator, technical coordinator, private site manager and three event managers. Combined, these interviews span the majority of the key roles within the organization, and we found that these individuals, through their roles, had a deep understanding of the dynamics at play throughout the project.

In the interviews, participants were broadly asked about their experiences working throughout the completion of the project. Interviewees were prompted to discuss how they interacted with their teams, what their roles looked like, and how they evolved over the course of the project. Respondents were encouraged to pragmatically recount their own and other project members' actions and decisions, and how these influenced their interactions. In their reflections, interviewees used detailed recounts of the event from the current and previous years to demonstrate their experiences of tasks, decisions, actions and team dynamics. Meeting recordings were used to triangulate described events or how team interactions played out.

As we developed this growing inventory of data our analysis progressed through three phases. Throughout these phases we continually referred back to existing literature to 'enhance sensitivity to subtle nuances in the data' (Corbin, Strauss, & Strauss, 2014, p. 50). This grounded approach exposed us to a great variety of perspectives from within DEV that supported the natural emergence of conceptually dense theory (Corbin et al., 2014).

Phase 1

Initial contact was made with DEV through in-depth interviews with the core team members (n = 6) accompanied by observation of meetings (n = 3). We went into these interviews with a broad interest in teamwork but had no expectations as to where the data would lead us from there. Interviews were therefore general in nature and guided by the responses of actors to get a sense for how the they perceived DEV (Charmaz, 2014). Questions such as 'What do you do in DEV?', 'Are you part of a team?' and 'What does your team do in DEV?' were asked. The meetings observed were attended by a mix of permanent and temporary members of DEV. The majority of discussion during these meetings centered on reviewing plans and schedules for event preparations to ensure that all roles required at certain points were accounted for and that each person knew what their role entailed.

As data were collected, preliminary analyses were undertaken using NViVO11. Data were first coded openly as "actions and analytic possibilities" emerged (Charmaz, 2011, p. 163). We started by coding inductively the ways tasks and responsibilities of the key actors were described, how they interacted with each other, and the key issues they experienced as they worked towards the delivery of the event. We coded examples of decisions and actions related to how members engaged in teamwork with one another. Open coding of interview and meeting data revealed a variety of perspectives on teamwork in DEV. Initial codes revealed two broad concepts actors associated with teaming, 'roles' and 'tasks'. We used the video recordings to compare our emerging insights from the interviews and further refine the codes. Based on this analysis, we extracted the observations and talk related to each of the emerging concepts (Langley, 1999). These codes were purposefully general to create conceptual space for the research to develop along a wide range of possible directions (Charmaz, 2014).

A review of this initial set of codes revealed that while all actors agreed that a core team persists year to year, there were contrasting views on the extent to which, at any time during

the project, teamwork was informed by stable team structures from previous iterations of DEV. Some actors indicated teamwork was very much informed by continuity between the roles and tasks of previous projects and the current project while others indicated teamwork was informed by unique aspects of the current project that saw roles and tasks diverge from those of previous projects. These accounts indicated that teamwork were underpinned by an evolving tension between those that saw the project as episodic, being part of a continuous story of characters, roles and tasks, and those that saw the project as *sui generis*: a self-contained entity with its own unique characters, roles and tasks. Comparing these findings with the literature, we found both perspectives had been identified (René M Bakker, 2010), however, the salient notion that the concepts of continuity and ephemerality could be drawn on in different ways throughout a project to reshape actors' experiences of teamwork was missing. This abductive process led us to moved forwards with a focus on identifying how continuity in teamwork manifested and how ephemerality in teamwork manifested.

Phase 2

Data were also collected through in-depth interviews with temporary staff who worked directly with members of the core team (n = 6) and through further meeting observation (n = 4). As this second data collection was underway preliminary analyses were undertaken to identify when theoretical saturation had been reached inventory (see Table 1 below). As described by Bowen (2008), this involved assessing whether the new data being returned contained previously unidentified concepts and assessing the extent to which the data was representative of the target organization, given its size and nature. Given that DEV was comprised of under approximately 50 individuals for more than half the year, and that the individuals interviewed included all permanent members of DEV, a total of twelve interviews accompanied by seven extended observation instances was deemed sufficient to address the

research aims. These interviews explored the emerging concepts of the continuity and ephemerality in greater depth. As such, questions such as 'Will you please tell us the story of your involvement with the team?', 'Could you please tell us the story of how the project was delivered?' and 'Do you see your involvement with DEV continuing after the event?' were asked. The additional meetings observed were similar in substance to those preceding, however as they were closer to the deadline for delivery of the event discussions focused less on roles and more on outstanding tasks.

Data sources	Collection instances	Footage/audio (mins)	Transcriptions (pages)
Observation	7	1,557	436
Interviews	12	674	363
Total	**20**	**2,231**	**799**

Table 1. Data Inventory

As data were collected and coded, they were compared against the existing inventory to enrich emerging concepts (Corbin et al., 2014). This comparison identified nuanced differences in how actors used the word team that helped use make sense of how teamwork connected with continuity and ephemerality. In some instances, actors would use team as a noun (for instance, 'we've got a very good team') and in others, as a verb (for instance, 'when we team up with the contractors'). This distinction had significant implications for our understanding of teamwork; is it bound by a continuous team construct that exists external to actors, or, does it emerge unbounded as actors cooperate to get work done? Returning to the literature, we found most research concurs with the former (Cohen & Bailey, 1997; A. Edmondson, 1999; Marks, Mathieu, & Zaccaro, 2001), however recently, teaming (A. Edmondson, 2012) has emerged as a concept describing the latter. In particular, we found that the distinctions between the dynamics of teams and teaming are not yet fully understood

(Benishek & Lazzara, 2019). Given this gap in the research we moved forwards with the themes of ‘teaming for stability’ and ‘teaming for speed’ as broad descriptors of the continuous and ephemeral approaches to teamwork observed.

Phase 3

In a final stage of theory building, we used selective coding to identify new properties of previously generated concepts and develop a more integrated understanding of the emerging themes (Charmaz, 2014). Throughout this process we explored possibilities with experts outside of the research team to verify the integrity of themes, clarify ambiguities and test the robustness of our emerging framework (Corbin et al., 2014). In particular, we focused on the pacing of the project and how actors let continuous and ephemeral approaches to teamwork intermingled throughout the project. From this process the concept of balance emerged to describe how actors across DEV were able to intuitively mix the continuous and ephemeral dynamics of teaming in their work. While different actors would focus on continuity or ephemerality at different stages of the project, overall, we observed a dramatic shift in teamwork from a predominance of dynamics informed by continuity at the beginning of the project to a predominance of dynamics informed by ephemerality in the final months of delivery.

Returning to the PBO literature, we found that the concept of actors operating at the threshold between teams and teaming in order to advance a project despite was missing. While different ‘modes’ of teaming have been identified in multinational enterprises (MNEs), these modes do not describe how different approaches to teaming, such as a teaming for stability and teaming for speed, are used for specific project outcomes (Santistevan & Josserand, 2019). To unite the themes of teaming for stability and teaming for speed we introduced the notion of ‘balanced teaming’ to describe the ability of actors to span the boundary between the different

teaming approaches observed at the beginning and end of the project. This final theme pulled together all concepts emerging from the data into a coherent theoretical structure that addresses our research question, explaining how tension between continuity and change interacts with teamwork throughout projects. Combined, the three aggregate dimensions of teaming for stability, teaming for speed and balanced teaming demonstrate how individuals are able to shift over the course of a project from carrying forwards team practices from previous projects to introducing new approaches to teamwork in a highly flexible, unrestrained manner. In this manner, our data advances a new understanding of how teamwork is transformed through balanced teaming to deliver complex projects in PBOs (see Table 2 below).

First-order concepts	Second-order themes	Aggregate dimension
Core team specify organizational structure separated into teams (e.g. production team) Role documentation sets out responsibilities and relationships between roles Team leaders source team members separately	Clearly bounded team structures	**Teaming for stability**
Proactive use of retention practices to encourage recurrent membership in teams Retention of members even when their roles will no longer exist Core team is entirely comprised of recurrent members Familiarity among temporary staff through repeated collaboration on other projects Temporary staff described as friends of the event Roles used to describe interaction between members	Stable/fixed team membership	
Note taking throughout project to carry over learnings about roles to subsequent projects Iterative development of role documentation to inform team dynamics across projects New members use role documentation as a starting point for working with their team New in project needs accommodated through formal changes to existing roles Negotiation of work centres on meeting the requirements of roles	Role oriented coordination	
Recurrent formation of organization for over a decade Connection to longstanding parent entity Recurrent partnering with small number of key contractors Organization revered among local events industry Members work on other events projects together and bring industry practices to DEV Overall purpose of project unchanged for over a decade	Structural and relational familiarity	
Major sites/attractions stay similar and require similar types of tasks to prepare Role documentation sets out routine tasks for all temporary roles Members describe day-to-day work as ‘routine’ Contractors support new members in adopting the same routines as their predecessors	Predominantly routine tasks	

(continued)

Table 2 (continued)

First-order concepts	Second-order themes	Aggregate dimension
Contrasting accounts of team structures Shared responsibilities over tasks between teams Sudden changes in hierarchy between actors Experiences of uncertainty about lines of reporting Actions and decisions owned individually and not shared amongst a team	Structures blurred and overlapping	**Teaming for speed**
Frequent sharing of actors between teams working at capacity Actors identify as working across multiple teams Organic comingling of actors driven by a collective sense of urgency	Unstable/unfixed team membership	
Constant back-casting against deliverables to identify outstanding tasks Negotiation of work centres on the capacity of individuals to take on more tasks Actors exhibit bricolage in the latter stages of the project to rapidly piece together work	Task oriented coordination	
Majority of actors new to DEV Low level of recurrent membership in temporary, casual and secondment positions Project is fleeting for many positions filled for less than a month DEV perceived as a 'stepping-stone' for many positions Low level of contact between core team and parent organization Difficulty establishing organizational learning due to sudden influx of actors	Varied structural/relational familiarity	
Actors taking on tasks outside of their role descriptions as needed Inclusion of new site significantly changes workload to manage nearby residents Changes to alcohol licensing requires retraining of actors and revised management plan Accommodation of international stage act surfaces unexpected technical challenges Reactive coordination sees actors frequently firefight unexpected challenges	Improvisation supplants routine	

(continued)

Table 2 (continued)

First-order concepts	Second-order themes	
Stable teams dissolving into teaming at critical points before regaining stability Stable teams used to set project in motion and carry out routine tasks Emergent teaming arising through individual actors in response to shocks Flux between stable teams and boundary spanning teaming across organization Sporadic teaming as actors collaborate across teams to refine role definitions	Phasing between stable teams and emergent teaming as required	**Balanced teaming**
Actors deploy the concept of team membership as a tool to align actions and decisions Actors identify where responsibilities or synergies are incompatible with team structure Team membership established in role documents eroded by unstructured collaboration	Key actors span boundaries to facilitate collaboration	
Actors create living role definitions through negotiation of task requirements with peers Meetings used to assess the suitability of role definitions for upcoming tasks Shared responsibility for tasks implicitly accepted as part of all actors' roles Actors prioritise adherence to roles during periods of certainty and low urgency Actors prioritise matching capacity to tasks during periods uncertainty and urgency	Reflexive negotiation of roles	
Actors simultaneously leverage new and old synergies to tailor current iteration of DEV Contextual embeddedness perceived individually and diluted as unfamiliar actors join Core team maximise continuity but also encourage exploration of new ways to work Smooth transitions between projects a priority but not in lieu of operational efficacy Bricolage facilitates departures from established practices without disrupting continuity	Emerging structures & relationships	
Actors expect to be surprised by unplanned challenges Awareness of role and task dependencies inform improvisational responses to tasks Actors shift between proactive and reactive teamwork while pursuing agreed outcomes	Novel tasks intersperse routine	

Table 2. Final data structure

RESULTS

In Australia, the events industry has a full calendar, but one annual event in particular dwarfs the rest. For well over a decade the event has taken place on a single day in a state capital and seen over a million patrons enjoy live music, dance, art and light shows across multiple sites. Delivery of the event is highly complex requiring a tightly coordinated effort from multiple stakeholders including government authorities, law enforcement agencies, national broadcasters and a slew of private contractors. While it is to be expected that over the years these permanent partners of the event have learnt to operate like a well-oiled machine, it may come as a surprise that the organization ultimately responsible for delivery of the event is temporary. DEV, the PBO at the center of this coordinated effort is somewhat of an enigma, reforming anew each year with mostly new members and yet somehow, it is able to successfully deliver the landmark event year after year. To understand the complex dynamics at play that enable DEV to excel at this mammoth undertaking we must follow its story over the course of a year as it prepares to deliver the event.

Project planning: teaming for stability

Early in the year, a small group of six people met. They were known as the ‘core team’ and for the time being, were the entirety of DEV. The last time the core team saw each other was approximately a fortnight prior when they oversaw the coordination of over 140 staff spread across 13 teams to deliver the event. Following the event, DEV disbanded and its members went their own ways with no certainty they would work with each other again. This year, the core team were faced with the same daunting task: to oversee the delivery of the event as a radical influx of new and returning staff caused DEV grow more than twenty-fold as the event neared.

From the outset, ensuring the organization's 14 teams are clearly defined was high on the core team's list of priorities. At this early stage the only change in project parameters from the previous year was the overall theme of the event which undergoes stylistic change year to year but does not dramatically change how the event is delivered. As such, the core team did not feel changes to DEV's teams were necessary at this stage and so the organizational structure of the previous year was carried forwards (see Figure 2 below).

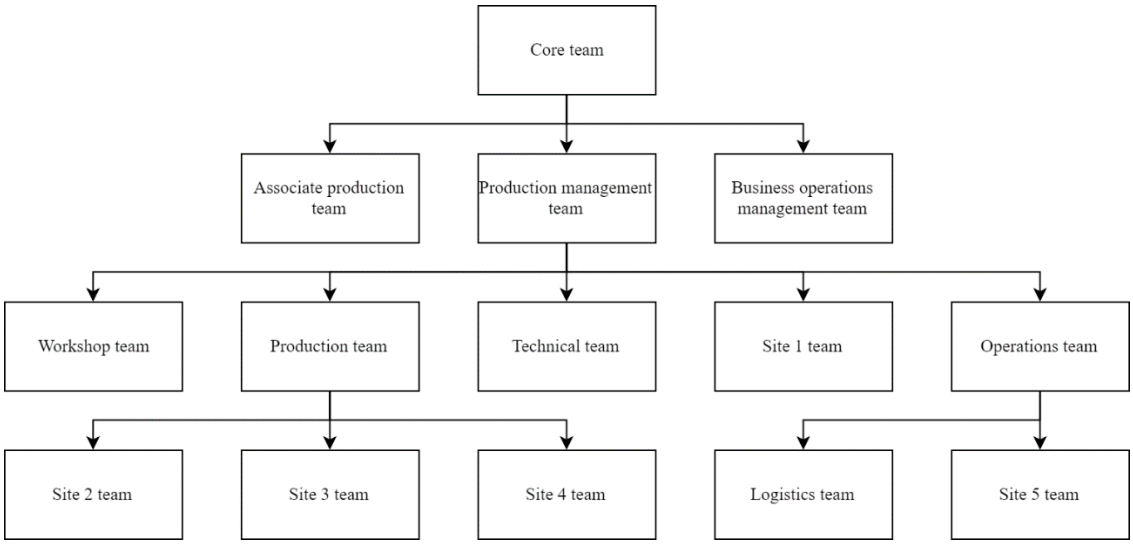

Figure 2. Organizational structure of DEV

Similarly, the core team viewed maximizing staff retention as a central concern when transitioning from one yearly project to the next. Retention was expected to improve the effectiveness of DEV by maintaining continuity in roles, relationships, and organizational learning. As the head producer surmised:

'Retention of those people is very important to me because they're friends of the event, they have a lot of corporate knowledge and to retain them and to have them come back means that you've got somebody who brings all of that knowledge to the role and can have another shot at it to make themselves even more effective than they were the previous year.'

Retention was largely achieved informally by members leveraging their friendships to encourage fellow members to return. As the production manager noted, "I help in recruitment and in retention by being someone that people feel is approachable ... having those informal conversations where I can say that I am friends with all of these people outside of work." However, since the previous year, retention had also been achieved more formally through exit interviews and retention notices in which members who had performed well in prior years were invited to return. As the head producer noted:

> *'One of the changes that I instituted was that in exit interviews we now tell people if we're going to want them back or not the following year ... We make it pretty clear if we've been happy with the work that they've done and there's no changes foreshadowed in their area.'*

Even in circumstances where changes in teams were foreshadowed, retention was considered so fundamental that members were asked to return even if it would be in a different role. As the head producer noted, "We say we definitely want you back but we're not sure what role we're going to put you in at this point, but at least people then know." This was because the core team believed that members developed valuable knowledge about how to work in DEV and with fellow members that held value beyond just their team and would make them more effective working across the organization as a whole than someone unfamiliar and unexperienced in DEV. As the business operations manager noted:

'Getting somebody new is difficult ... Corporate knowledge and continuity count for a lot because to bring a person up to speed is difficult ... Each year information is lost when everyone leaves; it literally walks out the door with them.'

Overall, this focus on retention exhibited by the core team was a significant factor in ensuring that the initial interactions of members were contextualized in an environment of social continuity and stability where familiar team dynamics allowed the organization to

transition smoothly from the previous project to the current project. However, it was not the only factor contributing to a sense of contextual embeddedness and continuity in the organization. As DEV grew over the initial months of the project a strong focus was placed on role definitions.

Role definitions were developed for all temporary and casual roles expected to be needed throughout the project. These definitions set out the responsibilities of each role, how each role fit in a team and how they fit in the hierarchic structure of DEV as a whole. They were mobilized through induction and documentation processes, which ensured the increasing number of temporary members joining DEV, whether new or returning, were aware upfront of the functions and responsibilities of their roles. In the previous year, detailed role descriptions, position fact sheets, and duties documents had been created for most roles within the organization. As the business operations manager noted, "We've now got position fact sheets and I also introduced a duties document." These documents were used to familiarize new and returning members with role definitions during induction days. Over the first two months of the project, definitions within the documents were reviewed by the core team to ensure fit with the needs of the project. As explained during a meeting, this was done with reference to notes composed throughout the year by members detailing how they went about their work:

> *So you need to cover all the aspects of what you do in the report. Say what activity worked well; what didn't; why you think they did or didn't. You know, what you would recommend in terms of lessons learned for anyone around next time. (Member 2, recording* – VN850015, at 2:49).

It was also done with reference to any non-routine parameters of the current year's project. By this stage in the project, the core team had greater clarity around what these non-routine parameters would look like so met to formally agree on role definitions that accommodated these non-routine parameters. As the production manager recalled, "March,

probably through to June, is where the lot of the work gets done on new initiatives or major changes… everybody has to put their hand on their heart and go yep, I'm signing up to that". This preemptive approach to accommodating new event parameters enabled the core team to manage the destabilizing influence new parameters could have on team dynamics were they not agreed upon.

While artistically the event underwent thematic change each year with different artists, musicians, and performers participating, logistically its parameters remained largely routine with changes localized to specific sites. For example, in the year studied only two changes required significant redefining of roles. At one site, there was a shift towards focusing on child entertainment leading to the prohibiting of alcohol. In response, the core team changed the role descriptions for the site coordinator and casual staff at the site to align with this new direction. The large responsibility of managing beverage contractors fell out of the site coordinator's role description and instead, the site coordinator was expected to work closely with their team to create a safe environment for children. Likewise, at another site, an internationally renowned live band was hosted instead of the usual entertainment, which had been a local DJ. This change required a significantly larger stage, different audio-technical equipment, and much closer management of the event's public profile. As the site manager explained:

"In previous years the only entertainment they'd had at that site was a DJ, so to get a much bigger group that's got an international following meant that a whole lot of roles around the site had to change to accommodate them."

In response, the core team reviewed role definitions at the site to ensure they accounted for a significantly larger sponsorship portfolio, additional site resurveys, and new contractor suitability assessments. In both examples, roles definitions underwent significant change to accommodate non-routine event parameters, however, as these changes were anticipated and formally agreed upon by the core team, their disruptive impact on team dynamics was

minimized with members remaining clearly aware of how they were expected to work with their team. Such ongoing reflection on roles and tasks was designed to pragmatically capture the nuances of daily work in role definitions, as the production manager noted, “We try to capture all that in a way that isn’t too overwhelming at the end of the previous year and try to distil it.” In this way, roles were used as a powerful tool to limit the destabilizing impact of non-routine event parameters on team dynamics while iteratively updating the responsibilities of members to match any non-routine needs of the project.

By the end of July, key temporary roles such as the operations coordinator, project coordinator and broadcast coordinator and been filled and were underway working. Up until this point the project had been largely business as usual for the core team and onboarded temporary members. While the core team were aware of certain changes to how two sites would be used that required role changes, on the whole the project remained largely routine. Throughout this period, team dynamics have been overwhelmingly shaped by the attempts of the core team to maintain continuity between the previous and current projects through retention of experienced members and developing agreed upon definitions for roles. As the production manager aptly surmised, ‘it's been the same for a number of years, but if it's not broke, don't fix it.’

