FINDING THE 'I' IN TEAM: THE MODERATING EFFECTS OF TEAM BOUNDARY MANAGEMENT ON THE RELATIONSHIP BETWEEN TEAM PERSONALITY TRAITS AND TEAM PERFORMANCE

NICHOLAS KECA

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Nicholas Keca

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Summary

With a rapidly changing landscape creating highly permeable team boundaries, the traditional team form has become the exception rather than the norm in contemporary organisations. A consequence of this is that management practitioners urgently need clarification of the considerations required to compose teams to positively influence team performance. Service Sector organisations whose main activities are rooted in knowledge work are prominent examples, as are other organisational forms whose dynamics create similarly challenging contextual conditions. With a century long tradition, team research has become a broad church and scholarly investigations have reported that boundary management improves performance through coordination, knowledge sharing, and access to scarce resources. Through the theoretical lenses of Trait Activation and Similarity Attraction, this research study investigated the relationships between Team Personality Traits and various Team Outcomes moderated by Team Boundary Management and Interdependence. Addressing calls for researchers to take a more nuanced approach to investigating the Personality and Performance relationship, this study applied a complex analytic strategy and evaluated a number of permutations of the variables in focus. In doing so it identified significant main, interaction and quadratic effects between Team Personality and Team Outcomes moderated by Team Boundary Management, including some of the conditions under which those relationships hold true. These results, and the understanding emanating from the analysis, contribute to theory and practice by extending existing knowledge and providing some new insights into the complexities and trade-offs associated with team composition where team personality traits are the team composition input variables.

Keywords or Phrases

Personality Traits; Five Factor Model; Team Boundary Management; Interdependence; Performance, Team Effectiveness

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CHAPTER 1: BACKGROUND AND CONTEXT

1.1. Summary

Emanating from career long observations, I've been concerned about the practice of composing (and managing) teams in an increasingly complex and rapidly changing organisational context. Also, by the utility of data derived from psychometric assessment of personality in context of team composition and performance development, since the evolving team context puts a premium on pro-social behaviours (George, 1991, Martin-Raugh et al., 2016). These provide compelling reasons to assess personality with the aim of composing teams that have a natural propensity for *'desirable'* social behaviours (Penner et al., 1995).

This has already stimulated a large body of literature examining the antecedents of team performance, including the personality-performance relationship, as well as collaborative processes, such as Boundary Management. However, many of these studies have reported small effect sizes and equivocal results (Driskell et al., 1987, Mount et al., 1998, Porter et al., 2003), leaving scholars to posit that, justified by Trait Activation Theory, more complex models are required beyond the dyadic relationship between personality and performance. Similarly, although researchers have previously shown that Boundary Management activities predict a range of team outcomes. There is no literature, or prior empirical studies, examining the team composition variables needed to explain the role of boundary management in the personality-performance relationship. This creates a lacuna in our understanding and has brought calls for the consideration of deep-level compositional factors as antecedents of boundary management processes (Dey, 2017), further supported by Seibert and DeGeest (2017).

This research answers these calls and accepts the conclusions of prior scholars: that *team composition* is an important *input* variable of performance; that personality traits are an important *input* to team composition; and that boundary management is an important team *process*. This led me to the central question addressed by this research: How, when, and under what conditions, do team personality traits influence team outcomes moderated by boundary management?

Collectively, these questions help to address the gaps in our theoretical and practical understanding, the resolution of which provides significant value in understanding how to compose teams for optimal performance. Therefore, this research is important because it contributes to knowledge and practice about team composition at a time when teams commonly operate in distributed contexts; there is an increasing tendency towards flattening organisation structures; and, increased demand for lateral interactions between distributed team members creates a requirement for pro-social behaviours.

1.2. A Personal Perspective

1.2.1. Genesis of this Research: A Practitioner's Viewpoint

This research germinated from observations I've made throughout my career as a practicing business executive in a variety of organisations, ranging from privately held, small to medium sized enterprises (SME's), to large, publicly held multinational enterprises (MNEs) operating in a variety of industry sectors including Manufacturing, Service, and Not-for-profit. For example, my last corporate role was as a senior executive in a global commercial organisation employing 65,000 staff, and where I held responsibility for a business portfolio with circa £0.5bn revenue and employing more than fifteen-thousand staff situated in twenty-five Pan-European business units. In particular, two observations guided the initial review of the literature: -

a. The practical challenges of composing (and managing) teams in an increasingly complex organisational context; and
b. The utility of data derived from psychometric assessment of personality in context of team composition, and performance development.

1.3. The Changing Face of Teams

Throughout my career, I have observed situations where similarly configured 'teams' undertaking comparable work had variable performance outcomes. Where teams, and their leaders, were successful in one situation but failed in another, despite seemingly identical operating conditions. I consistently found that performance at individual, team and organisation levels was unpredictable, inconsistent, and unsustainable and required intensive and frequent interventions. I concluded that the teams in evidence did not resemble those typically described in the team literature I'd been exposed to. Consequently, the practices associated with developing performance based on such literature was problematic. For example, in contrast to the typical characteristics of traditional, collocated teams, the teams in evidence were quite different, see **Table 1.1** below: -

Table 1.1: Team