Operationalizing plans: balanced teaming

Growth of DEV had been slow up until the end of July but during the latter half of the year preparations for the event were well underway and the familiar team dynamics established by the core team through retention and role defining were faced with a constant stream of new members. With accelerating project progression and growing membership, the prescribed role definitions set out by the core team were being increasingly tested in challenging real-world scenarios. This more explorative period saw members feel out the boundaries and

interdependencies between their roles *in situ* and begin to see team dynamics less as an external structure translated from previous projects but as something they could explore and enact. For many members this often involved developing a more pragmatic understanding of how team dynamics play out in their team beyond what they could glean from role documentation. For example, the technical coordinator, who was new to the organization, recalled feeling overwhelmed by the information provided to them in their first days, suggesting they only began to understand their role once they had started working in it:

> *'So those first couple of days were rather intimidating ... You were told a lot of things you're going to need to take responsibility for and make happen. It's only when you get some time to process it all and start to sink your teeth into the job that you start to understand it.'*

This was partly a factor of the previous technical coordinator having been a longstanding member of DEV and having developed a deep, but undocumented, understanding of how the technical team coordinates delivery of the event. Lacking the same familiarity with DEV, team dynamics for the new technical coordinator were far more ambiguous and required what they described as 'detective work' to develop a working understanding of how to lead the technical team. This detective work was done in partnership with their direct subordinate, the technical assistant who was also new to DEV. Together, the pair negotiated how best to work together based on their strengths, weaknesses and what the job before them required. As the technical coordinator recalls, "There were many cases where we could say, 'Well this is more of a me thing and this is more of a you thing.'" Contractors also played an important part in shaping the dynamics of the technical team by sharing their experiences delivering previous iterations of the event. The new dynamics that grew out of this explorative process were partly familiar and partly new, seeing the technical coordinator and technical assistant flexibly share role responsibilities according to emerging needs.

Negotiation of role responsibilities within teams also happened during this period in the business operations team where the business operations manager and administrative assistant negotiated changes to both of their roles in order to share procurement reporting responsibilities differently. As they recalled:

> *'Something new crops up and either you'll think I'm suited to doing that, or somebody else will say 'I think you're suited to doing that,' and a conversation will happen. So it's quite organic and it's very much a negotiation process'*

This informal negotiation of role responsibilities within teams increasingly occurred across DEV as new members were onboarded. As the project progressed, in-team role interaction became seen as a negotiated construct, allowing for more effective team dynamics through mutual appreciation of real-world strengths, weaknesses and interdependencies. This more reflexive period contrasted with the beginning of the project when the core team worked extensively to define roles and leverage continuity in team dynamics as a fundamental strength of DEV. The core team did not see this transitive phase as a weakness however, as it helped tailor team dynamics to the specific cohort of members present that year. As the production manager acknowledged, "Each year, you have to make it your own show".

With the project now past halfway, members are also being faced with non-routine tasks that blur the boundaries of responsibility between their teams. In some cases this required changes to existing roles to facilitate more effective collaboration across teams while in other cases it required the creation or removal of entire roles. For example, the business operations manager recalled how previously council representatives had encouraged the use of a guerrilla marketing campaign throughout the city in the month leading up to the event. This change called for the creation of an additional marketing assistant role which would support the marketing manager in undertaking the new campaign. As they noted, "There were a number of standalone projects that needed to be done, that didn't really fit ... so we created that position."

Similarly, as a result of new workload demands, the core team had to create a project coordinator position to be responsible for merchandising. As the business operations manager noted, “We're already fairly at capacity within the core team so there was no capacity to take on additional projects. So that's why we created that role.” Additionally, members identified elements of role structure that had become redundant due to changing project processes and parameters. For example, the technical coordinator highlighted the removal of a site liaison as a result of altered liaising procedures, noting “That position was dropped due to delays in communication between the transportation control room and our control room because of a liaising procedure, which wasn’t efficient.”

Sometimes, however this blurring of role and team boundaries negatively impacted DEV by introducing structural uncertainty, relational strain, and workflow inefficiency. For example, while in previous years the production manager had served as a crossover between the business operations and creative production aspects of the project, by half way through this year the production manager had gradually adapted their role to be almost solely production oriented, noting, “It is important to make your role your own.” This change was driven by the production manager’s interest in being involved in the creative planning of the event. However, the head producer was not thrilled with the change and explained, somewhat unhappily:

“There's been movement on that in the last little while ... When I was production manager the role was very much a generalist role so I had a lot of input in the general management of the unit rather than being specific to production.”

This adaptation to the role of the production manager impeded efficient workflow as the head producer had “very set expectations about what that role is,” conceding that the change was “quite difficult in terms of our relationship there and making that work.” However, in most circumstances where different expectations for a role created dissonance, members were adept at negotiating how to balance continuity and change in their teams. As the head producer

recalled, “Sometimes there are different perspectives on things ... We all work close enough and long enough together to go away and talk about it if there is tension or if there is a disagreement.”

As DEV reached the final month of the project this desire to negotiate how best to use continuity and change to deliver the event typified coordination and saw the constant mingling of longstanding team dynamics and ephemeral dynamics emerging through the act of teaming. By adapting both the internal structure of teams and how teams collaborated, members of DEV were able to tailor their work more closely to the specific needs of the project. By this late stage, team dynamics had evolved dramatically and diversely across the organization as the melting pot of new and returning members grew. For some members, such as the head producer, team dynamics had remained familiar, largely informed by continuous aspects of their recurrent role in DEV, however, for many of the new members, team dynamics had become a far more ephemeral expression of their day-to-day execution of tasks. Overall, this transitory state in which continuous team dynamics and ephemeral teaming dynamics coalesced proved beneficial to teams as it enabled them to undertake both routine and non-routine tasks in a way tailored to the unique mix of new and recurrent members they accommodated.

Final delivery: teaming for speed

In the final month before The event, the looming and inflexible deadline of the event caused a sudden acceleration in the work rhythms of the burgeoning workforce of DEV, which, on an organizational level, saw a distinct shift towards members relying solely on ephemeral teaming dynamics to rapidly complete tasks and improvise responses to problems. The increasing urgency of deadlines created a temporally sensitive social space in which members almost completely suspended role structure as the paradigm governing their behavior and were

instead guided by the urgency of tasks and available capacity. As one member reflected, “You became far more aware of the deadlines ... that kicked everything into gear for me.”

Salient to the period was a strong focus on meeting deadlines using whatever means necessary; and so, ensuring members were acting within their roles was no longer a priority. With roles no longer the primary cognitive resource-informing team dynamics, members would intuitively share responsibilities on the fly. For instance, the business operations manager had to suddenly take on aspects of the broadcast coordinator’s role to ensure the event could be adequately broadcast across television, radio, and online streams. As the business operations manager reflected, “I think what tends to happen under pressure is that roles dissolve. So whilst my baseline role as business operations manager is to do X, Y, and Z, because I can add value in other areas, those things end up coming to me.” As a flow-on effect, the administrative assistant then intuitively took aspects of business operations manager role alongside their existing responsibilities, noting “by the end of it, I ended up filling two roles and so do a lot of people, actually. You do whatever you need to do to make the event go bang whether it’s in your role or not.”

During the final week before the event there was a dramatic influx of casual, secondment and volunteer members joining DEV making maintaining continuity in team dynamics neither possible, nor conducive to giving members the agility they required to firefighting unexpected challenges. As a result, members almost uniformly exhibited a hyper-flexible teaming dynamic in which teamwork is doing whatever it takes with whoever is needed to get tasks done. As the production manager expressed in a meeting:

“I know we're all stretched ... but you just have to find whatever way you can to make it work. I get this feeling every year but whatever it takes we always find a way” (video recording – GOPR2437, at 7:01).

This resulted in widespread improvisation that saw members of the core team pitching in on everything from making last minute scheduling changes to moving stage equipment with the casual staff. Likewise, casual members of DEV would intuitively take over the tasks facing their temporary team leaders as needed, as the primary site coordinator recalled:

'So there are moments when I have to hand over tasks that I was doing ... I made sure that [my assistant] had a good understanding of all the tasks she may need to take ... She knew all that sort of stuff so that I could instantly drop them and work elsewhere.'

This new teaming dynamic was underpinned by a pervading sense of ephemerality: that the time left before delivery was fleeting, decision making had to be rapid and that any changes to team dynamics as a result would not threaten the stability of DEV when it reformed the following year. To achieve this ephemeral teaming dynamic members shifted into a task-centric mode of coordination where task contingencies were distributed across individuals through negotiation of their workload capacities. As the head producer noted, "we're working together on a task-based level to make how we work more efficient and more effective." Likewise, the public site manager noted, "it becomes about tackling the tasks in front of us". In this new teaming dynamic, informal negotiation of workload capacities was the main way in which the coordination of tasks was achieved. This saw rapid and organic coordination emerge through a myriad of micro-level interactions between members across the entirety of DEV. For example, as the business operations manager recalled, "I might say, 'I've got a bit of spare capacity, is there something I can take off your plate?'" Overall, this final transcendence of bounded team structures to an ephemeral state of hyper-flexible teaming achieved the collaborative agility members needed to get DEV over the finish line. As the production manager noted, "It's very much like a family ... It's a very collaborative period. There's a level of, I suppose, genuine care amongst the teams ... it's a very much the feeling of 'I've got your back'".

After a chaotic and galvanising sprint to the end, DEV delivered the event. At 141 members strong, DEV stood in stark contrast to its beginnings less than a year prior. Despite the ever-present and evolving tension between continuity and change that shaped team dynamics, the delivery of the event was a major success. With its task complete, DEV disbanded.

TENSION BETWEEN CONTINUITY AND CHANGE IN TEAMWORK

Our results explore the noteworthy case of DEV, a PBO that consistently comingles continuity and change in teamwork to deliver a major Australian event. Figure 3 below draws together our findings on teamwork into a coherent framework. Central to our findings is the concept of balanced teaming that we define as 'teamwork occurring at the boundary between teaming for stability and teaming for speed'. Our results indicate that balanced teaming is integral to the ability of PBOs to manage tension between continuity and change as projects evolve.

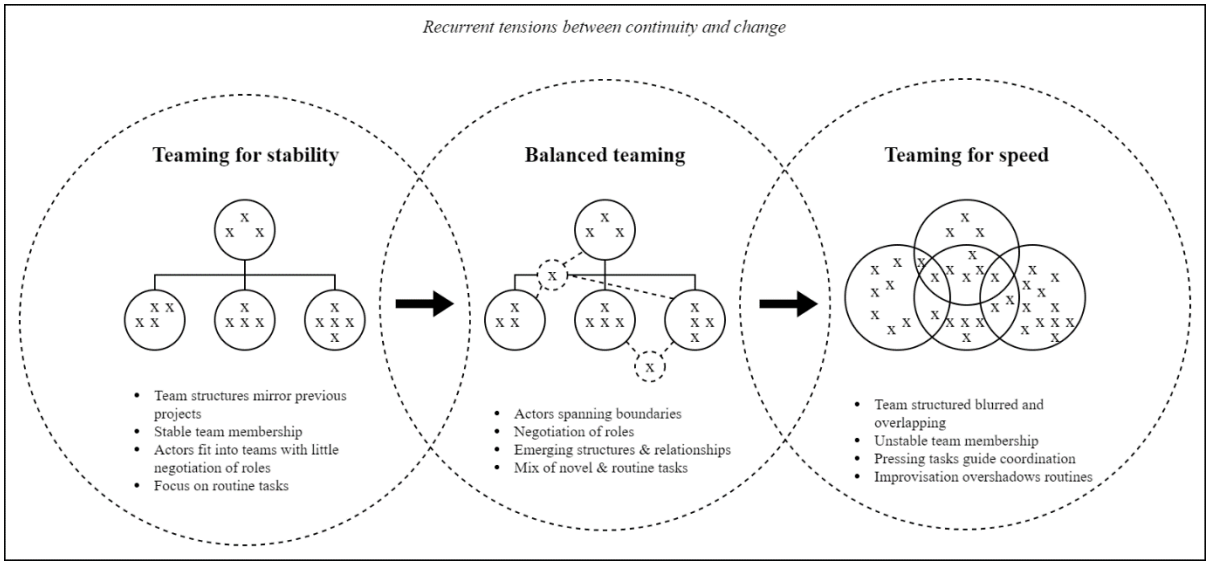

Figure 3. Concatenation of teaming phases and characteristics

Our results indicate that as DEV shifted between the overlapping project planning, operationalizing plans and final delivery stages of event preparations, actors transitioned through three approaches to teamwork: teaming for stability, balanced teaming and teaming for speed. These transitions did not occur uniformly across the organization but in timing unique to each individual actors. For instance, a member could be onboarded in the final two months of the project but still be initially met with role documentation & induction activities that were designed to maintain continuity in their role. From this point the member would then go through a transitional period as they developed a more pragmatic understanding of how their role could be played out in the spaces between interdependent roles and begin to introduce minor changes. Finally, they would experience a sudden acceleration in work rhythms in the final month of the project and operate in an unbounded task-centric fashion with little concern for maintaining continuity in their role.

The widespread accumulation of these individual experiences of tension between continuity and change in their roles saw the emergence of the observed organization-wide shift in teamwork over the course of the project. While DEV remained small and largely in the planning phase of the project, stable and teaming for stability were seen as a preferable approach to teamwork as they enabled the smooth transition of the organization between the previous and current project. At this stage, continuity could be maximized through retention of individuals who had previously participated in a project with DEV, and through the use of role definitions. However, as plans begun to be operationalized, marginal change begun to emerge to more closely align efforts with non-routine project parameters and the skills of onboarding members. Throughout this middle phase of the project the ongoing translation of predefined team structures into practice saw certain actors begin to perceive teamwork more as a flexible expression of their interaction over the project rather than a predefined set of boundaries on the types of interactions and activities they could undertake. As a result, changes to roles and team

interaction became increasingly frequent as actors identified new opportunities to optimize how they worked to the specific skills they had and the tasks they faced. Finally, a severe amplification of this trend was observed in the final month of the project when actors came under significant pressure to delivery tasks quickly. With actors now exhibiting extreme agility in how they shared, redelegated and improvised work, teamwork in DEV had transitioned into a widespread state of teaming for speed that stood in stark contrast to the reformation of the organization.

In the accounts of the core team, it was the middle transitional phase of the project that proved most integral to the success of DEV. During this phase, DEV operated in the liminal space between continuity and change as actors actively comingled continuity and change to find the best balance for the situation at hand. This phase enabled members to connect the teaming for stability that saw their pre-existing experience leveraged at the beginning of the project, with the juxtaposed but equally important teaming for speed that enabled a burgeoning and unfamiliar group to deliver the event on time. Our results therefore indicate that, contrary to extant research, it is neither continuity or change in isolation that underpin the effectiveness of PBOs, but rather, the ability of actors to balance continuity and change according to the ongoing needs of their project.

DISCUSSION

This study addresses the research question: how is teaming used to balance tension between continuity and change throughout projects in PBOs? To answer this question, we conducted a longitudinal case study in a PBO tasked with the delivery of a major Australian event. Our results outline three approaches that illustrate the dynamic nature of managing continuity and change throughout a project: bounded teaming, balanced teaming and teaming for speed. Our results reveal the diverse ways in which individual actors respond to tension

between continuity and change throughout a project, coalescing in large shifts in organization-wide dynamics.

These findings hold important implications for both theory and practice. For theory, these findings have implications for how we understand teamwork in PBOs and our understanding of how organizational tensions can be balanced through micro-level interaction. For practice, these findings have implications for how members of PBOs working towards high pressure deadlines should approach teamwork. We contribute to PBO theory by demonstrating how PBOs can be understood as operating in the liminal space between persistent and ephemeral approaches to teamwork in order to achieve different balanced between continuity and change at different times. We integrate these findings in a framework which explains how the comingling of these different approaches to teamwork enable progression during high-pressure projects. We also contribute to research on organizational tensions by demonstrating how the interaction of individual members can organically coalesce to produce effective meso-level management of organizational tensions over time.

Implications for theory

Existing research on *teamwork in PBOs* depicts teams as either enduring (Ebers & Maurer, 2016) or ephemeral (Saetrevik, 2015) and does not consider how tension between continuity and change may see team dynamics evolve throughout a project. In the current paper we introduce a teaming perspective (A. Edmondson, 2012) to explore how temporal shifts in teamwork occur in response to the comingling of continuity and change. In particular, we consider how individual actions and decisions in response to changes in project parameters, non-routine tasks and the onboarding of new members coalesced in widespread shifts in how teamwork unfolded. Our findings introduce the notion of teamwork being temporally fluid through the concept of balanced teaming. We observed members actively engage in balanced

teaming that responsively adapts to ongoing interplay between continuity and change throughout the project. They did so by supporting negotiation of roles within and across teams, reflexively considering how tasks and roles aligned and carefully restraining change where it posed too great a destabilizing influence. Through identification of this transitory state our research introduces more nuanced properties to ongoing teamwork discussions, advancing a new line of theory that draws together previously disparate concepts into a more integrative whole (René M Bakker et al., 2013).

In particular, this finding responds to calls for a deeper understanding of the types of role changes that persist in PBOs and those that are ephemeral (Ebbers & Wijnberg, 2017). Throughout much PBO research, change is dealt with as a unidimensional construct (Birnholtz et al., 2009; Modig, 2007). Our findings challenge this perspective by distinguishing between lasting change in how teams work, which has the potential to persist across projects, and ephemeral change achieved through a teaming. In our case, while conscious efforts were made by the core team to preserve role continuity in the early phases of the project we studied, those same actors later encouraged the introduction of changes to role definitions during the operationalizing phase. Given the strong likelihood of recurrent membership for these senior members, these changes to role definitions made during the operationalizing phase were likely to be carried over into subsequent projects. These changes could be distinguished from those introduced during the delivery phase of the project where teaming for speed shifted focus away from roles to tasks so that any rapid changes instituted were not considered to constitute lasting change to underlying role definitions. In this manner, teaming creates a temporally fluid space for testing out possibilities for lasting role change without instituted changes having to be absolutely lasting or ephemeral. For some time PBO research has been filled with calls for "a closer exploration of the dynamics of role change … in order to understand the emergent patterns of stability in organizations" (Bechky, 2006, p. 16). Through the current study, we

now have greater scope to understand when and why teams in PBO may choose to keep roles as they are, test out lasting change in liminal spaces or introduce ephemeral changes that will pass with the project at hand (Bechky, 2006; Ebbers & Wijnberg, 2017; Manning & Sydow, 2011).

Further, the way in which we introduce a teaming perspective (A. Edmondson, 2012) to PBOs is new also. While it has recently been proposed by teaming scholars that the introduction of teaming may uncover new lines of theory in PBO research, to date, this avenue has been largely unexplored (Santistevan & Josserand, 2019). In our study, widespread teaming emerged during the final stages of the project and enabled hyper-flexible collaboration between members who were formally more distant in the organization's structure. According to the accounts of recurrent members, such as the core team, this phase serves a dual purpose in accelerating delivery of the project and limiting the destabilizing impact of the organization's many new members at this time. This use of hyper-flexible teaming is significant as it reveals how PBOs recursively manage continuity and change by using teaming for speed as a release valve for latent role tension, temporarily transcending normative role structures without jeopardizing the ongoing stability of teams. This finding expands on the findings of Bechky and Okhuysen (2011) who find bricolage being used to achieve a similar effect despite the practice being reliant on normative role structure. By identifying how hyperflexible coordination can manifest without depending on normative role expectations, our findings indicate that bricolage fits within a broader arsenal of practices geared towards ephemerality that PBO can deploy to accelerate urgent work.

Finally, while the emergence of hyper-flexible coordination is commonplace in teaming research studying other contexts (A. C. Edmondson & Harvey, 2018), what is perhaps less common is the influx of membership that manifestly fueled the transition into teaming for speed. In the organization studied, it was widely accepted that with growth of more than

twenty-fold anticipated, the stable teams instituted by the core team at the outset of the project would not suffice for delivery. In this manner the finding that organization-wide adoption of a radical teaming approach, similar to that described elsewhere as fluid teaming (Santistevan & Josserand, 2019), could be prompted by dramatic staffing changes, also responds to calls from teaming scholars to investigate the question of 'how does staffing impact the dynamism of team characteristics?' (Benishek & Lazzara, 2019, p. 10).

Stepping back, the findings of the current study also hold implications for research on *organizational tensions*. Reframing teamwork as a mechanism for balancing ongoing tensions between continuity and change has implications for our understanding of how organizations cope with, and use, tensions. By exploring the process dynamics of change in teams in a PBO, the current study reveals how micro-level role interactions throughout a project embed a distributed capacity to absorb and manage tension between continuity and change. This builds on recent research that highlights the importance of dynamism and interdependency in the process of balancing continuity and change, but which does not capture how teams and individual actors can achieve this cumulative effect (Chreim, 2005; Graetz & Smith, 2008). For example, Graetz and Smith (2008, p. 277) find that arbitrating continuity and change is an "interdependent and iterative process," and suggest that the methods used to do so are poorly understood, calling for "work in the future that elucidates these micro features." Our findings address this gap by highlighting how micro-level interactions between interdependent members can contribute to addressing meso-level tension. As seen throughout the project, members were repeatedly faced with complex decisions between maintaining continuity and introducing change, adhering to role definitions and adapting skill sets, maximizing delivery efficiency and agility. For the most part, members would be left to manage these organically within and between their teams, meaning that organizationally, shifts in how continuity and change were

balanced throughout the project became an accumulation of interdependent members' micro-level interactions.

This finding extends emerging research on how organizational tensions influence micro-level interaction, and, reflexively, shows how micro-level interaction sculpts tensions (Bednarek, Paroutis, & Sillince, 2017; Birkinshaw, Crilly, Bouquet, & Lee, 2016; Jarzabkowski & Lê, 2017; Panayiotou, Putnam, & Kassinis, 2017; Smets, Jarzabkowski, Burke, & Spee, 2015). Until recently, researchers have generally approached tensions from a top-down proactive organizational strategy perspective and there have only been a handful of attempts to consider how organizational outcomes might be linked to the micro-level reaction of individuals to duality, contradiction, and tension (Chaharbaghi et al., 2005; Cheal, 2009; Clarke-Hill, Li, & Davies, 2003; Fiol, 2002; Talbot, 2001; Windrum, Reinstaller, & Bull, 2009). One such study comes from Bednarek et al. (2017), who consider how organizations operating under dual strategic imperatives can rationalize and leverage tensions through micro-level rhetorical practices that engender an organizational competence to transcend strategic contradiction. From this perspective, tension arising from duality cannot be "tidily resolved," and instead must be part of "an ongoing process of working through contradiction" (Bednarek et al., 2017, p. 97). Likewise, as Smets et al. (2015, p. 48) highlight, tension management is "done by people, rather than built into organizations." These insights are significant as they align with contemporary reflections of the dynamic, relational nature of organizational coordination and avoid reductionist oversimplification of individuals' reactive interplay at the heart of teamwork (Schad, Lewis, Raisch, & Smith, 2016).

Our findings extend this line of research by highlighting how tension management is mobilized on a micro-level through the mingling of recurrent and transient working relationships. This characterization humanizes our understanding of decision-making approaches by focusing on the agentic role of each organizational member in relation to

emerging approaches to teamwork (René M Bakker, Cambré, Korlaar, & Raab, 2011; Smith & Lewis, 2011; Smith & Tushman, 2005). It also stands distinct from extant research on tension management by indicating that it is the temporal context in which tension between continuity and change is occurring that will determine appropriate approaches to balancing the tension effectively (Bednarek et al., 2017; Jarzabkowski & Lê, 2017; Schad et al., 2016; Smith & Lewis, 2011). Therefore, to understand how teamwork interacts with tension between continuity and change, researchers must understand the temporal context the teamwork occurs in. Our framework conceptualizes one formulation of this interface between project specific temporality and shifting approaches to teamwork that is new to managing tensions. It demonstrates how the micro-level interactions of organizational members coalesce in a blend of teamwork approaches that saw a shifting balance in tensions between continuity and change, enabling the organization to deliver on its aims. This contribution is significant as, until now, the influence of an organization's temporal context on the dynamic, micro-level balancing of meso-level tensions has not been sufficiently explored (Bednarek et al., 2017; Birkinshaw et al., 2016; Jarzabkowski & Lê, 2017; Panayiotou et al., 2017; Smets et al., 2015).

Implications for practice

The findings of the current study also hold some immediate, practical implications for actors in PBOs. In particular, the current study has implications for teams looking to balance tensions in how they get teamwork done. Our findings contrast with longstanding structural characterizations of teamwork, and explain how adaptations to roles should be allowed to emerge socially throughout projects *alongside* consensus around team structures (Biddle, 1986; Scott, 1981). Likewise, the finding that the activities undertaken by the core team in defining boundaries were perceived to create teams that could quickly work effectively together suggests actors should not characterize their roles as entirely fluid social phenomena either

(Day, Gronn, & Salas, 2006; Morgeson, DeRue, & Karam, 2009). Indeed, despite the ways in which teamwork is socially reconstituted throughout a project, this study suggests that unless teaming for speed sets in, these reconstitutions will, in part, be informed by role definitions established at the beginning of the project. Team leaders must therefore accept that the dynamics of teamwork will, and should, constantly embody a balance of continuity and change, being part rigid reflections of efficient accepted approaches to teamwork and part fluid expressions of agile teaming emerging in the liminal space between continuity and change.

Expanding on existing research our findings suggest that in PBOs where this coalescence of continuity and change is encouraged, teamwork will evolve over time as roles, tasks and relationships induce constant reframing of interaction (Ebbers & Wijnberg, 2017). In practice, this indicates that to effectively manage teamwork in PBOs, leaders must sense and be responsive to how team structures evolve over time and use their influence to proportion planned and emergent interactions in ways that serve project outcomes.

LIMITATIONS AND RESEARCH DIRECTIONS

Our results stem from a single case study. This reduces the transferability of our findings (Gerring, 2004). Nevertheless, the trio of teamwork approaches identified within offer a new conceptual frame that can be used by future research to explore the dynamics of teamwork in other PBOs and industries. Our findings could be extended through translation, for instance, to digital advertising agencies (Grabher, 2001, 2004), theatre productions (Kramer, 2009), and IT enterprises (Chen, Sun, Helms, & Jih, 2008), as research suggests these contexts are similarly characterized by inter-project continuity in team structures but regular changes in membership and shifting project demands. Such translation would enable comparative analyses of the ways in which structural and industry idiosyncrasies influence the balance of continuity and change, and the unfolding of teamwork in other PBOs. Another

limitation of our methodology concerns the types of conclusion we are able to draw. For example, we are unable to quantify the causal effect of changes teamwork approaches on project progress and, instead, can only theorize likely causal mechanisms (Gerring, 2004). The present research could benefit, therefore, from empirical testing in a multi-unit setting to provide greater insight into relationships theorized; for instance, whether, and the extent to which, balance teaming and teaming for speed accelerate project progress at different stages. Despite these limitations, this study offers a unique perspective on how teaming can be used to dynamically balance tensions between continuity and change in PBOs.

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Chapter 6. Innovators at the edge: how dilemma & paradox mindset shape responses to barriers in the Australian Defence Force (Paper 3)

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ABSTRACT

Innovation is full of tensions that create barriers for innovators. While there is much literature to help us understand the types of innovation barriers organizations face, there is far less literature explaining how individual innovators respond to those barriers. Existing literature demonstrates that innovators play a pivotal role in overcoming barriers but largely focuses on how pre-emptive behaviours can mitigate the impact of barriers. To build a deeper understanding of why and how innovators formulate certain responses to barriers, research needs to address the underlying motivational dimension of innovators thoughts and feelings towards tensions. We draw on the concept of mindsets to address this gap. Using in-depth interviews with 38 innovators building cutting-edge capability in the Australian Defence Force, we compare how innovators with a dilemma mindset and a paradox mindset respond to barriers. We find that innovators with a dilemma mindset use an *anticipate and avoid* response to barriers, while innovators with a paradox mindset use an *accept and reframe* response to barriers. Our data also reveals a third group of innovators who blend the dilemma and paradox mindsets to use an emergent *fit and feel* response to barriers. Through innovators' accounts of these responses we theorize new boundary conditions for the dilemma and paradox mindset. These findings advance our understanding of barriers by demonstrating how innovators' mindsets towards tension motivate contrasting responses to barriers and further humanize our understanding innovation praxis.

KEYWORDS

Innovation projects, innovators tension, balance, paradox mindset, dilemma mindset

INTRODUCTION

Innovators are constantly confronted with the challenge of balancing tensions (Andriopoulos & Lewis, 2010; Chrisman, Chua, De Massis, Frattini, & Wright, 2015; Lin, McDonough III, Lin, & Lin, 2013): situations involving interdependence between multiple elements that create a sense of conflict or strain (Schad, Lewis, Raisch, & Smith, 2016). Largely, these tensions stem from the fact that innovation pushes individuals into uncertain territory where competing interests at play, and how to navigate them, may be unclear (Lenfle, 2011). While much literature focusses on tension between exploiting existing capabilities and exploring new capabilities as the predominant tension faced by innovators (Andriopoulos & Lewis, 2010; Lin et al., 2013), recent research shows how innovators faced a wide array of tensions including tension between maintaining project control and being open to external influences (Lauritzen, 2017; Lauritzen & Karafyllia, 2019; Wang, Libaers, & Park, 2017), tension between the ability and willingness of innovators (Chrisman et al., 2015) and tension bewteen creative and commercial interests (Beverland, 2005).

Innovators experience tensions in the form of innovation barriers (Beverland, 2005). In this way barriers are often regarded as signifiers of underlying tensions (Hueske & Guenther, 2015). While, most literature on innovation focusses on categorizing barriers (Frishammar & Åke Hörte, 2005; Mohnen & Rosa, 2002; Sandberg & Aarikka-Stenroos, 2014), this says little about the pivotal aspect of how individuals respond to barriers (Landau, 1993). More recent research highlights that individual capability to address barriers is key to radical innovation (Griffin, Price, Maloney, Vojak, & Sim, 2009; Griffin, Price, Vojak, & Hoffman, 2014; Yeşil & Hırlak, 2013), yet our understanding of how individuals think, feel and act towards barriers is still limited (Hueske & Guenther, 2015). Depending on individuals' capabilities, underlying tensions can lead to uncertainty, difficulties anticipating barriers, anxiety and paralysis or, on the contrary, trigger creativity, learning and innovation (Andriopoulos, Gotsi, Lewis, &

Ingram, 2018; Burström & Wilson, 2018; Lenfle, 2011). Yet, we do not yet know the different ways individuals, once confronted by barriers, approach underlying tensions and develop responses to barriers (Hueske & Guenther, 2015). This is an important topic of investigation if we consider that innovation barriers trigger illicit visceral cognitive and affective responses (Shepherd, Patzelt, & Wolfe, 2011; Todt, Weiss, & Hoegl, 2018). If the innovativeness of organizations depends on the ability and willingness of individuals to steward innovative endeavors, it follows that the complex micro-level dynamics involved in responding to barriers will play a significant part in the achievement of innovative outcomes (Brenton & Levin, 2012).

To fill this gap, we draw on the concept of mindset, where a mindset is 'a mental frame or lens that selectively organizes and encodes information, thereby orienting an individual toward a unique way of understanding an experience and guiding one toward corresponding actions and responses' (Crum, Salovey, & Achor, 2013, p. 716). Mindsets are a useful lens for micro-level research as they draw together the cognitive and affective dimensions of the mental framework an individual uses to make decisions (Crum et al., 2013). As an analytic lens, mindsets therefore invoke a broader assessment of how individuals convert experience into response than the alternative lenses of affect and cognition. Where cognition focusses on individual and group-level mental processes of parsing information, and affect focusses on instinctive emotive responses, mindset looks to pull together the entire chain of decision-making agency exhibited by individuals as they interpret and respond to experiences (Crum et al., 2013). By connecting the underlying thoughts and feelings of an individual with exhibited practices, mindsets give scholars a lens to enhance and humanize our appreciation of a range of innovation praxis including ideation (Celuch, Bourdeau, & Smothers, 2014), collaboration (Lahiri, Pérez-Nordtvedt, & Renn, 2008) and marketing (Kuczmarski, 1996).

The dilemma mindset (Zheng, Kark, & Meister, 2018) and paradox mindset (Miron-Spektor, Ingram, Keller, Smith, & Lewis, 2018) are particularly relevant as they describe two

contrasting dispositions towards tensions that can result in different approaches to innovation. Individuals with a dilemma mindset feel challenged or deterred by tensions as they perceive tensions to involve mutually exclusive elements that must be taken out of conflict (O'Reilly III & Tushman, 2008; Zheng et al., 2018). Contrastingly, individuals with a paradox mindset feel motivated or energized by tensions as they perceive tensions to involve mutually dependent elements that enhance their work (Hargrave & Van de Ven, 2017; Miron-Spektor et al., 2018). That is to say, when confronted with tensions, individuals with a dilemma mindset are more likely to perceive barriers, while those with a paradox mindset may perceive opportunities to further their projects. In view of the established connection between organizational tensions and barriers to innovation (Andriopoulos et al., 2018; Beverland, 2005; Sandberg & Aarikka-Stenroos, 2014), our study draws on the notion of mindset to investigate how individuals think, feel and act towards barriers.

Our study is structured as follows. First, we set out the theoretical background to the study by demonstrating how extant theory on barriers to innovation largely neglects the role of micro-level responses exhibited by innovators. We then introduce tensions as our conceptual lens and provide a detailed comparison of the cognitive and affective differences between the dilemma and paradox mindset established in existing literature. Next, we introduce our research context and sample, before describing our methodology in detail. Following this, we discuss our results and outline the significance of our findings. We conclude with a discussion of practical implications, study limitations and future research.

Contrasting with most preceding theory, our study demonstrates the salience of the innovators' mindset in shaping their responses to barriers. We respond to growing calls for a more contingent understanding of the positive and negative effects of the dilemma and paradox mindset. Overall, our study holds important theoretical implications for how we understand the human link between organizational tensions and barriers, and important practical implications

for how innovators should approach barriers. Our findings illuminate new avenues for understanding the connection between individual mindsets, barriers and successful innovation.

THEORETICAL FOUNDATION

The innovation barriers literature is still emerging (More, 1985; Sandberg & Aarikka-Stenroos, 2014). To date, the primary focus of this literature has been on the foundational question: '*what are the barriers to innovation?*' (see Table 1). While this research provides important insights about the types of barriers organizations can expect to encounter, it says little about what 'actors involved in the innovation process' actually do when confronted with a barrier (Hölzl & Janger, 2012, p. 1). Existing literature points to some responses available to organizations and teams but has been slow to pierce down to the micro-level responses of individuals at the 'coalface' of innovation (Butcher & Jeffrey, 2007). With little literature explaining why and how individuals respond to barriers, organizations are 'not equipped to understand individual problems nor furnish individual solutions' (Landau, 1993, p. 8).

Source	Research context	Barrier types identified
D'Este, Iammarino, Savona, and von Tunzelmann (2012)	Generic barriers	Cost, knowledge, regulatory and market
Hölzl and Janger (2012)	Generic barriers	Risk, adoption, mindset, financial, skill, information, partnering
Reynolds and Hristov (2009)	Retailing firms	Cost, market and knowledge
Madrid-Guijarro, Garcia, and Van Auken (2009)	Spanish small-medium enterprises	Cost, access to personnel, access to financial resources, training, employee retention, resistance to change, external support & information, partnering, economic insecurity
Larsen and Lewis (2007)	Small-medium enterprises	Cost, marketing and management
Hewitt-Dundas (2006)	Small & large manufacturing plants	Cost, human and organizational
Hadjimanolis (2003)	Generic barriers	Market, government and other external barriers, structure, strategy and people
Mohnen and Rosa (2002)	Canadian service industries	Cost, risk, resource availability, resistance to change and regulatory
Baldwin and Lin (2002)	Canadian manufacturing industries	Cost, institutional, labor organizational and information

Table 1. Barrier types - adapted from Sandberg and Aarikka-Stenroos (2014)

Tensions at *the coalface*

Existing research makes it clear that 'individual innovation is awash with tensions' (Liu, Xu, & Zhang, 2019, p. 2). Innovators are constantly confronted with the challenge of balancing interdependent interests, such as, exploitation and exploration (Andriopoulos & Lewis, 2010; Lin et al., 2013), control and openness (Lauritzen, 2017; Lauritzen & Karafyllia, 2019; Wang, Libaers, & Park, 2017) and ability and willingness (Chrisman et al., 2015). By their very nature, tensions push projects into uncertainty territory where the ability of individuals to read the lay of the land and anticipate hurdles is diminished (Lenfle, 2011). On the one hand, tensions can be a flashpoint in projects, sparking new ideas and creativity, while

on the other tensions can induce uncertainty, conflict and paralysis (Burström & Wilson, 2018). As Andriopoulos et al. (2018, p. 428) surmise, 'tensions pose a double-edged sword fueling learning and innovation or triggering anxiety and counterproductive responses'. As innovators weave serpentine paths through this complex lattice of interdependent interests, they are constantly confronted by tensions in the form of barriers (Beverland, 2005).

For individuals at the coalface of innovative projects, barriers illicit visceral cognitive and affective responses (Shepherd et al., 2011; Todt et al., 2018). To work through barriers, individuals must grapple with a milieu of considerations and feelings that may not always cohere or point them towards a clear answer (Lenfle, 2011). For many people, overcoming barriers is an immensely powerful experience, inspiring feelings of accomplishment, empowerment and self-worth (Joseph, 2012). Inversely, being stalled or falling prey to barriers can shake one's sense of self-worth, ability and purpose (Shepherd et al., 2011). Perhaps worse still, it may not always be clear to an individual whether they've encountered, overcome or succumbed to a barrier, inducing uncertainty, confusion, and counterproductive behaviors (Stetler & Magnusson, 2015).

If the innovativeness of organizations depends on the ability and willingness of individuals to steward innovative endeavors, it follows that these complex micro-level dynamics involved in responding to barriers will play a significant part in the achievement of innovative outcomes (Brenton & Levin, 2012). Yet our understanding of how individuals think, feel and act towards barriers is limited (Hueske & Guenther, 2015).

As a starting point, it generally holds that individuals who feel favorably towards an innovative pursuit will be more willing to take part in activities related to it (Ajzen & Fishbein, 1980; Landau, 1993). As individuals confront the pervasive 'fear caused by change' when innovating, it stands to reason that their 'abilities and attitudes' will serve as strong

determinants of how effectively they can respond to tensions (Hueske, Endrikat, & Guenther, 2015, p. 60).

Griffin et al. (2009, p. 233) find through a series of in-depth interviews with 11 high-performing innovators, that successful innovators exhibit a combination of 'personality, perspective, preparation, and motivation' that enables them to master 'both a process for innovating and a political capability'. Through further 19 interviews, Griffin et al. (2014, p. 1362) show in more depth how these 'serial innovators' overcome barriers using non-linear processes, a fuzzy front end (FFE) focus, transitional management between FFE and outputs, and a proactive approach to market advocacy, noting: *'Accepting responsibility for all of the tasks involved with inventing, gaining political acceptance and facilitating the final development of a radical innovation is one way that Serial Innovators overcome some of the barriers to radical innovation'*

These insights enhance our understanding of how serial innovators pre-emptively mitigate the negative effects of barriers as projects change hands, but do not address the underlying motivational dimension of how an innovator's thoughts and feelings towards tensions elicit particular responses to barriers (Griffin et al., 2009; Griffin et al., 2014). Tensions pose a 'double-edged sword' that opens up new theoretic possibilities for how we understand barriers (Andriopoulos et al., 2018, p. 427). While tensions constrain and disarm some individuals, they free and empower others (Burström & Wilson, 2018). Seen as temporary manifestations of tensions, the nature of barriers also becomes opaque and situational (Chrisman et al., 2015). To some, barriers may continue to be walls that impede innovation, but to others barriers may be springboards that propel innovation (Madrid-Guijarro et al., 2009). While existing literature demonstrates the significant influence of innovator behavior on mitigating the negative consequences of barriers, further research 'investigating differentiating aspects of their personality more completely' is needed to understand how an

innovator's thoughts and feelings towards tensions influence whether they approach barriers as walls or springboards (Griffin et al., 2009, p. 239).

Mindset as a window into the innovator

To address this gap, we rely on the concept of mindsets. As an analytic lens, mindsets offer us a window into the underlying interpretive frames that guide individual behavior (Crum et al., 2013). Built over time, mindsets describe the cognitive and affective frames an individual uses to understand particular ideas or experiences. As individuals interpret information these cognitive and affective frames coalesce to produce the individual's unique disposition and situational responses (Miron-Spektor et al., 2018). By unpacking the mental frame through which innovators interpret information and formulate action, researchers have been able to better understand why some innovators are suited to activities at the front-end of innovation, such as ideation (Celuch et al., 2014), while others are suited to activities at the back-end, such as marketing (Kuczmarski, 1996). With growing interest in 'the temporal dimension of coping with paradoxical tensions as well as the consequences of the different mindsets over time' (Zheng et al., 2018, p. 584), the dilemma mindset and paradox mindset have emerged to describe two distinct cognitive and affective dispositions towards tensions (Miron-Spektor et al., 2018; Zheng et al., 2018).

Individuals with a dilemma mindset have a tendency to think about tensions as involving mutually exclusive elements, and feel that tensions between elements must be resolved (Zheng et al., 2018). In other words, individuals with a dilemma mindset generally feel challenged or deterred by tensions and therefore look for ways to remove the tension (O'Reilly III & Tushman, 2008). Accordingly, they tend to make 'either-or decisions' (Hunter, Cushenbery, & Jayne, 2017; Smith & Tushman, 2005), 'trade-offs' (Benner & Tushman, 2015)

or ‘resolutions’ (Abelson, 1959). Existing literature also characterizes the dilemma mindset as inflexible and ill-suited to tasks requiring the frequent integration of perspectives, which is often required for innovation (Zheng et al., 2018).

Contrastingly, individuals with a paradox mindset tend to think about tensions as involving mutually dependent elements and feel comfortable with the presence of tensions (Miron-Spektor et al., 2018). Individuals with a paradox mindset generally feel motivated or energized by tensions and therefore look for ways to use tensions without necessarily resolving them (Hargrave & Van de Ven, 2017). In the literature this has been described as a propensity to ‘value, accept and feel comfortable with tensions’ (Miron-Spektor et al., 2018).

Studies on paradox mindset are still limited, and the majority of these view paradox mindset as enabling innovation. For example, Miron-Spektor et al. (2018, p. 27) describe paradox mindset as ‘the key to unlocking the positive potential of tensions’ (Miron-Spektor et al., 2018, p. 27). Others have argued that paradox mindset enhances the ability of individuals to accommodate contrasting perspectives (Zheng et al., 2018), think creatively (Liu et al., 2019) and work cooperatively (Keller, Loewenstein, & Yan, 2017). However, recently, the overwhelming positive terms used by scholars to describe paradox mindset have come under criticism for potentially overlooking ‘negative consequences of paradoxical thinking’ (Sleesman, 2019, p. 94). For instance, it has been suggested that by encouraging individuals to constantly look for new directions, ‘individuals with a paradox mindset tend to craft an optimistic view of the tension-filled situation and persist’ even when a course of action is failing (Sleesman, 2019, p. 94). However, we are just beginning to understand the impacts that a dilemma mindset and paradox mindset can have on the behavior of individuals in organizations. While existing literate tends to indicate that individuals with a paradox mindset are better suited to innovation, further research is needed to understand the specific ways in

which either a dilemma mindset or paradox mindset impact a range of innovative behaviors, and in particular, individuals' responses to barriers (Liu et al., 2019).

Innovation is replete with tensions and it is clear that individuals are at the crux of overcoming the barriers this creates (Griffin et al., 2014). However, without addressing the underlying dimension of innovators' dispositions towards tensions, our ability to explain why innovators adopt contrasting responses to barriers is limited. A deeper investigation of innovators' mindsets and how they impact innovators' stance towards innovation barriers can help us build a more robust understanding of why barriers constrain some innovators and empower others (Andriopoulos et al., 2018).

METHODOLOGY

To contribute to addressing the above discussed research gap we conducted a large exploratory case study in the Australian Defence Force (ADF). The case study approach was chosen to allow the richness of actors' accounts to convey the depth and diversity of experiences within a situated organizational reality while garnering theoretical insights about how individuals think and feel about barriers along with any associated responses (Flyvbjerg, 2006; Gerring, 2004; Lawrence, 1997).

Research setting

ADF is the 60th largest military in the world by active personnel (IISS, 2018) and is responsible for the defence of Australia. It is comprised of four service groups: the Royal Australian Navy (RAN), the Australian Army (ARMY), the Royal Australian Air Force (RAAF) and a collection of joint service organizations (JOINT) that work across RAN, ARMY

and RAAF. Given its relatively small size, the ADF prioritizes the training of its personnel, integration of advanced technical systems and capacity to operate at the cutting edge of military capability as the foundation of its efforts to secure Australian national interests, resulting in a string of innovations now used in military and civilian applications globally (Lyles & Miller, 2016). Despite this focus on innovation, a growing 'organizational culture that is risk averse and resistant to change' has been flagged as creating barriers to the ADF staying at the cutting edge of military capability (Payne, 2016, p. 166).

To understand how individuals respond to barriers within ADF, the authors were connected with an ADF unit responsible for facilitating and championing innovation. Having developed a strong reputation as an effective and agile supporter of innovative projects, this unit has built connections with a large network of innovators across the ADF. These innovators were each responsible for a different innovative project and form the basis of our study. Innovators came from all four service groups and oversaw projects varying greatly in scale, duration and stage of development. Some projects were small in scale and still in the ideation phase. In contrast, we also interviewed individuals working on a small number of multi-decade, multi-billion-dollar projects involving hundreds of personnel, the largest of which being a 30-year National Naval Shipbuilding Plan sustained until 2050 by $90 billion of government investment. In most circumstances innovators interviewed were the sole leader of their project. In cases of larger projects led by multiple leaders or high-ranking leaders with extremely busy schedules, a senior leader responsible for delivery of a significant aspect of the project was interviewed. For example, we interviewed a leader responsible for delivery of a class of warship as a core component of the expansive National Naval Shipbuilding Plan. A summary of interviewees' roles and project focal areas is provided in Table 2.

Given the sensitive nature of information discussed during interviews, it is important that interviewees are de-identified. Therefore, certain characteristics, such as exact role titles

and North Atlantic Treaty Organization (NATO) rank equivalents, are omitted from the table. To provide an indication of the breadth of interviewee characteristics, we interviewed commissioned officers ranging in NATO rank equivalent from Officer Cadet through to OF-5, and non-commissioned officers ranging in NATO rank equivalent rank from OR-6 to OR-9. Approximately 76% of interviewees were male and 24% were female. Approximately 55% of interviewees came from RAAF, 18% from ARMY, 16% from RAN and 11% from JOINT.

#	Service	Project area	#	Service	Project area
1	RAAF	Operations & personnel	20	RAAF	Operations & personnel
2	RAAF	Engineering	21	JOINT	Operations & personnel
3	RAAF	Force design	22	RAAF	Operations & personnel
4	JOINT	Intelligence & strategy	23	ARMY	Intelligence & strategy
5	ARMY	Operations & personnel	24	ARMY	Intelligence & strategy
6	RAN	Force design	25	RAN	Innovation management
7	RAAF	Operations & personnel	26	JOINT	Force design
8	RAN	Force design	27	RAAF	Force design
9	RAAF	Innovation management	28	RAAF	Force design
10	RAAF	Operations & personnel	29	RAAF	Operations & personnel
11	RAAF	Intelligence & strategy	30	ARMY	Engineering
12	RAAF	Intelligence & strategy	31	RAAF	Intelligence & strategy
13	RAAF	Force design	32	RAN	Force design
14	JOINT	Innovation management	33	RAAF	Intelligence & strategy
15	RAN	Innovation management	34	ARMY	Intelligence & strategy
16	ARMY	Innovation management	35	ARMY	Intelligence & strategy
17	RAN	Innovation management	36	RAAF	Engineering
18	RAAF	Engineering	37	RAAF	Education and training
19	RAAF	Education and training	38	RAAF	Engineering

Table 2. List of interviewees and project areas

Data collection

To ensure a large enough sample size, data collection occurred iteratively over the three-year period between 2017 and 2019, resulting in a total of 38 interviews. Interviews ranged in length between 28 minutes and 67 minutes and on average lasted for approximately 45 minutes. Due to challenges with the availability of some innovators, five interviews had to be split across two separate calls. This resulted in a total of 43 separate collection instances, 1,682 minutes of audio and 423 pages of interview transcription. Given the wealth of experience held across the interview cohort interviews were dense with information, averaging over a page of transcription every four minutes. Interviewees exhibited extensive subject matter expertise and experience leading projects, and so it was not uncommon for interviewees to refer to multiple projects they had led while illustrating a particular point. This gave the research team more opportunities to triangulate interviewee experiences across multiple projects and identify consistent mindsets and responses. Therefore, despite having a sample size of 38 interviews, the theoretical richness of the interviews ensured the sample was sufficient to address the research question. Additionally, given the long lead-times required to arrange interviews with suitable personnel from the ADF, the research team made the judgement that capping the sample size at 38 would ensure even the oldest interview data would remain relevant at the time of writing the results.

Before interviews, each innovator was assured anonymity and asked to provide informed consent. Given the sensitive nature of many projects, the first author begun each interview with a reminder that the interviews were to be recorded and transcribed, and that the research team did not have security clearance to hear any classified information. Interviews were semi-structured to gather insights relevant to our theoretical focus, while allowing innovators space to introduce any alternative foci, frames, or concepts they felt relevant (Longhurst, 2003).

Initially innovators were asked to provide an account of their career. Next innovators were asked to pragmatically recount their involvement with their current projects. In particular, innovators were asked to describe in detail any experiences of tensions or barriers they had encountered and how they responded to these throughout their projects. In their reflections, innovators used detailed examples of key barriers, milestones and important changes they had experienced, painting vivid accounts of their work.

Data analysis

Our data analysis followed a grounded approach that moved through three stages to build out our case-study (Charmaz, 2014). First, data were used to establish which innovators had experienced barriers and to develop general categorizations for the types of barriers experienced. This formed the first stage of our analysis as barriers are considered signifiers of underlying organizational tensions in our analytic framework (Andriopoulos & Lewis, 2010). In working through barriers innovators necessarily must work through underlying tensions also, and so analysis begun by establishing both a list of innovators that had encountered barriers and what types of barriers these were. Initially, the first author used literal descriptions of barriers used by innovators as codes (Gersick, 1988). After discussion with the second and third authors, the first author compared these initial codes against barrier categories established in the literature to assess whether any existing typologies described the data accurately (Corbin, Strauss, & Strauss, 2014). The four-type categorization of D'Este et al. (2012) including cost barriers, knowledge barriers, regulatory barriers and market barriers was found to match the data closely. However, 'market barriers', described by D'Este et al. (2012, p. 487) as 'markets dominated by established enterprises' and 'uncertain demand for innovative goods or services', was revised to 'reputational barriers'. This is because ADF, as the sole provider of a public

service, does not compete in a traditional market the same way a private enterprise might. Rather, innovation gaps are both defined by and addressed within the closed capability market of ADF. In this way, competition to innovate in ADF occurs at the individual level as individual innovators use their track record and reputation to navigate the closed ADF environment and deliver capability outcomes. All three authors agreed that this initial categorization of cost, knowledge, regulatory and reputational barriers accurately described the data. Additionally, this first phase of analysis confirmed that the accounts of all 38 innovators contained experiences of barriers and were therefore suitable for subsequent stages of analysis. Brief descriptions of how cost, knowledge, regulatory and reputational barriers manifested in ADF (along with demonstrative quotes found in Table 4) can be found below.

Cost barriers, defined as barriers related to the financial or economic impacts of innovation, were introduced by what innovators described as the 'closed system' design of the ADF resourcing environment where budgets and labour availability rarely changed. Over time, the increasing costs of acquiring technology, combined with costs associated with navigating a more complex regulatory environment, have, in the view of innovators, seen this closed resourcing system become ill-suited to achieving the capability aims of ADF. This created barriers to projects needing to secure both initial funding and ongoing funding when projects encountered delays. In this way the fixed funding allocations ADF personnel were expected to work within were intrinsically connected with their tolerance for risk in projects. As one innovator described: *2% of GDP that's the resourcing reality, and I can't imagine it going higher than that. How much of that gets apportioned to innovation and Force Design? So we have to live within our means, and if that is fixed, then that determines the next piece, our risk appetite.'* (interviewee 3).

Knowledge barriers, defined as barriers related to availability of qualified personnel, information about technology or information about opportunities, were also present in the

accounts of innovators but were the least common type of barrier encountered. Most often knowledge barriers would take the form of qualified personnel not having the time to dedicate their expertise and professional networks to projects. As one innovator noted, 'everyone's very busy and no one's got enough time to do everything that they've been asked to do' (interviewee 4). For many innovators, their projects were not their sole, or primary, responsibility and as a result, they were expected to balance their time between their projects and other responsibilities. While for some innovators this was found to be a beneficial experience, most found themselves focussing on day-to-day deliverables and not building the networks and know-how they needed to deliver their projects. As one innovator reflected: *'I think sometimes there aren't enough people, and I think sometimes the issue is that they're not the right people, or the people you have aren't – you know, come back to my point about the culture, the people you have aren't lined up and pointing in the right direction to meet the organisation's needs.'* (interviewee 4)

Regulatory barriers, defined as barriers related the regulation and administration of innovation, were frequently cited by innovators. Innovators experienced regulatory barriers throughout their projects from project pitching (interviewees 5 and 15), to applying for work releases (interviewees 7 and 36), reporting project progress (interviewee 9) and contracting with external organizations (interviewees 4, 5, 11 and 26). A particularly common source of regulatory barriers cited were the mandatory safety review processes imposed by airworthiness regulators and other governing bodies. In general, innovators described most regulatory barriers as the direct result of the accountability-driven, risk-averse culture of ADF that imposed extensive processes on top of even small activities. As one innovator put it, 'We created processes where you needed twelve thousand pages of paperwork to buy a Texta' (interviewee 4). While these regulatory barriers were rarely enough to prevent a project commencing, they were described as an 'anathema to innovation' that over time would

accumulate and cause projects to become delayed and eventually stall entirely: *'Bureaucracy. It's pure and simple bureaucracy that holds us back. All the processes and assurance frameworks around our operating systems are necessary, but they are an anathema to innovation… Projects will always get caught up in the process and invariably become so slow and cumbersome that they stop being innovative.'* (interviewee 5)

Reputational barriers, defined as barriers related to the risks to personal reputation faced by innovators, were a significant inhibitor of innovation in ADF. As with most military institutions, innovators described ADF as a place where individuals put a large amount of value on seniority and rank. This creates an environment where personal reputation is used as an important driver for maintaining the speed and trajectory of an individual's projects and career. Innovators would encounter reputational barriers when project sponsors and other involved personnel were deterred from providing support to a project due to the possible impact it may have on their career or personal standing. In particular, we found reputational barriers to impact mid-ranked innovators (NATO OF-3 to OF-4 equivalent) most strongly 'those people who are on the cusp of moving into senior leadership and have the most to lose' (interviewee 1). At this rank, innovators were intent on achieving senior positions in ADF and described feeling as though their success and failings at their current ranks would decide whether this was achievable. As one innovator noted, *'often we're dealing in opportunity and time and reputation; if I collaborate with someone and it fails it's going to cost me time, opportunity and reputation and they cannot recompense me for that.'* (interviewee 1).

Cost barriers	**Regulatory barriers**
Support requires funding whether it's personnel or financial and we're resource constrained on both. So, unless it's a discreet activity, that generally resides within emerging project areas that are classified, I generally don't have the funding for it. Previously, I had project development funding or capability development investment funding but now that is really a tightly constrained area (interviewee 8) It costs money to get a quote on how much something will cost. Industry doesn't work for free and these are the aspects that I think ADF for the large part doesn't understand (interviewee 8) I think we grossly underestimate how much we need to be investing in innovation and so there'll be a long way to go to get that funding to an adequate level. (interviewee 14) I guess we've designed a system that is very careful about what is an auditable and traceable use of funds, but the downside is that when we come across a company that we would like to get funding into overnight, we can't because they have to go through a fairly drawn out selection process (interviewee 15) I think that there will always be money to develop the workforce. I think the biggest risk of all is not spending the money on something that is deemed worthwhile. While I think there is enough money that money will only come if we ask for it and we can justify why we're asking for it. (interviewee 31) All things equal, we operate on a fixed manpower and a fixed budget… Take our new planes, we've got 10 of them at $6 billion. That's a very different number to what 10 planes would have cost 30 years ago when technology was a lot cheaper. So as the variables that affect that fixed base change, we need to adapt to be relevant and successful as an organisation. (interviewee 7)	Bureaucracies are inherently static… I mean bureaucracy is ultimately about preventing a naked and random play of power. So that's its job is to be static but you've also got to be able to enhance it at certain ends so that being static doesn't cause a capability deficit if you like. (interviewee 12) We've got so much bureaucracy that sometimes it stifles the ability to put these great ideas into reality. (interviewee 13) The problem with innovation in ADF is ADF is so driven by process and bureaucracy and oversight by necessity, that where there is a requirement to innovate, trust and risk a failure, they're not natural tendencies in our environment. So the two are often competing narratives, and sometimes innovation wins as a predominant narrative and sometimes it doesn't. (interviewee 5) At least in the Airforce, administrative structures are fairly rigid, and procurement cycles are reasonably slow.(interviewee 4) We created processes where you needed twelve thousand pages of paperwork to buy a Texta. We added paperwork to the point where the process became ridiculously unwieldy and a risk itself (interviewee 4) We've got a defined risk spectrum we've got to operate in and if you walk around any air force environment everyone in the command chain has to make their safety statement (interviewee 1) There's some areas where we're never going to probably relax the standards or appetite for risk which would be in safety, probably mission and capability systems and reputation (Interview 1)
Knowledge barriers	**Reputation barriers**
People are very comfortable in the way they're currently doing their job; they're not taxed by it, they see any innovation will likely be a change which will require them to maybe do a bit more than what they're currently doing and also require additional time or a change their circumstances (interviewee 1) There's always too much work for the number of hours in the day and the number of people you have onboard, that's a given. That certainly hasn't changed as long as I've been around (interviewee 9) There isn't an organisation in the world that thinks it's got enough people. Everyone gets sick for a few days or for a week and somehow the organisation survives, but we are hesitant to just push them out the door to go and do some thinking or to go and meet smart people or to go on a trip to learn, for fear of losing a person for a day. So we find it hard to release people (interviewee 7) Pretty much any work-release I do get I get on a one-off basis. So if I had three, four days put aside for an event that sort of works against any extra time off for the project, because I'm already getting time off to do other important events. So that's a really difficult situation we're in, however I'm happy to do stuff outside of work as well, which is where I do most of my stuff (interviewee 36) I guess starting an innovation project, you want time and support. Basically time in getting started in the first place. Otherwise, there's risks you'll lose momentum and things will peter out (interviewee 37)	I suppose risks from a macro perspective consist of strategic risks, and they're things like risk to reputation, risk to the portfolio, those issues are important. (interviewee 5) I've certainly seen a change in attitude towards financial risk. The mantra is to be more innovative and more willing to accept risk, so that's changing. But reputation is still big – it's huge, and I don't think we're over that one yet. (interviewee 3) If I try something different and it doesn't work that's a personal reputation issue. So if I've made time out of a busy schedule to do something differently and it works, great, but if it doesn't work I'm sure it's not worth it. (interviewee 17) Instead of referring to enterprise risks as the focal point, the current Chief referred to war fighting, capability, reputation and workforce reform as the key issues… So at the highest level strategy must be consistent with an innovation mindset I think. (interviewee 17) If you're the type of person that is known to be innovative and have past successes, it's great for your reputation. But if you're the type of person that just talks about innovation and does not follow through with anything, it's bad for your reputation. (interviewee 13)

Table 4. Barriers to innovation in ADF

Following the identification of these four barrier types, each interview transcript was analysed individually to establish whether the innovator in question exhibited a dilemma mindset, paradox mindset or combination thereof. Based on Miron-Spektor et al. (2018) and Zheng et al. (2018) description of mindsets, we defined two codes for each mindset, describing its unique cognitive and affective signifiers established in the literature. For example, the code describing the affective features of paradox mindset read 'Enjoying, feeling comfortable with, being energized, uplifted by or feeling open to elements in tension'. The second and third author cross-checked these codes against the literature to ensure coherence. All four codes can be found Table 3 below. Using these four codes, the first author coded innovators' descriptions of experienced tensions against the cognitive and affective signifiers of the dilemma and paradox mindset and categorized innovators as exhibiting either a dilemma mindset, paradox mindset or dilemma & paradox mindset. These three categories were subsequently used to group first order codes emerging in the final stage of analysis. Of the 38 innovators, the accounts of four were unable to be categorized using the coding structure and so were removed from the final stage of analysis.

Stage	Activity/outcome
1. Barrier analysis	• Coding of literal barrier descriptions • Comparison against extant barrier typologies • Coherence with typology of D'Este et al. (2012) • Accounts of 38 innovators suitable to move to next phase of analysis
2. Mindset analysis	• Development of four codes using terminology of Miron-Spektor et al. (2018) and Zheng et al. (2018) o <u>Dilemma mindset codes</u> ▪ *Cognitive signifiers* - Dichotomizing, polarising, excluding, problematizing, fragmenting or prioritizing elements in tension ▪ *Affective signifiers* - Disliking, feeling uncomfortable with, being deterred by or feeling closed to elements in tension o <u>Paradox mindset codes</u> ▪ *Cognitive signifiers* - Considering, accepting, embracing, working on, dealing with or pursuing elements in tension ▪ *Affective signifiers* - Enjoying, feeling comfortable with, being energized_uplifted by or feeling open to elements in tension • Coding of innovators' reflections against the cognitive and affective signifiers to identify innovators exhibiting either a dilemma mindset, paradox mindset or dilemma & paradox mindset • Accounts of 34 innovators suitable to move to next phase of analysis
3. Response analysis	• Coding of perceptions of barriers according to mindset as first-order concepts • Extraction of paired cognitive and affective responses to barriers associated with each mindset as second-order concepts • Extraction of final aggregate level responses to barriers associated with each mindset • Arrival at coherent theoretical structure connecting the dilemma mindset and paradox mindset to three unique micro-level responses to barriers

Table 3. Stages of data analysis

Finally, the accounts of innovators' responses to barriers were compared across the dilemma mindset, paradox mindset and dilemma & paradox mindset groups. Initially, the first author used innovators' literal descriptions of how they perceived barriers in relation to their project (Gersick, 1988). This process generated first-order codes highlighting key differences in how innovators with a dilemma and paradox mindset felt and thought about barriers. For instance, first-order codes such as 'Organization vs me mindset' and 'Survivalist mindset' emerged from innovators' reflections with a dilemma mindset while first-order codes such as 'Feeling excited by new directions' and 'Pivoting project aims' emerged from innovators' reflections with a paradox mindset. Then, using axial coding, all three authors conferred to

identify second-order codes describing the overarching cognitive and affective postures towards barriers described across the first-order concepts. This process identified second-order concepts in three pairs where each pair described a deeply entwined cognitive and affective response exhibited by innovators under one of the three categories of mindset. Across the accounts of innovators, the close entwining of the cognitive and affective responses was clear; for instance, innovators who felt that barriers were threats would invariably avoid them. This close pairing of the second-order codes led the authors to extract a final level of aggregate responses to barriers: *anticipate and avoid*, *accept and reframe* and *fit and feel*. This final phase of analysis pulled together the identified mindset groupings and aggregate responses to barriers into a coherent theoretical structure to reveal the unique influence of the dilemma and paradox mindset on micro-level responses to barriers (see Figure 1).

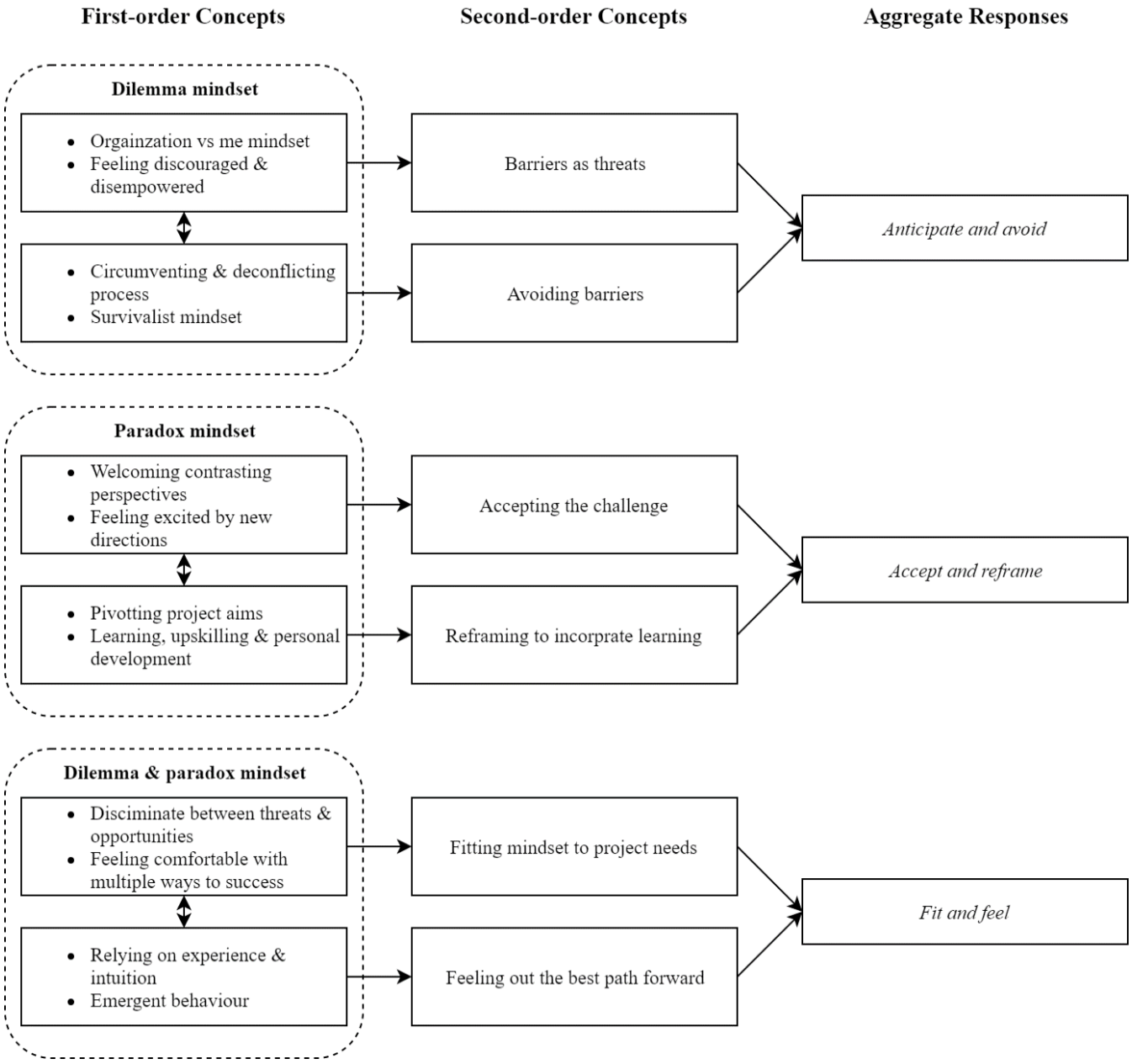

Figure 1. Data structure: dilemma mindset, paradox mindset & responses to barriers

RESULTS

We found that interviewee experiences with innovation were deeply connected with experiences with risk in ADF. Project leaders described ADF as a 'risk-averse' environment primarily geared towards being able to deliver a growing suite of capabilities, such as real-time integration of data from strategic assets in the air and ground, or end-to-end shipbuilding capabilities, with a high degree of 'repeatability and reliability'. In this environment, innovation occupies a conflicted position. ADF must a) achieve innovative capability advantages over its adversaries, and b) apply these advantages in ways that reliably achieve specific aims (Payne, 2016). On the one hand, ADF must embrace flexibility and novelty to facilitate the rapid development of new capabilities, while simultaneously maintaining tight control over personnel and operations through a rigid and accountable command structure (Lenfle & Loch, 2010). While this classic exploration-exploitation ambidexterity tension plays out daily across multi-billion-dollar projects, its real-world effects are felt by individuals across ADF who become positioned 'directly at odds with another' (interviewee 5) and must constantly work through contrasting objectives, perspectives and ways of working (Andriopoulos & Lewis, 2009).

Our findings concern the people at the centre of innovation in ADF who face a range of tensions in order to identify and deliver capability advantages. Their accounts demonstrate how tensions are perceived as barriers to innovation and how rationalising and responding to these barriers requires a deeply 'human centred approach' (interviewee 17). As one innovator put it, 'you get different problems along the way and have to sit down as a group of humans to find out how to best address them' (interviewee 18). According to another, 'what I initially thought was a very technical problem, was actually all about human centric themes' (interviewee 27).

Responses to barriers

With barriers to innovation so commonplace in ADF, innovators had developed strong opinions about how barriers should be thought about and responded to. While the specifics of each innovator's encounters with barriers varied, their accounts revealed clear divisions across the sample between those approaching barriers with a dilemma mindset, those approaching barriers with a paradox mindset and those using a combination of both (see Table 5).

Mindset	*Dilemma*	*Paradox*	*Dilemma & paradox*	*Unable to categorize*
Interviewees	1 2 4 9 12 20 21 22 25 33 36 38	6 8 10 13 14 15 17 18 16 23 26 29 30 31 34 35	3 5 7 11 24 27	16 28 32 37
Total	12	16	6	4

Table 5. Interviewee mindsets

We identified twelve innovators with a dilemma mindset who felt deterred by barriers. These innovators saw barriers as representative of a fundamental contradiction between ADF priorities and their projects' needs and would therefore try to *anticipate and avoid* barriers. We identified sixteen innovators with a paradox mindset who felt motivated by barriers. These innovators saw barriers as part of a valuable tension that drove ADF to be both innovative and reliable, and therefore displayed an *accept and reframe* response to work with barriers. Finally, we identified a small group of six innovators whose reflections pointed to both a dilemma and paradox mindset used at different times. These innovators expressed more neutral feelings towards barriers, describing how they would use intuition and a range of emergent behaviours to *fit and feel* their projects through and around barriers as needed. Aside from four innovators whose interview responses did not provide a clear indication of their mindset given our coding structure, the responses of *anticipate and avoid*, *accept and reframe*, and *fit and feel* describe

the breadth of responses to barriers resulting from innovators adopting a dilemma mindset, paradox mindset or combination of both mindsets.

Anticipate and avoid

Across our data, twelve innovators exhibited an anticipate and avoid response to barriers, characterizing them as threats that fundamentally jeopardized the viability of their projects. They described these barriers as representing an irreconcilable contradiction between the aims of their projects and a risk-averse, reliability driven approach to function that had been deeply normalized in ADF. This caused innovators to feel that the level of commitment to innovation expressed in ADF was incongruent with the level of support they could expect in their attempts to realize innovative capabilities. They noted that while senior ADF personnel had expressed a clear commitment to delivering new capability advantages through innovation, this commitment was superficial and poorly defined. Without a clearer definition of what innovation is, and a framework of incentives to support projects falling under this definition, innovators felt that encountering insurmountable barriers to their projects was inevitable. As one innovator noted, *'I don't think air force has actually defined what innovation is; we throw the term around willy-nilly in different contexts and it means different things. It has created a problem because we haven't defined what innovation is or how we're going to move an idea to implementation.' (Interviewee 1)*

In this way, the perception that barriers were threats emerged from innovators feeling as though their projects were happening at the fringes of ADF and needed to be fought for if they were to survive and deliver a capability advantage. These project leaders explained that they 'don't feel valued a lot of the time… [and] feel like a very small, insignificant cog in a wheel' (interviewee 22). One innovator described feeling that their project was 'just stuff

injected on top' of a resistant organization rather than part of a 'change from within' (Interviewee 20). Generally, this perception of adversarial tension caused negative affective responses from innovators, including feeling 'de-motivated' (interviewee 38), 'closed off' (interviewee 33) and 'frustrated' (interviewee 2). It would also lead innovators to characterize barriers as insurmountable and develop responses targeted at anticipating and avoiding 'the blocks that stop innovation' (interviewee 12).

For innovators who saw barriers as threats, being able to anticipate and avoid barriers was seen as a necessity if their projects were to succeed. This was generally achieved by managing how a project moved through the ADF regulatory system by, for instance, classifying projects in particular ways or contracting out parts of projects to external stakeholders. This response to barriers was unique in that innovators did not attempt to confront, change or work with barriers, but instead would manage their projects in specific ways based solely on the anticipation of particular barriers. As one innovator put it, 'sometimes you need to bypass the walls that are built around you' (interviewee 38). In most circumstances, use of the anticipate and avoid strategy was motivated by an expectation that a project would not be able to begin or continue if a certain barrier was to manifest. For example, one innovator looking to propose a new use for drones explained that having seen the barriers their peers had faced when trying to start new projects, they decided that the best way to begin their project would be to pitch it outside of their immediate chain of command. As they recalled, *'I had to go to many ranks up above me to get endorsement, certainly navigating the chain of command appropriately is a very key tool which assisted us turning a concept into an approved project under a month' (interviewee 36).*

In this instance, the innovator anticipated resistance from their direct superiors who they felt may not see the value in the project or feel that supporting the project would expose their reputations to risk. By stepping out of their usual chain of command and 'communicating

with like-minded people who are senior in the chain of command' (interviewee 36), the innovator was able avoid this potential barrier and turn their idea into an endorsed project.

Innovators also described using the anticipate and avoid strategy to bypass the extensive regulatory processes that projects would usually be subject to when reviewing performance, applying for funding or contracting with external stakeholders. For example, one innovator recalled how peers had carefully navigated progress review processes to avoid additional regulatory processes: *'If your project is identified as a project of concern, it creates a huge amount of extra work in responding to additional management overlays. So obviously there is a tendency to try and report that projects are– you know, promote optimism… because as long as you can show there is a way out of the hole, you will hopefully avoid being put on that list of concerning projects.'* (interviewee 9)

Attempting to avoid the extreme delays imposed by regulatory processes was a common theme across the accounts of innovators. For example, one innovator described having learnt how to effectively 'run away from and avoid contracts and finance' but acknowledged that without changes to how projects were processed they would be 'inevitable' barriers for many projects (interviewee 2). They saw the underlying cause of this being a lack of sensitivity in the ADF regulatory system to variations in project scope, suggesting that 'there are contracts you should be able to strip shorter, cleaner and quicker because it involves smaller amounts of money' (interviewee 2). So common was this strategy of avoidance as a response to regulatory barriers one innovator anecdotally recalled a previous Chief of Air Force saying that 'if he wants something to fail, he'll leave it in the system but if he wants to do something quickly, he'll pull it out of the standard process' (interviewee 1).

However, innovators noted that the anticipate and avoid response was not always beneficial to projects as it could cause them to miss opportunities to incorporate new ideas into

their projects and enhance delivered capabilities. For instance, one innovator experimenting with a new explosive detection system recalled attempting to avoid situations involving 'group work' (interviewee 33), as in past projects this had become a barrier to decision making. However, this anticipate and avoid response caused them to overlook possibilities for their project and left them going down what they described as a 'rabbit hole', noting: *'My view of the project was very narrow. I only had contact with one, maybe two other people, it was essentially just me on the project, so I didn't really have visibility or I guess the interest to research and see what else people were doing… Then come the air show… we were stuck in a tent with all the other projects and technology demonstrations and it was really good seeing all the different things they were doing… it showed me that I'd gone down a bit of a rabbit hole' (interviewee 33).*

Accept & reframe

Sixteen innovators described an approach centred on accepting barriers as a necessary part of the innovation process, and reframing their projects to integrate learnings from these barriers. These innovators attempted to use barriers to motivate action, trigger creativity and reframe their projects. In this way, innovators exhibiting the accept and reframe response saw barriers as important 'roadblocks' (interviewee 19) that were part of an ongoing process of working through contrasting perspectives to arrive at relevant learning and capability advantages. As one innovator described: *'Any kind of tension always comes with certain barriers. For me, it's about figuring out how to relieve that tension by working through the barriers. In my case, I like to take a bit of time, sit down, evaluate what a barrier is telling me, whether it's a technical barrier or a personal barrier, for example, and find an alternative solution to what we'd been doing prior to that.' (Interviewee 35)*

Unlike innovators looking to avoid barriers, innovators who accepted barriers as a necessity did not see their projects at the fringes of ADF but instead described how ADF had undergone a 'change in behaviour to think differently and get out of a template centric view' (interviewee 6). They described this change as having been brought about by senior personnel making statements to bring innovation further into the cultural fold of ADF. For example, one innovator highlighted the Chief of Navy 'actively pushing' a call to 'think differently' (interviewee 6), while another pointed to Deputy Chief of Navy creating an outlet 'for people to come during their working day, time permitting, to be creative and to try something new' (Interviewee 17). Similarly, another innovator stated: *'The current Chief of Army doesn't care about leaving with a bumper sticker, he's really challenging how we do business, he wants us to be more innovative… If you create a climate that encourages innovation, you'll see people putting the effort in to thinking of new ways of doing business.' (Interviewee 13)*

By working in an environment seen to be 'very supportive of innovation' (interviewee 10 & interviewee 14), these innovators took a different approach to engaging with barriers to their projects, feeling as though they had 'a license to explore problems through a different lens' (interviewee 17). Barriers were seen to introduce a 'productive tension' (interviewee 35) capable of honing the direction a project was taking, and as a result, were generally met with positive affective responses. These innovators described feeling 'comfortable' (interviewees 23 and 30), 'driven' (interviewee 35), 'excited' (interviewee 23) and 'motivated' (interviewees 18 and 35) when barriers brought tensions to their projects.

By feeling comfortable, and in some cases motivated by the presence of barriers, the acceptance response encouraged innovators to take time to consider whether the aims of their project should be reframed rather than looking to move past barriers as quickly as possible. As one innovator described, 'It's really about trying to explore ideas with innovators and seeing how to frame your realisations in ways that build capability' (interviewee 14). In this way, the

comfort these innovators felt when faced with barriers encouraged them to use conflicting opinions and contrasting aims to enhance their project: *'Sometimes you think of barriers as threats. In our mind we think, "oh someone else is going to come in and stop us, or they're going to have a better idea or they're going to take this thing and change direction", but that's not the case at all. If you open yourself up to the other perspectives and a different frame, a different way of looking at it, it enhances the process, not take away from it.' (interviewee 18)*

While innovators described different approaches to reframing their projects, reframing generally involved an initial period of reflection on the aims of a project, identification of barriers preventing the project reaching its next milestone, and a reformulation or 'pivot' (interviewee 35) in the project's aims such that its next milestone was achievable. This practice required innovators to reshape the direction and value proposition of their projects by building in learnings they had taken away from their encounters with barriers. As one innovator described it, reframing involved 'pulling back the layers of a problem to look at things and go 'Okay, let's look at this from a different angle' (interviewee 29).

However, innovators also described how an accept and reframe response could have negative consequences for their projects, such as overloading them with information and contrasting perspectives to the point where finding a clear way forwards was very difficult. For example, one innovator whose project focussed on improving training for JOINT strategists highlighted how a major barrier was accessing the depth and diversity of practitioner knowledge in the area, and so took a proactive approach to embrace the barrier 'conducting workshops and teleconferences with the key stakeholders' (interviewee 26). However, they described how this approach did not help demystify their project but only made finding a way forwards that accounted for the many different perspectives all the more challenging, noting 'it's quite hard to prioritise and differentiate through all the noise' (interviewee 26). While at the time of interview their project was ongoing, they felt it was at risk of failing, citing previous

project experiences where the gradual accumulation of stakeholder interests had led to what they described as ‘a death by a thousand pinpricks’ (interviewee 26).

Fit and feel

Finally, a small group of six innovators described a third response to barriers that we call the fit and feel response. Innovators adopting this approach described how they adapt their posture towards barriers over time and never rely on a single process to guide their projects. As one innovator explained, *‘Innovation is never a system subscribed solution, it’s rather a process of adaptive and emergent behaviours which come from employees being able to fit and feel their way towards more efficient, more practical and better solutions’* (interviewee 5).

Innovators described the fit and feel response as a highly pragmatic and opportunistic approach that they applied across all aspects of their work and not only their innovative projects. As one innovator noted, ‘It’s about understanding the process of getting from one place to another and the ability to adapt over time… a lot of the time you’re just making things work, it’s more about adaptability than innovation’ (interviewee 7). While innovators who described using a fit-and-feel response generally saw barriers as threats to their projects, past experience had taught them that barriers could provide valuable feedback about how projects fit against prevailing sentiments in ADF. As one innovator described, ‘nobody wants to fail because of a barrier, but sometimes they’re an opportunity to learn or to get feedback, which is why they can be a useful reality check’ (interviewee 11). In this manner, the fit-and-feel response acted as somewhat of a midway between avoiding barriers as threats to the survival of a project, and accepting barriers as opportunities for the enhancement of projects. Innovators in this group repeatedly described the importance of engaging in ‘emergent and disruptive behaviour’ (interviewee 3) to find a balance between working around and working with

barriers. As one innovator said: *'it's about emergent behaviour, we want to continually rethink what we're doing so that our projects can generate a kind of tempo that keeps them at the front of technology and on top of any barriers that crop up'*(interviewee 5).

While this small group of innovators described emergent behaviours in different ways, their accounts coalesced around describing barriers as risks that required recurrent 'sensing' (interviewees 3, 5, 7, 24) and 'treating' (interviewees 5, 7, 11, 24) throughout a project. One innovator compared this emergent approach to operating in a live battle scenario in which 'you're forever sensing and looking to emergent behaviour that is able to treat risks as they are identified or actualise' (interviewee 5). As in a battle situation, the ability of innovators to intuit which prevailing risks or barriers required consideration and which did not, was described as something developed through extensive situational experience overseeing projects within ADF. Given how reliant this approach was on experience, innovators emphasized the importance of communicating their ongoing sense of how different barriers might threaten or enhance a project to stakeholders. As one innovator described: '*I think to balance the two approaches you need to provide context for people…. You're never going to sell a methodology that's fundamentally orientated towards threats or opportunities unless you make it clear why that's right given the context… For an organization that's very outcomes focused, that process needs to be clearly communicated.'* (interviewee 24)

This emergent approach was exemplified in one innovator's description of their approach to developing a new intelligence framework. Looking to integrate two intelligence groups with the chain of command, the manager encountered many barriers including access to relevant personnel and their own availability to work on the project. Initially, they were able to work around these barriers by drawing on information from ADF artefacts and progressing the project outside of normal work hours, however, as the project progressed they increasingly recognized that underlying tensions between the culture and processes of the two intelligence

groups was a ‘consistent challenge’ for the project and a growing barrier that required an adaptation in their approach, if the project was to succeed. They described the barriers as ‘trying to make the same people jump back and forth between two culturally very divergent roles’ (interviewee 24). In response, the innovator temporarily sacrificed project progress to work flexibly with stakeholders from both intelligence groups to learn about tensions and follow leads to a possible solution as they emerged. Ultimately, this emergent analysis allowed the innovator to identify inadequacies in intelligence training that left both groups ill-equipped to bridge their contrasting workplaces, noting: *‘You receive a baseline training and an expectation that you will be able to adapt and move back and forward. That gradually emerged from the analysis as a critical flaw, that we don’t provide people with the necessary emotional intelligence or capability to do that’* (interviewee 24).

This processes of feeling out barriers allowed the innovator to avoid some barriers while working through an important barrier that honed the direction of the project by highlighting the importance intelligence adaptability training. As they surmised, ‘I was able to follow an emerging problem that we don’t have an existing framework to adequately capture’ (interviewee 24). While overall this small group of innovators described the fit and feel approach as being a flexible enough approach to either avoid, overcome or incorporate most innovation barriers, these innovators were not immune to failure. Rather, they put particular emphasis on just how important failure was to their ability to learn and refine their approach to innovation. One innovator described this as ‘failing forward’ or ‘fail safe’, noting that Defence is ‘an environment where failure is not encouraged, but is a necessary function of learning’ (interviewee 5). They felt that when innovators accrue experiences with failure, learning how to move projects forward becomes a ‘truistic built into their DNA’ (interviewee 5).

DISCUSSION

Much has been written about barriers to innovation, yet we still only have a limited understanding of how individuals think, feel and act towards such barriers. While we know that individual's disposition towards innovation influences their approach to innovative practices, there is limited understanding on how mindsets influence the ways individuals respond to barriers (Ajzen & Fishbein, 1980; Landau, 1993). To date, researchers have made headway in identifying how particular traits, such as, age, tenure at company, attitudes and abilities, can lead innovators to be more or less effective (Buschow, Nölle, & Schneider, 2014; Hueske et al., 2015; Hueske & Guenther, 2015). As barriers have come to the fore in innovation research, in-depth qualitative studies have helped unpack how individual practices like non-linear processes, fuzzy front-end (FFE) focus, managing transitions between FFE and output, and in-market advocacy enable innovators to overcome barriers (Griffin et al., 2009; Griffin et al., 2014). However, this research approaches barriers from a preventative stance and primarily gives insight into how sustained use of particular practices enables effective innovators to prevent common barriers, such as the "valley of death", as responsibility for innovations passes hands (Griffin et al., 2014, p. 1370). Without uncovering innovators' thoughts and feelings towards the tensions that give rise to barriers, our understanding of why innovators respond to barriers in different ways will remain incomplete (Andriopoulos et al., 2018). To address this gap, we draw on the analytic lens of mindsets to describe the underlying interpretative frames of innovators (Celuch et al., 2014; Kuczmarski, 1996; Lahiri et al., 2008). Specifically, we use the dilemma mindset (Zheng et al., 2018) and paradox mindset (Miron-Spektor et al., 2018) as lenses to compare how innovators with differing cognitive and affective dispositions towards tensions respond to barriers.

With a lack of research investigating micro-level barrier dynamics, our study sheds light on the importance of individuals in managing the impacts of innovation barriers (Griffin

et al., 2014; Hueske & Guenther, 2015; Yeşil & Hırlak, 2013). Across our data, the ways in which innovators thought about barriers, and their role more broadly as an innovator in the ADF, had a significant impact on how projects progressed. Aside from barriers related to the safety of ADF personnel that placed strict boundaries on how projects could proceed, there were no cost, knowledge, regulatory or reputational barriers that innovators uniformly described as insurmountable. Likewise, our findings demonstrate how individual mindsets can impede the overcoming of barriers. While existing theory posits that 'individual related factors rather than organizational and technological factors operate as barriers toward individual innovation' (Yeşil & Hırlak, 2013, p. 52), our findings develop a more robust understanding of how individuals are exposed to tensions which manifest as barriers, and further, how their responses to barriers are deeply embedded in their orientations towards such tensions.

More specifically, our results identify three mindset orientations towards tensions: dilemma mindset, paradox mindset and a combination of both dilemma and paradox mindset. Our findings demonstrate how these mindsets motivate innovators to adopt drastically different responses when managing the influence of barriers on their projects and shed light on the types of circumstances in which each response is best suited. Innovators with a dilemma mindset described feeling as though ADF operated in opposition to their projects and that barriers stemming from this tension would threaten the survival of their projects. Consequently, they adopted an *anticipate and avoid* response scanning the horizon for barriers they were likely to encounter and strategically navigating their projects around these barriers. While existing theory describes how innovators implicitly avoid certain barriers (Hueske & Guenther, 2015), innovators in our sample showed how avoidance can take on more extreme forms of structural and processual circumvention (see, for instance, interviewee 36 who pitched their project outside of their chain of command).

More importantly, however, our findings point to the cognitive and affective drivers underpinning the choice of innovators to avoid barriers. Our findings highlight how for innovators with a dilemma mindset, barriers trigger affective discomfort and a defensive cognitive frame that motivates attempts to avoid barriers. The accounts of innovators conveyed how this rather absolute stance towards tensions had mixed effects depending on the type of project and barriers encountered. By focussing their efforts on avoiding barriers in the first instance rather than adapting their project to pass through barriers encountered, innovators with a dilemma mindset were better positioned to preserve the original capability aims of their projects. While innovators working on more narrowly defined projects, like acquisition projects, described this approach as effective for progressing projects as quickly as possible, innovators working on more exploratory or radical innovation projects encountered more challenges. By attempting to avoid barriers at all costs, innovators with a dilemma mindset working on more broadly defined projects could miss opportunities to incorporate new ideas into their projects and enhance any delivered capabilities (see, for instance, interviewee 33 who described overlooking directions for their project).

Contrastingly, innovators with a paradox mindset described feeling comfortable working in contexts characterized by ambidexterity tensions. Our findings highlight how for innovators with a paradox mindset, barriers trigger cognitive engagement and affective comfort. With this more open posture towards tensions, these innovators were adopting an *accept and reframe* response to barriers. The innovators welcomed encounters with barriers as valuable opportunities to work through tensions and hear different perspectives. As they slowly worked through the tensions, they would iteratively adjust the aims of their projects to incorporate learnings. These accounts show how the paradox mindset leads innovators to accept multiplicity & tensions, hearing a range of perspectives and incorporating emerging

insights into their projects (see, for instance, interviewee 18 who described opening their project up to be enhanced by other perspectives).

Existing theory highlights how organizations can be 'positively affected by barriers' (Madrid-Guijarro et al., 2009, p. 484). However, most research on an individual-level has focussed on the negative affective outcomes of encounters with barriers (Todt et al., 2018). While we know that experiencing innovation barriers can create new insights and support learning (Shepherd et al., 2011), our findings point to a more nuanced understanding of the circumstances in which such learning is helpful. The accounts of innovators in this study suggest that an open posture towards tensions has mixed effects depending on the type of project and barriers. By focussing on what encounters with barriers were revealing about their projects, innovators with a paradox mindset felt they could be more aligned with the dynamic capabilities needs of ADF. In exploratory or radical innovation projects, innovators described being empowered by tensions and contrasting perspectives as they had both the time and scope to reframe the capability aims of their project. However, our findings also highlight how a paradox mindset may become a trap for innovators. By embracing tensions and encounters with barriers, innovators with a paradox mindset could become overloaded with information and contrasting perspectives, leading their projects to stall (see, for instance, interviewee 26 who described feeling overloaded with perspectives on their JOINT training project). This is in contrast to existing research which has positioned a paradox mindset as positive for innovation (Liu et al., 2019; Miron-Spektor et al., 2018).

Finally, we identified a third group of innovators who adopted a combination of the dilemma and paradox mindset. These innovators seemed to draw upon each of the mindset in a dynamic way, depending on the needs of their projects. Thus, this more contingent mindset enabled innovators to take a context-specific approach to barriers, which we have called the *fit and feel* response. This group of innovators worked in an emergent fashion, evaluating the

upsides and downsides of anticipated or encountered barriers iteratively as their projects progressed. By having a more flexible posture towards tensions, these innovators described barriers situationally, sometimes as constraints needing to be avoided and sometimes as ways to tap into generative tensions that would enhance the outcomes of their projects. By highlighting how a combination of the dilemma and paradox mindset helps innovators adapt their practices to barriers contextually, this finding builds on research highlighting that an important 'direction for future research is the context specificity of innovation barriers' (Hueske & Guenther, 2015, p. 139). While existing research demonstrates how serial innovators solve problems by navigating the complex political environments around projects and 'following their intuition' (Griffin et al., 2014, p. 1367), our findings shed light into the mindset of these innovators, demonstrating how the intuition to avoid some barriers, while working with others, stems from contingent reliance on the dilemma and paradox mindsets (see, for instance, interviewee 24 who described barriers as both threats and opportunities).

Unlike those innovators with solely a dilemma mindset or paradox mindset, these innovators did not describe specific scenarios in which an emergent fit and feel approach was detrimental to their project. Rather, the adaptive fit and feel response to barriers allowed these innovators to dynamically manage how much tension was built into their projects over time, maintaining a balance between avoiding tensions but missing opportunities, and accepting tensions but becoming overwhelmed. However, even these innovators highlighted how intensely challenging barriers can be both professionally and personally for innovators. While the more flexible fit and feel approach they had developed with experience equipped them to navigate the complex, tension-riddled environment of ADF, they too described being familiar with failure.

Overall, the accounts of these innovators using a contingent fit and feel approach to barriers advances our understanding of how innovators can deploy emergent, context-specific

responses to barriers (Hueske et al., 2015). Their accounts also reinforce the importance of resilience and learning from failure as formative experiences in the development of capable innovators (Shepherd et al., 2011; Todt et al., 2018).

Theoretical implications

This study holds two important implications for theory. First, our study highlights the salience of the innovator mindset in informing the types of responses deployed to barriers. Second, this study builds on the growing body of literature exploring how a paradox mindset influences work behaviour and points towards the development of a contingent framework for the types of project settings where a paradox mindset might be more suitable to addressing barriers and settings where other mindsets, such as a dilemma mindset, are required.

The role of mindset in responding to barriers

Tensions cut through organisations leading to the finding that 'firms need to address conflicting demands… across distinct levels, from the individual and group levels to the firm level' (Lauritzen & Karafyllia, 2019, p. 118). Throughout our study, innovators described how underlying tensions would impact their work by placing barriers in front of them. Innovators perceived tensions in the strategic aims of the ADF, between different parts of their organization (for instance those working to mitigate risk and those searching for new capabilities), and even tensions within their own work (for instance between daily responsibilities and project work).

While the close connection between tensions and barriers can be traced far back in the literature (Noth, 1973), our study implies a new understanding of the processual dynamics that

underpin this connection. Our results indicate that innovation barriers serve as a dynamic interface between tensions and embedded organizational actors. Rather than describing barriers as an outcome of actors' attempts to directly address identified tensions (Lauritzen & Karafyllia, 2019), our study characterizes barriers as a type of boundary object that gives actors a window into underlying tensions and the many pathways through these tensions (Koskinen, 2005). Further, we demonstrate how by becoming the target of actor responses, barriers inversely give actors a gateway to express their individual posture towards particular tensions and influence how tensions present in barriers in the future. In this manner, barriers create moments of dialogue between actors and tensions.

Perhaps most importantly, by demonstrating how barriers intercede between underlying tensions and individual agency, our study introduces mindset as an important dimension of how individuals respond to barriers. In contrast to individual factors such as age, tenure at company, abilities and attitudes, which have been the subject of previous barrier research (Buschow et al., 2014; Hueske & Guenther, 2015), the effect of mindset, as an encompassing cognitive and affective mental frame, has only been studied at the organizational level (Töytäri et al., 2018).

We show that an innovator's mindset towards tensions is an important arbiter in the process of experiencing barriers and formulating responses. The cognitive and affective traits of a dilemma mindset lead innovators to see barriers as threats and deploy anticipatory avoidance responses, while the cognitive and affective traits of a paradox mindset enable innovators to accept barriers as necessary triggers for the reframing of their projects. While existing literature theorizes that individuals become effective innovators 'perhaps through a combination of recognized personality traits, innate idealistic perspectives on the world, and strong intrinsic motivation to innovate' (Griffin et al., 2009, p. 238), our findings show how studying individual traits, perspectives and motivations through the lens of mindsets can lead

to more granular insights about the types of innovative behaviours motivated by specific cognitive and affective profiles.

This new prism demonstrates more clearly how the processes of formulating a response to a barrier begin well before an individual actually encounters a specific barrier (Griffin et al., 2014). We know that serial innovators are successful because they pre-emptively limit the influence of barriers; however existing research explains this through the behaviours consistently exhibited by these innovators, such as, for example, an end-to-end project stewardship (Griffin et al., 2014). By distinguishing between how innovators with different mindsets describe responding to barriers, our study builds on this research to suggest that innovators' responses to barriers are preconfigured by cognitive and affective orientations towards tensions and are less dependent on barrier specifics (see, for example, interviewee 36 who described avoiding barriers based on their perception of peer experiences rather than based on encounters with specific barriers). As increasing interest is directed towards how individual factors connect with group and organisational factors when responding to barriers, it is important that the role of mindset in preconfiguring individual level responses is emphasized (Buschow et al., 2014; Griffin et al., 2014; Hueske & Guenther, 2015).

Contingencies of using a dilemma and paradox mindset

Finally, this study has implications for theory on organizational tensions, in particular the emerging paradox mindset literature. Existing theory indicates that individuals with a dilemma mindset feel confronted, deterred, demotivated and disempowered by tensions, and break tensions down into 'either-or' decisions between adversarial elements (Hunter et al., 2017; Smith & Tushman, 2005; Zheng et al., 2018). Contrastingly, individuals with a paradox mindset feel comforted, engaged, motivated and empowered by tensions and see mutualism

and interdependence as things which should be maintained (Liu et al., 2019; Miron-Spektor et al., 2018). To date, there has been little research demonstrating how these mindsets translate into behaviour in different work contexts (Miron-Spektor et al., 2018). Our study situates the dilemma and paradox mindset in a real-world context, responding to calls for research exploring how actors 'manifest paradoxical behavior in different situations' (Liu et al., 2019, p. 15).

Our study shows that innovators with a dilemma mindset feel threatened by barriers and become highly defensive, while innovators with a paradox mindset feel comfortable working with barriers. To date most theory has investigated the dilemma and paradox mindsets in isolation, resulting in calls for more research contrasting the mindsets (Miron-Spektor et al., 2018). In contrasting the use of dilemma mindset against the use of paradox mindset in response to different innovation barriers, our study advances a contingent understanding of the suitability of these mindsets for innovators, heeding calls for a deeper understanding of the boundary conditions of specific mindsets (Liu et al., 2019; Waldman, Putnam, Miron-Spektor, & Siegel, 2019).

In contrast to existing case studies, the accounts of innovators in our study did not demonstrate that either a dilemma mindset or paradox mindset was preferable in all circumstances. Zheng et al. (2018, p. 593) identify that 'there could be short-term setbacks from a paradox mindset and temporary reprieve from a dilemma mindset' for women leaders, but find that 'over the long term, a paradox mindset tends to open up possibilities… [while] a dilemma mindset inevitably leads to oversight of one side of a paradox, adding to tensions, and fuelling a vicious cycle'. Similarly, Waldman et al. (2019, p. 5) suggest that a paradox mindset may 'increase complexity and uncertainty… [and] hold people back from taking a stand for a specific idea' but identify situations where this is the case. In our study, some innovators described experiencing long term success using a dilemma mindset (for instance, interviewee

2 who learnt to avoid barriers created by contracts and finance), while others described encountering long-term challenges using a paradox mindset (for instance, interviewee 26 who became overwhelmed with information). While a paradox mindset helped innovators reframe the aims of their project to open doorways, sometimes this would be detrimental to the project, inducing conflict, diluting aims and obscuring a way forwards. We suggest that this is because in situations where individuals are presented with a mix of powerful voices and diverse perspectives, the welcoming of tensions enabled by a paradox mindset may divide and convolute projects, leading to delays in delivering outcomes in comparison to seeking to circumvent the tension altogether (Sleesman, 2019; Waldman et al., 2019).

Overall therefore, the accounts of innovators in our study indicate that a dilemma mindset is better suited to projects with narrowly defined aims, as reframing is not an option for these projects, while a paradox mindset is better suited to projects with broadly defined aims, as these projects have scope to reframe aims while working with barriers. Given this new appreciation for the contingencies involved in using a dilemma vs a paradox mindset, we suggest that innovators who adapt their mindset over time, relying on experience and intuition to *fit and feel* their way through barriers, were best poised to deliver innovative outcomes.

This contingent understanding contributes to the ongoing debate about paradox mindset and escalation commitment (Sleesman, 2019). Understanding why and how actors decide to continue with potentially failing projects is important for limiting the exposure of organizations to the influence of misguided leaders (Brockner, 1992; Staw, 1981; Sundaramurthy & Lewis, 2003). On the one hand, literature indicates that actors who can work with tensions are less likely to escalate commitment to failing projects as they are better positioned to incorporate multiple perspectives and consider multiple courses of action (Calic, Hélie, Bontis, & Mosakowski, 2019; Sundaramurthy & Lewis, 2003). On the other hand, literature suggests a paradox mindset increases the likelihood of actors committing to failing projects as they feel

more comfortable continuing despite tensions (Sleesman, 2019). Our study offers new insight into the mechanisms that may be at play in determining whether paradox mindset deters or encourages innovators to escalate commitment to their projects. Our findings help build a clearer image of specific circumstances under which a paradox mindset may inhibit the ability of actors to make prudent decisions regarding escalation commitment, responding to the call that 'future research may reveal that a paradox mindset can potentially unbind individuals from a failing course if they have a creative alternative to pursue' (Sleesman, 2019, p. 95).

Managerial implications

Our study also holds two important managerial implications.

Including mindset in selection criteria

As innovation research has brought individual factors under the spotlight, managerial interest in how to choose the right individuals for innovation tasks has grown (Griffin et al., 2014). Our findings indicate that mindset is an important criterion for innovation managers to consider when designing selection criteria for innovative positions. While currently, the skills and abilities of individuals are often the paramount consideration when selecting candidates for a position (Potočnik, Anderson, & Latorre, 2015), our findings suggest that consideration of how an individual thinks and feels about tensions may be equally important. Given that mindsets develop slowly over time, it makes most sense to track innovators' mindsets from early in their careers (Crum et al., 2013). This could involve interviews with potential candidates to establish how they have thought and felt about tensions in the past, or through the use of qualitative instruments assessing different mindsets (Miron-Spektor et al., 2018).

For projects with narrow aims and less uncertainty, for instance, incremental innovations via acquisition, innovation managers should look for innovators with a dilemma mindset who can anticipate and work around barriers. For projects with broader aims and more uncertainty, for instance, exploratory projects, innovation managers should look for innovators with a paradox mindset who are open to the challenges of barriers and able to accommodate contrasting perspectives. While innovators who can move between the dilemma and paradox mindset are most well equipped to manage a range of barriers, these individuals were, in our sample, highly experienced so may not be as relevant to innovation managers searching for 'high-potential individuals… early in their career' (Griffin et al., 2014, p. 238). In this way, innovation managers could tailor the cognitive and affective profiles of innovators to the types of barriers they are likely to encounter.

Building innovator experience with barriers

While our findings highlight a small group of innovators who could adapt their mindset over time to *fit and feel* a way forward for their project, their accounts suggest that this flexibility had only come through years of experience addressing innovation barriers. Across our sample reputational risk was consistently mentioned as a major deterrent to junior innovators. As research quells mysticism around serial innovators and more individuals look to build careers in innovation (Griffin et al., 2014), it is important for innovation managers to foster cultures receptive to failure. Our study indicates that only through ongoing encounters with barriers, and potentially failure, can innovators be bolstered with the ability to read situations intuitively and respond flexibly. Treated wrong, failure can spark negative emotions, a loss of commitment and skewed sense of self in innovators (Todt et al., 2018). Treated right, failure can also build resilience, learning and the experience needed to overcome a wide range

of barriers (Shepherd et al., 2011). If innovation managers are to support innovators who can *fit and feel* their way forwards, no matter what challenges face them, it is essential that innovators have both a license to fail and tools to learn and move forwards.

LIMITATIONS AND FUTURE RESEARCH

Our study has two main limitations. First, our study aims to understand the experiences of innovators who are embedded in tensions and innovation barriers. As such our focus has been on teasing out a more nuanced understanding of the interface between an innovator's mindset and their approach to barriers through in-depth qualitative accounts. To establish the extent to which the mindset influence responses to barriers, further quantitative research is needed. Future research could use the three innovator response profiles of *anticipate and avoid, accept and reframe, and fit and feel*, along with measures of dilemma mindset (Zheng et al., 2018) and paradox mindset (Miron-Spektor et al., 2018), as a starting point.

Second, due to the scale, complexity and classified nature of a number of projects included in the sample, we were unable to draw meaningful longitudinal comparisons between the progress of different projects. Rather, our study relies on the richness of the accounts of each innovator to deconstruct the barriers facing their projects and how they had, or intended to, progress past them. While the variety in scope and scale of projects including in our study increases the types of projects our findings are relevant to, future research comparing the connection between different mindsets and responses to project barriers in a smaller sample of projects over time may paint a clearer picture of the temporal aspect of managing tensions throughout projects (Langley, Smallman, Tsoukas, & Van de Ven, 2013).

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Chapter 7. Discussion

Tensions are a divisive 'double-edged sword' to individuals (Andriopoulos et al., 2018, p. 427). In the complex milieu of organizational life, tensions both threaten and support individuals, sometimes creating intractable impediments and other times spurring on progress towards important goals (Sharma & Jaiswal, 2018). Increasingly, tensions have become an important dimension of working in organizations, bringing together connected and contrasting interest that reveal challenges and opportunities (Loch & Sommer, 2019). Some individuals find the push and pull of tensions constrains their imagination and motivation, others experience a notable boost in creativity and innovation when confronted with tensions (Sweetman & Conboy, 2013). And while the delicate tightrope walk of working with tensions has been depicted broadly (De Keyser et al., 2019; M. S. Feldman et al., 2016; Kassotaki et al., 2019; Schad et al., 2016; Sharma & Jaiswal, 2018): scholars have rarely leant into the metatheoretical concept of balance to explore the underlying mechanics enabling individuals to work with tensions (R. Müller et al., 2018; Schad et al., 2016). With organizations replete with tensions, this gap in the microfoundations literature is an important avenue for new insight into how individuals dynamically respond to tensions (Schad et al., 2016). By studying how individuals situationally perceive and achieve balance when working with tensions, we can more fully understand the interface between micro level cognition, emotion and behavior, and the macro level evolution of tensions (Smith et al., 2017).

In this research, I have focused on tensions and how individuals can balance their positive and negative effects. My research aims to answer the research question: How do individuals balance tensions on a micro-level in organizations? To address this question, I have investigated the organizational factors, process dynamics and cognitive-affective factors that play into individuals' responses to tensions. By virtue of the greater flexibility and transience of project-based organizing, projects are often rife with tensions and were therefore chosen as

the research context of my thesis. Through three papers I show how organizational factors, process dynamics and cognitive-affective factors underpin micro-level responses to tension.

In Paper 1 we saw how construction projects have become heavy laden with leadership tensions as traditional leadership archetypes have faltered under a wave of new safety, innovation, sustainability and labor demands. In Paper 2, we saw how the ephemeral team dynamics of a project, combined with mounting time pressures, recurrently surface tensions between continuity and change. And, in Paper 3, we saw how innovation projects highlight latent ambidexterity tensions and throw up barriers, placing innovators in challenging scenarios where their cognitive-affective makeup significantly impacts their responses. Further these studies reflect another growing realization in the project literature: that tensions are not necessarily an anathema to project-based organizing. Across the three studies of this thesis I show how individuals and tensions interact in a constant reflexive interplay that ultimately sees tensions be both a constraining and an empowering force in projects. In Paper 1, tensions between vertical and horizontal leadership challenge institutionalized hierarchies and bring into question longstanding construction processes designed to achieve repeatable and reliable results. The process of vertical leaders handing over control over key aspects of projects, such as safety culture, to horizontal leaders induces conflict and strain, but also frees up vertical leaders to focus on key activities like vision and external engagement, while creating opportunities for creativity and innovation from horizontal leaders. In Paper 2, tensions between continuity and change are seen as a constant threat to the ability of project members to deliver against a pressing deadline, however, it is also this tension that allowed new members with different perspectives and skills into the fold and encouraged the constant documenting of new approaches to project delivery. In Paper 3 tensions between risk and innovation has polarizing effects on innovators, causing some to close off and loose power, while leading others to feel motivated, debate issues and reframe the direction of projects. It is clear that

tensions are a double-edged sword in projects, yet existing literature struggles to explain why this is. With the microfoundations literature offering divergent explanations of how organizational factors, process dynamics and cognitive-affective factors play into the management of tensions, the literature on project-based environments needs a more integrative framework through which to understand tensions.

To address this gap I introduce the metatheoretical concept of balance to show how organizational factors, process dynamics and cognitive-affective factors influence individuals' responses to tensions (Schad et al., 2016). By investigating how individuals achieve a sense of balance in their management of tensions, this thesis delivers both tension-specific insights and higher-level insights into the nature of balancing tensions in projects. Individually, the three studies of this thesis offer a window into how tensions between leadership archetypes, continuity and change, and risk and innovation are managed in projects. In the following three sections, I briefly overview the key findings of each study as they pertain to this thesis. With the relevant findings highlighted, I then draw together the studies to discuss three collective theoretical contributions that expand our understanding of the microfoundations of tension and demonstrate how individuals balance tensions on a micro-level in organizations. For readers who do not require the key findings of each study re-iterated, discussion of the collective contributions of the studies begins at section 5.4.

Collectively, the studies elucidate new insights into common dynamics across the microfoundations of tensions, highlighting how individuals can achieve a dynamic state of balance. The studies show that balancing tensions is a dynamic process combining emergence and punctuation, that sometimes imbalance is required for projects to push past asymmetric tensions, and that contrary to previous thought, the process of balancing tensions encourages both accumulation and transcendence of tensions. These findings give researchers a new window into how individuals leverage the benefits of tensions while mitigating their

constraints. For practitioners, the research positions tensions more clearly in a balance-centric framework that explains more clearly how tensions play into organizational innovation and change.

4.1 Balancing vertical and horizontal leadership

In paper 1, I sought to understand how different leadership styles could be used to leverage beneficial aspects of tensions while mitigating negative aspects. Through a systematic review of 289 peer-reviewed articles, Paper 1 highlights how contrasting vertical and horizontal leadership styles have emerged in the construction industry in response to tensions, for instance between cost controls and sustainability benchmarks, and subsequently generated new tensions as individuals operate under divergent leadership paradigms. In doing so, the review highlights the devilishly recursive nature of tensions that so quickly sees attempts to resolve tensions turn into even more confounding situations involving nested and interlinked tensions. By providing a comprehensive assessment of the construction leadership corpus, the review demonstrates that construction leadership theory has been slow to address this growing tension between vertical and horizontal leadership practices. Instead, construction leadership literature remains largely focussed on the vertical leadership archetype and, in doing so, overlooks evidence from other project industries where horizontal leadership has been shown to improve coordination (Carte et al. 2006; Galli et al. 2016; Hsu et al. 2017; Sullivan et al. 2015), change management (Chreim et al. 2010; Kempster et al. 2014; Rambe and Dzansi 2016), innovativeness (Hu et al. 2017; Kakar 2017; Lee et al. 2015; Sun et al. 2016; Wu and Cormican 2016) and agile project management (Bäcklander 2018; Dybå et al. 2014; Li et al. 2018; Moe et al. 2015; Moe et al. 2019; Xu and Shen 2018). While centralized, hierarchic leadership archetypes have given way to more dispersed, collaborative leadership archetypes in other project-based industries, construction projects, as represented in existing research, continue to depend on the traditional control structures of vertical leadership. From the review, we see how this lagging dependence

can breed tensions in worker safety cultures (Andersen et al. 2018; Choi et al. 2017; Wen Lim et al. 2018; Wu et al. 2016), innovation and sustainability frameworks (Bilal et al. 2016; Ozorhon and Karahan 2017; Papajohn et al. 2017; Pushkar 2018), leadership development (El-Gohary and Aziz 2014; Mikaelsson and Larsson 2017; Wan Muda et al. 2016), knowledge sharing (Love et al. 2016; Ni et al. 2018; Oladinrin and Ho 2016), vision and external engagement (Afsar and Shahjehan 2018; Esther Paik et al. 2017; Liu and Chan 2017; Zhang et al. 2018a), and on-site power dynamics (Ameh and Odusami 2014; Liu and Fang 2006; Liu and Moskvina 2016).

While the core contribution of the review is highlighting how tension between vertical and horizontal leadership presents in construction projects, and producing a research agenda aligned to these challenges, the review also points towards balanced leadership as a way for construction leaders to use tension between vertical and horizontal leadership productively (R. Müller et al., 2018). Balanced leadership supports interaction between vertical and horizontal leaders using a phased approach where teams rely on empowerment, self-management and shared mental models to create a shared socio-cognitive space (a common mental space between teams and project managers), where the balance of power between vertical and horizontal leaders is recurrently negotiated (Müller et al. 2018; Yu et al. 2018).

However, for balanced leadership to be an effective way of managing tensions between vertical and horizontal leadership, the review highlights that the nature of leadership in construciton projects needs to change. Leaders need to expect greater sharing of their responsibilities and greater demand for their ability to integrate the interdisciplinary perspectives of both internal and external project stakeholders. The review posits that as construction projects move away from task-oriented leadership towards more co-operative approaches, vertical leaders need to build new soft skills to complement the technical competence that, until now, had been the backbone of their leadership authority. Vertical

leaders need to aggregate and synthesize information faster so that they do not become bottlenecks in the delegation of leadership responsibilities. As leadership authority is recurrently diffused and centralized, the ability to foster collaboration, share responsibilities and exert control through relationships and social cultures becomes essential (Shirazi et al. 1996). In view of these requirements, the review encourages leaders to tailor their professional development efforts towards softer practices associated with building team competence for knowledge sharing and developing stronger capabilities for sensing complex power dynamics so that they can adapt their leadership to match different balances of authority as they emerge.

Finally, the review highlights how tensions require balancing across different levels from the interaction of individuals to how leadership education and development is designed across an industry. As highlighted in the review, tension between the vertical and horizontal leadership archetypes has been heightened by industry-wide neglect of emerging leadership archetypes. As environmental, technological and labour shifts have increased the frequency with which individuals in construction experience situations where horizontal leadership styles are needed, these experiences have aggregated into industry-wide tension recognised throughout emerging construction leadership literature (Hsu, Li, & Sun, 2017; Thorkildsen, Kaulio, & Ekman, 2015). With tension between vertical and horizontal leadership stratified across the micro, meso and macro levels of the construction industry, the balanced leadership archetype may need to expand to include processes geared towards the balancing of leadership tensions on a larger scale (Müller et al. 2018; Yu et al. 2018).

4.2 Balancing continuity and change

In Paper 2, I respond to calls for "a closer exploration of the dynamics of role change … in order to understand the emergent patterns of stability in organizations" (Bechky, 2006, p. 16). I investigate the processes dynamics of managing tensions in projects, looking in

particular at how tension between continuity and change can be managed. Existing theory portrays teamwork in projects as either enduring (Ebers & Maurer, 2016) or ephemeral (Saetrevik, 2015). I introduce a teaming perspective (Edmondson, 2012) to explore how the boundary between stability and instability in team dynamics fluctuates throughout a year seeing varying levels of continuity and change. When individuals responded to changes in project parameters, non-routine tasks and the onboarding of new members I observed how micro-level actions coalesced in widespread shifts in teamwork. The results of Paper 2 suggest that teamwork is a temporally fluid phenomenon where individuals must adapt to ongoing interplay between continuity and change in the internal and external project environments (René M Bakker et al., 2013). This is achieved through the negotiation of roles within and across teams, reflexive consideration of how roles align and carefully placing limitations on changes with the potential for destabilizing team dynamics. This pushes us to see change in projects as a multidimensional construct and poses the question: what types of changes persist across projects and what types of changes revert upon project completion? (Birnholtz, Cohen, & Hoch, 2009; Ebbers & Wijnberg, 2017; Modig, 2007).

In Paper 2, I distinguish between lasting change in how teams work, which has the potential to persist across projects, and ephemeral changes during situational teamwork performances. While it may stand to reason that those individuals who work across multiple connected projects would benefit from limiting lasting changes that disrupt their approach to work, this was not the case in my study. Rather, the core team who worked across multiple projects exhibited a shifting tolerance for change throughout the project, preserving role continuity in the early phases of the project and encouraging changes during later project phases. In addition, I demonstrate how a growing roster of members (Benishek & Lazzara, 2019) and heightening time pressure (Waller, Conte, Gibson, & Carpenter, 2001) in the last

months of the project caused individuals to engage in a more organic and ephemeral process of change where focus shifted away from roles to tasks.

As widespread teaming emerged members who were formally distant in the organization's growing team structure were brought close and could collaborate flexibly. When teams grow quickly, tension between continuity and change is difficult to manage proactively and so a hyper-flexible approach to teamwork serves as a release valve for role tensions burbling below the surface, allowing individuals to temporarily transcend the constraints of normative role structures without jeopardizing long term stability. Therefore, I suggest that while normative roles structures can support the management of tension between continuity and change by making collective problem-solving second-nature, the transcending of normative role structures can similarly aid the management of tension between continuity and change by accelerating how quickly individuals can roll-out small, targeted changes in response to prevailing project conditions (Bechky & Okhuysen, 2011). In a more temporally fluid environment where individuals can improvise the coordination of work, they have the space needed to test out possibilities for lasting role change without fear of changes enduring beyond the project. This gives us greater scope to understand when and why teams may choose to keep roles as they are, test out lasting changes or introduce ephemeral changes on a task-to-task basis that will not persist into subsequent projects (Bechky, 2006; Ebbers & Wijnberg, 2017; Manning & Sydow, 2011).

Introducing changes is an dynamic and interdependent activity for individuals in projects (Chreim, 2005; Graetz & Smith, 2008). Seeing how individuals use teamwork as a mechanism for leveraging continuity and change has implications for our understanding of how individuals manage tensions. By exploring the dynamics of change in project teams, Paper 2 reveals how micro-level role interactions embed a distributed capacity to absorb and manage tension between continuity and change as a project evolves. When facing complex decisions

between maintaining continuity or introducing change, individuals interact organically with their peers, meaning that as their organization grows and time runs short, their actions coalesce in shifts in how tension between continuity and change are managed. By highlighting how micro-level interactions between interdependent members contribute to addressing meso-level tension, Paper 2 extends our understanding of the process dynamics involved in situational tension management achieving a cumulative effect that reshapes widespread teamwork (Bednarek, Paroutis, & Sillince, 2017; Birkinshaw, Crilly, Bouquet, & Lee, 2016; Gümüsay et al., 2020; Jarzabkowski & Lê, 2017; Panayiotou, Putnam, & Kassinis, 2017; Smets et al., 2015).

To understand how teamwork interacts with tension between continuity and change, researchers must understand the temporal context the teamwork occurs in (Bednarek et al., 2017; Jarzabkowski & Lê, 2017; Schad et al., 2016; Smith & Lewis, 2011). Paper 2 shows how, in a feedback-loop of recurrent projects, social aggregation sees organizational tensions shape micro-level interaction, while reflexively, micro-level interactions sculpt the balance of tensions. In this way, Paper 2 encourages further humanizing of how we think about the process dynamics of tensions in projects by showing how tension management is triggered by constant mingling of recurrent and transient working relationships (René M Bakker, Cambré, Korlaar, & Raab, 2011; Gümüsay et al., 2020; Smith & Lewis, 2011; Smith & Tushman, 2005). It highlights the importance of project timeframes and the temporal context of tensions in framing micro-level responses (Stjerne & Svejenova, 2016). To understand how tensions between continuity and change are managed in the finite timeline of projects, researchers must understand how tensions and team dynamics share a common temporal context within a project that determines how urgent and lasting responses must be. The framework in Paper 2 conceptualizes one formulation of these process dynamics, highlighting how tension between continuity and change and approaches to teamwork co-evolve throughout a project. It

demonstrates how individual experiences with tension coalesce into a blend of teamwork approaches that, in this case study, largely enhanced project delivery.

Looking through the lens of balance, Paper 2 demonstrates that balancing continuity and change is never a 'tidy' process and requires persistent effort to sense, and address, prevailing tensions as new members come and go, project requirements change and deadlines near (Bednarek et al., 2017, p. 97). The process dynamics of balancing tensions cannot be reduced down to or abstracted away from their deeply human foundations, as evaluating where a project has been and where it is going will always be a highly relational process dependent on the individuals present and the time constraints they are faced with (Schad et al., 2016). In this way, Paper 2 responds to the need for research illuminating the murkier *in situ* realities of tension management, and enhances our understanding of how individuals strategically lean on intuition, ambiguity and improvisation to recursively balance tensions (Bednarek et al., 2017; Gümüsay et al., 2020).

4.3 Balancing risk and innovation

In Paper 3, I set out to investigate how individual mindsets influence responses to tensions. To date, theory has argued that individuals with a dilemma mindset feel confronted, deterred, demotivated and disempowered by tensions, and approach tensions as 'either-or' decisions between different elements (Hunter et al., 2017; Smith & Tushman, 2005; Zheng et al., 2018). In contrast, individuals with a paradox mindset feel comforted, engaged, motivated and empowered by tensions and see mutualism and interdependence as beneficial to their work (Liu et al., 2019; Miron-Spektor et al., 2018). By situating the dilemma and paradox mindset in a real-world context I was able to see how the interplay between mindsets, tensions and barriers plays out in innovation projects (Liu et al., 2019). Though Paper 3 we can see that innovators with a dilemma mindset feel threatened by barriers and become defensive while

innovators with a paradox mindset feel comfortable with barriers and become motivated. More importantly, though, Paper 3 raises interesting insights regarding the contingencies of using either, or both, mindsets in innovation projects, addressing calls for research identifying the boundary conditions of different mindsets (Liu et al., 2019; Waldman, Putnam, Miron-Spektor, & Siegel, 2019).

Of particular note, and in contrast to existing research (Zheng et al., 2018), my study does not indicate that either a dilemma mindset or paradox mindset is preferable for all innovation projects. I found that a dilemma mindset was helpful for some individuals as it enabled them to find inventive ways to avoid project barriers, but hindered other individuals who struggled to take on the different perspectives necessary for their project to progress. Likewise a paradox mindset was helpful for some individuals as it helped them reframe their projects and open new doorways with collaborators, but left some individuals struggling to progress their projects that had slowed to a standstill while tensions between different perspectives were being worked through. It is important that the paradox mindset literature, which has been criticised for overlooking negative aspects of the mindset (Sleesman, 2019; Waldman et al., 2019), investigates this undesirable effect further. Individuals in projects constantly encounter a mix of influential voices and diverse perspectives and unlike prior literature, my research indicates that the welcoming of tensions may divide and convolute projects while, in some circumstances, the circumvention of tensions may prove more expeditious. Indeed, feeling too comfortable with tensions may cause individuals to persist with failing projects that, had they had a less favourable mindset towards tension, they may have moved on from sooner (Sleesman, 2019).

In building a clearer image of specific circumstances under which different mindsets may inhibit the ability to make prudent decisions in projects, Paper 3 demonstrates why finding a balanced mindset towards tensions is important for individuals. Overall, the insights from

Paper 3 suggest that finding a desirable mindset towards tension is more complex than previously thought, and that a dynamic balance between the dilemma and paradox mindsets may give individuals the cognitive-affective flexibility needed to overcome a range of barriers effectively. As was demonstrated in Paper's 1 and 2, finding a balanced mindset with regard to innovation tensions is deeply situational, depending on individual experience, project scope and barriers encountered. As a starting point, Paper 3 indicates that in projects with narrowly defined aims, individuals should adopt a balance skewed more towards dilemma mindset as reframing project aims is less likely to be an option and any fundamental barriers encountered could spell the end of the project unless they are able to be avoided entirely. In projects with broadly defined aims, individuals should adopt a balance skewed more towards paradox mindset as these projects are more likely to retain support despite encountering barriers and the possibility of needing to reframe project aims. However, while these trends held true amongst the sample of innovators studied for Paper 3, further empirical research is required to test their broader validity.

4.4 Living in a dynamic state of balance: emergence and punctuation

Combined, the papers of this thesis build three contributions which extend beyond the isolated contributions of each paper. First, the research sheds light on how individuals can create a 'dynamic state of balance' when responding to tensions (Schad et al., 2016, p. 36). It shows that balancing tensions is a dynamic endeavour, one that pivots and shifts throughout projects requiring individuals to constantly evaluate their approach. In particular, the findings of Paper 2 and 3 contribute insights that help advance the debate regarding the stability of balanced tensions over time. As Schad et al. (2016, p. 36) ask, 'is there a temporary balance (a punctuated equilibrium) between opposing elements or a dynamic equilibrium involving

constant shifting?' A punctuated equilibrium view of tensions describes balance as a state only ever able to be temporarily achieved by cycling between elements in opposition (Geerts, Blindenbach-Driessen, & Gemmel, 2010). As tensions interact in an organization, they create periods of stability punctuated by sudden change (Gersick, 1991). However, even in a punctuated equilibrium view of tension, finding balance is a reactive enterprise where individuals must operate one step removed from reality, prompting Sutherland and Smith (2011, p. 541) to suggest, 'In essence, organizations never reach a state of balanced equilibrium'. In contrast, an emergent or dynamic equilibrium view describes the evolution of tensions as a gradual process of continual change meaning that balance can never be achieved in a lasting fashion (Schad et al., 2016). As 'dynamic equilibrium… assumes constant motion across opposing forces' constant work is required to address and redress how the efforts of individuals to balance tensions align with emergent conditions (Smith & Lewis, 2011, p. 386). By polarising these two models, existing literature has made little space for research considering how punctuation and emergence coalesce over time to produce tensions with more dynamic and chaotic movement (Schad et al., 2016).

While previous literature diverges along contrasting models in which either rapid punctuation or gradual emergence is needed to manage tensions, I argue that balanced tensions, while never static, phase through differing degrees of volatility that coalesce in more multidimensional dynamics, slipping slowly at times and fluctuating rapidly at others. In Paper 2, tensions between continuity and change flared up at key moments such as transitions between projects, misalignments between role expectations and periods of rapid onboarding. However, the balance between continuity and change continued to shift and evolve between these moments of heightened tension as unfamiliar members were onboarded, individuals negotiated how to go about teamwork and gradual changes occurred in their project's external environment. Likewise, in Paper 3, innovators described the unpredictability with which

tensions would pose barriers to their projects. While there were particular barriers that would present in a largely predictable fashion, such as barriers related to safety and airworthiness, barriers related to fostering senior support, accessing funding and collaborating with external organizations were less predictable, seeing projects progress in a mix of gradual progress and sudden leaps forwards. In this manner, the findings of this thesis do not cohere exactly with either punctuated or emergent models of change in tensions. Rather, the movement of tensions is similar to that of a double-pendulum, involving a highly chaotic combination of fast and slow movements. The analogy holds twofold in projects where the movement of tensions is highly dependent on initial project conditions, as seen in Paper 2. I therefore propose that to dynamically balance tensions, individuals must anticipate a combination of punctuation and emergence requiring monitoring that is constant but varies in intensity with the rate of change in how tensions are playing out.

While scholars recognize 'balance between order and disorder' (Sutherland & Smith, 2011, p. 545), and the juxtaposition of 'calm and chaos' (Smith & Lewis, 2011, p. 394) in the microfoundations of tension, this thesis demonstrates clearly how tensions unfold through a chaotic combination of punctuation and emergence that tests the experience of individuals. For many of the individuals studied, it was this unpredictability in the tensions they had to work with that kept them interested, engaged and creative in projects. While overcoming one barrier may create rapid progress and a state of seeming stability in projects, there was an almost universal awareness that under the surface tensions were constantly shifting and could rear up to constrain or enhance a project at any time. From this research it becomes clear that not only juxtaposition between opposing forces in tensions can serve to stimulate the 'creative problem solving' faculties of individuals (Smith & Lewis, 2011, p. 394), but that juxtaposition between the rates of change in how tensions play out in a project also engender a sense of motivation and urgency in individuals.

4.5 Asymmetric tensions: extreme weightings and strategies for useful imbalance

This research also furthers our understanding of how individuals can use imbalance to progress projects despite the constraining influence of tensions. Generally when tensions are involved, scholars observe a natural human tendency towards states of balance. For instance, social balance scholars argue that 'in business relationships, if actors perceive a set of cognitive elements as being a system, they will prefer to maintain a balanced state among these elements' (Galati, Bigliardi, Galati, & Petroni, 2019). While existing literature highlights that balance does not necessarily imply the exactly equal weighting of elements in tension, this tendency towards balance shines through with a desirable balance generally being thought of as involving substantial recognition of all elements in tension (Boonstra, van Offenbeek, & Vos, 2017). Likewise, scholars observe a natural resistance to states of imbalance where elements in tension are weighted disproportionally. Adopting an imbalanced approach to tensions is associated with resistance to change, a limited awareness of alternatives and transformation through dialectics. As (Galati et al., 2019) highlight, 'imbalance in the network increases discomfort, which influences attitudes and directs efforts towards regaining consistency and balance, thus resulting in attitudinal change in one or the other party'.

In contrast, I suggest that individuals experience situations involving asymmetric tensions where their options to weight elements closely are limited and extreme weightings are needed to find a suitable 'balance'. In situations where individuals approach a tension from a position of disproportionately *greater* power than other stakeholders involved, their interests are often served by maintaining the status quo by skewing how elements geared towards continuity are pitted against elements geared towards change. This was clear at the outset of the project studied in Paper 2, where the core team held near absolute control over the extent to which newcomers could shape roles and organizational structure. However, this imbalance

had emerged over recurrent projects to serve both the interests of key individuals and the project as a whole as it ensured that knowledge could be more effectively transferred across projects and that the project could start with a clearer trajectory. Additionally, the presence of asymmetric tensions and imbalanced responses did not lead to dialectical mobilization and conflict but rather dissolved into a period of mutual adjustment throughout the mid-phase of the project where tensions were brought into balance more closely (Hargrave & Van de Ven, 2017). In Paper 3, I also observed situations where individuals approached tension from a position of disproportionately *lower* power than other stakeholders involved and similarly benefited from an imbalanced approach to tension. For some individuals with a dilemma mindset, certain asymmetric tensions posed such challenging barriers that the only viable response was a strategy of avoiding situations where they would be forced to work with tensions. It is however important to distinguish between the temporal contexts of these two examples. In Paper 2, imbalanced tension between returning members, such as the core team, and new members, such as new temporary members, was seen to be necessary only at the outset of the project when the stable reformation of the organization was a paramount consideration. Given that this period was temporary, even temporary members with fewer avenues for working through tensions, such as the technical coordinator, could progress their work with only minor changes until chances for more drastic attempts to balance tensions were possible. Contrastingly, in Paper 3 many innovators faced asymmetric tensions, such as conflicting interests in rapid prototyping and satisfying boards, that would persist beyond their projects with great certainty. With far smaller prospects of a shift in the balance of the asymmetric tensions facing them, these innovators were quicker to adopt equally asymmetric responses.

In view of these findings I expect that as researchers study more situations in which extreme or volatile weighting strategies are required for asymmetric tensions, imbalance will carve out space in the lexicon alongside balance as an equally useful metatheoretical concept

to inform micro-level management of tension in projects. While it is clear that in general, individuals experience greater discontentment in situations where they feel incentivised to pursue imbalance, the current thesis demonstrates the utility of imbalance as strategy for progressing projects (Galati et al., 2019). Tensions convolute and complexify projects and in some circumstances, tension asymmetries may be better leveraged or overcome by pursuing an imbalanced approach where consideration of tensions is minimized (Waldman et al., 2019). In this manner, the current thesis builds on recent literature calling for further reserch into some of the potential negative dimensions of working with tensions (Sleesman, 2019).

4.6 Spinning the plates: transcendence and accumulation of tensions

Finally, this thesis advances our understanding of the 'self-defeating' nature of transcending tensions through balance (Bednarek et al., 2017, p. 95). Balance has been described as a way for individuals to transcend the forays of tensions and reach a state where the creative, innovative and motivational benefits induced by tensions are maximized and the confusion, conflict and stagnation induced by tensions are minimized (Schad et al., 2016). This is because the pursuit of balance encourages individuals to consider how elements in tension are complementary rather than contradictory (Bednarek et al., 2017). Through transcendence, it has been suggested that individuals can alleviate tensions 'in such a way that the original tension no longer exists' (Boonstra et al., 2017, p. 31). However, achieving transcendence through balance is a self-defeating process because in order to develop the awareness and sensitivity to tensions required to create balance individuals must throw themselves headlong into tensions. Recently there has been growing interest in the challenges associated with achieving transcendence through balance, including calls for research into situations where

transcendence remains in the process of 'establishing', unable to be 'tidily resolved' or actively 'resisted' (Bednarek et al., 2017, p. 97).

In the current thesis I build on this line of thought by demonstrating how the dynamic process of pursuing balance only serves to entrench individuals further into the messiness of tensions. To pursue balance, even where balance is weighted heavily towards a particular element or outcome, the individuals studied in this thesis had to first, remain cognisant of the influence of tensions on their work, and second, continually evaluate whether the balance they pursued was best for their project. This continual evaluation and rebalancing could be seen particularly clearly in the iterative sharing of responsibilities between the technical coordinator and assistant in paper 2, and in the accept and reframe response exhibited by innovators in paper 3 who described peeling back progressive layers of the tensions guiding their projects. Given the deeply interdependent nature of elements in tension where different elements may each play a role in multiple tensions (Cunha & Putnam, 2019), this process of embedding in tensions to pursue balance caused individuals to accumulate a growing network of tensions requiring their consideration. This accumulation could be seen throughout accounts in papers 2 and 3, but perhaps most clearly in the account of interviewee 26 of paper 3 who described becoming overloaded with 'noise' and fearing their project's 'death by a thousand pinpricks' after attempts to balance information sharing tensions only surfaced deeper underlying tensions. This finding contrasts with most existing theory that explores 'possibilities of transcendence that accentuate the positive, while avoiding the negative effects' (Schad et al., 2016, p. 36), and responds to calls for research demonstrating the embedded reality of transcending tensions through balance (Bednarek et al., 2017).

Critically, it invites a rethinking of the nature and aims of achieving balance in tensions. Frequently scholars compare the practice of balancing tensions to that of walking a tightrope (De Keyser et al., 2019; M. S. Feldman et al., 2016; Kassotaki et al., 2019; Schad et al., 2016;

Sharma & Jaiswal, 2018). M. S. Feldman et al. (2016, p. 508) for instance, note that 'stability has been likened to walking a tightrope—a matter of constant adjustment', while Schad et al. (2016, pp. 35-36) note that 'the image of tightrope walkers depicts such dynamic balancing; their stability on the thin rope depends on consistent, ongoing microshifts'. In light of the processes of accumulation and interdependence involved in transcending tensions through balance, I believe this is an inadequate metaphor. If this thesis were to evoke a single impression of what balancing tensions in projects is like for individuals, it would be that of a carnival plate spinner. I characterize it as such for three reasons. First, just as a plate spinner keeps more and more plates aloft simultaneously, the process of balancing tensions inherently exposes individuals to a growing raft of stakeholders, considerations and tensions that all must be brought into balance simultaneously if a project is to succeed. Second, while a plate spinner can rely on gyroscopic forces to keep a plate balanced temporarily while they attend elsewhere, this balance will inevitably decay and require rebalancing. The current thesis shows how balancing tensions is a dynamic endeavour, requiring individuals to constantly monitor and adjust their approach to tensions to ensure balance is suitable given the prevailing conditions. While moments of punctuation may emerge where tensions appear more or less balanced, the interconnected, nested and knotted nature of tensions means individuals face an unrelenting and exponential decay of balance requiring constant adjustment to 'keep the plates in the air'. Third, the final measure of success for a plate spinner is not how well they dismantle their many spinning plates after the show, but the view of their plates aloft when the curtain falls: so too is the nature of balancing tensions in projects. Unlike traditional permanent organizations, projects give individuals a clear horizon which their efforts to balance tensions must last until. Once a project has ended, individuals have fewer expectations of ongoing relationships with involved peers and are likely to move onto new projects with new aims and peers. Across the case-studies of this thesis, the impact of project-based organizing on the teleology of tension

management was evident with individuals balancing tensions in order to meet project deadlines with less consideration for what happens after the curtain falls.

4.7 Practical contribution

The practical contribution of this thesis rests in explaining how practitioners can draw on the metatheoretical concept of balance as a foundation for working through tensions, and in doing so, highlighting the hitherto undiscussed challenges of blending emergent and punctuated responses, balancing asymmetric tensions and coping with the accumulation of tensions. By highlighting the circumstances in which pursing balance in tensions is beneficial, namely when projects have scope and time to benefit from contrasting ideas and considerations, and when it is not, such as when projects have narrow scope, demanding timelines or face asymmetric tensions, individuals in projects will be better equipped to progress projects past the barriers thrown up by tensions and deliver on project outcomes. These findings contribute to practice by giving practitioners a clearer understanding of the contingencies involved in engaging with and balancing elements in tension. While this agile, fit and feel approach where tensions are engaged with contingently, was demonstrated by a small group of experienced individuals in paper 3, the tacit knowledge underpinning their approach had only emerged through years of leading projects. By comparing micro level responses to tensions across different types of projects and industries, this thesis articulates how tensions can be balanced in different circumstances more clearly than prior research, enhancing the ability of practitioners to prudently navigate tensions regardless of their experience and tacit knowledge.

Additionally, the three studies of the thesis deliver practical contributions for individuals working with the specific tensions addressed. For practitioners in the construction industry, Paper 1 highlights building culture and consensus around worker safety identities

(Andersen et al. 2018; Choi et al. 2017; Wen Lim et al. 2018; Wu et al. 2016), integrating technical innovations and sustainability frameworks into delivery processes (Bilal et al. 2016; Ozorhon and Karahan 2017; Papajohn et al. 2017; Pushkar 2018), tailoring leadership competencies to anticipated project demands (El-Gohary and Aziz 2014; Mikaelsson and Larsson 2017; Wan Muda et al. 2016), sharing knowledge throughout teams (Love et al. 2016; Ni et al. 2018; Oladinrin and Ho 2016), establishing trust and vision in external engagements (Afsar and Shahjehan 2018; Esther Paik et al. 2017; Liu and Chan 2017; Zhang et al. 2018a) and managing transient shifts in on-site power dynamics (Ameh and Odusami 2014; Liu and Fang 2006; Liu and Moskvina 2016) as six areaswhere greater balanced leadership capability may address leadership tensions and improve project outcomes. The paper argues that practitioners in the construction industry will increasingly be expected to develop soft leadership skills that facilitate the negotiation, distribution and sharing of leadership responsibilities in projects. For practitioners who move between projects frequently, Paper 2 offers insight into the process dynamics of balancing continuity and change and shows how throughout a project control over this balance diffuses across an organization. These individuals therefore need to accept that teamwork dynamics will always embody elements of both continuity and change, being part rigid reflections of pre-project conditions and part fluid expressions of how micro-level interplay between roles aggregates over time. Finally, Paper 3 raises relevant insights for how innovators think, feel and act towards barriers in projects by demonstrating boundary conditions for the dilemma and paradox mindsets. The practical contributions of this are twofold. First, the paper predicts that mindset towards tensions will become an important means of distinguishing between innovators and encourages innovators to develop an ability to consider tensions and their resultant barriers in the context of key project parameters such as deliverable flexibility. Second, the paper encourages innovators to

embrace experiences with project failure as a way of developing a more balanced mindset that is able to intuit when tensions should be avoided and when tensions should be worked with.

Tensions will continue to be a double-edged sword in projects and it is important that practitioners have accessible concepts on which to base their decisions (Andriopoulos et al., 2018; Miron-Spektor et al., 2018). In this thesis, I have mobilized balance as a way of exploring the nuances of managing some key tensions in projects while also opening up a broader understanding of the process dynamics of balancing tensions. Tensions develop in chaotic ways that combine punctuation and emergence and increasingly, practitioners are faced with challenging scenarios involving asymmetric tensions where they have little scope for decision making. As practitioners take on evermore tensions in projects, it is hoped that the explorations of how tensions can be balanced in this thesis will help demystify and destress their work.

4.8 Limitations and future agenda

Before concluding this research it is important to highlight its limitations and suggest avenues for future research. Aside from the limitations discussed in the three papers, the main limitations of this study relate to the ability to quantify the impact of different approaches to balancing tension on projects, reconciling findings across differing project environments, and conceptualising praxis in relation to more complex nested and knotted tensions.

First, while the objective of this research was to understand how individuals dynamically balance tensions in projects through the richness of first-hand accounts, the qualitative methodology of this thesis limits the types of conclusions I can draw with regard to causal relationships. As a result, I have not been able to quantify the causal effect of the different leadership archetypes, teaming routines or mindsets exhibited by individuals on, for instance, the degree of tension experienced, the rate of project progression or measures of

project success. Instead, I have only been able to theorize likely causal mechanisms based on actor accounts (Gerring, 2004). Future research could therefore build on this thesis through testing theorized relationships empirically in multi-unit settings using validated measures (Miron-Spektor et al., 2018). In particular, researchers could look to establish the extent to which balanced leadership explains variation in the quality of project outcomes; differences in the frequency with which individuals experience tensions while using different teaming routines; and variations in the outcomes of projects led by leaders with either a dilemma or paradox mindset as opposed to leaders who exhibit both mindsets.

Second, the degree of difference between the project environments studied in this thesis is both a strength and limitation. Differences between case-studies can enhance research by surfacing otherwise overshadowed contextual factors, however, they can also limit the comparability of case studies (Flyvbjerg, 2006). By investigating how individuals dynamically balance a variety of tensions across the construction, creative and defense sectors, I have been able to generate both industry-specific insights and broader insights about how balance serves as a common foundation for individuals managing tensions in a range of project-based contexts. However, this blend of research contexts is not uniform enough to develop highly pointed insights nor highly generalizable insights from the entire data inventory. Further research is therefore needed to either dive deep into a single type of projects, for instance recurrent events, or extend the research to other types of project tensions in, for instance, digital advertising agencies (Grabher, 2001, 2004), theatre productions (Kramer, 2009), or IT enterprises (Chen, Sun, Helms, & Jih, 2008). This type of translation would enable stronger comparative analyses of the ways in which cultural, structural and industry idiosyncrasies influence individual's approaches to balancing tensions in projects.

Third, this thesis has generally focused on how a particularly salient tension surfaces and is balanced in a particular project context. While my findings highlight the interdependent

nature of tensions in projects that causes individuals to accumulate awareness of, and involvement in, tensions, further research is needed exploring how the concept of balance translates to contexts involving more complex networks of tension (Smith & Lewis, 2011). I draw on the metaphor of a plate spinner keeping multiple plates aloft as it coheres with the accounts of individuals across the two empirical studies of this thesis, however, I am unable to distinguish between different arrangements of 'plates' or tensions, and explain how individuals cope with the different arrangements. Tensions can be nested within each other and across levels, creating a multiplier effect on the actions of individuals (Patrick, 2018; Smith & Lewis, 2011). Tensions can also be knotted together in complex relations that can invert, transform and modulate the effects of individual responses to individual tensions (Sheep et al., 2017). Researchers should therefore consider longitudinal, or perhaps ethnomethodological, case-studies to investigate further how the metatheoretical concept of balance can inform micro-level practice in relation to more complex arrangements of tensions.

4.9 Conclusion

Today's organizations must operate with greater speed and with less certainty than ever, leading project-based organizing to become the new norm (Packendorff & Lindgren, 2014). Projects allow individuals to segment out work into discrete parts, each with a defined horizon and clearer purpose (Söderlund, 2002). However, projects combine individuals in unfamiliar ways and encourage the adoption of more flexible, transient approaches to working together (Manning & Sydow, 2011; Meyerson et al., 1996). This heightens the potential for individuals to encounter tensions that can cause strain, conflict and paralysis, or, spark creativity, progress and innovation (Andriopoulos & Lewis, 2010; Lin et al., 2013). In these moments involving tension, the thoughts, feelings and actions of individuals play a pivotal role and can be the difference between projects failing or succeeding (Griffin et al., 2014; Hueske & Guenther,

2015). Yet, the microfoundations of tensions in projects have remained fragmented and poorly understood (Smith et al., 2017). Existing literature is yet to explain the full gamut of micro-level factors influencing how individuals approach tensions and tends to address organizational, processual and cognitive-affective factors separately (Schad et al., 2016). For practitioners embedded in projects, theory contrasts with reality where organizational factors, process dynamics and cognitive-affective factors coalesce organically to inform responses to tension (Burström & Wilson, 2018). In the current thesis, I have drawn on the metatheoretical concept of balance as a way to frame responses to tension and connect insights across the organizational factors, process dynamics and cognitive-affective factors involved. Specifically, I have focused on the concept of dynamic balance as a logic and process guiding the ways individuals approach tensions (Schad et al., 2016). Introducing this dynamic view of balance to the study of micro-level tension management in projects is useful as it emphasizes the persistence of tensions, multilateral interdependence between elements in tension and the situational nature of responses to tension (Salvato & Rerup, 2018; Smith & Lewis, 2011).

Applying this lens we see that balancing tensions implicitly involves a lag for individuals, making their endeavor one of constant movement. As individuals pursue balance, tensions exhibit chaotic movement akin to a double pendulum, where project conditions set about both gradual movements and rapid punctuations (Smith & Lewis, 2011; Sutherland & Smith, 2011). To follow the chaotic movement of tensions, individuals must therefore develop a strong sense of both how stakeholders, resources and elements embroiled in tensions are moving relative to each other and the pace at which these changes are unfolding: are prevailing tensions evolving gradually or undergoing sudden punctuation? As project conditions evolve through changes in deliverables, membership changes and nearing deadlines, individuals may encounter asymmetric tensions where certain elements are more powerful than others, making balances with roughly similar weighting of elements undesirable or unattainable. Contrary to

natural human tendency to find imbalance undesirable (Boonstra et al., 2017; Galati et al., 2019), we can see that adopting an imbalanced posture where working with certain tensions is resisted or avoided may be an expedient way of overcoming barriers and pushing projects to their next stage. Finally, as we become increasingly aware of the asymmetry, situational dependency and messiness of balancing tensions (Smith et al., 2017; Sweetman & Conboy, 2013), it is important to further explore the self-defeating nature of transcendence (Bednarek et al., 2017). Despite tensions being characterized as equally capable of constraining or enhancing projects (Andriopoulos et al., 2018; Wang, Libaers, & Park, 2017), transcending tensions through balance continues to be thought of as a way out of tensions. However, the dynamic process of balancing tensions actually entrenches individuals further into the nested and knotted messiness of tensions (Sheep et al., 2017; Smith & Lewis, 2011), encouraging constant refinement through increasing awareness of different elements involved in tensions. Unlike a tightrope walker who, having found balance, can step off the rope, individuals who transcend tensions through balance tend to accumulate more tensions needing to be balanced in an act more akin to a plate spinner.

In view of the above, this thesis highlights both an opportunity and a challenge to individuals working in projects. By virtue of the more transient temporal, structural and interpersonal dynamics that can come with working in projects, individuals will be expected to work with tensions with increasing frequency. Rather than being the domain of project leaders, the ability to manage tensions will be expected from all individuals. For individuals who can dynamically balance tensions as they move chaotically through periods of emergence, punctuation and asymmetry, this presents an opportunity to enhance projects and be distinguished from peers. However, in finding a dynamic balance, individuals can also expect to become increasingly entrenched in connected tensions that complexify the task of delivering projects.

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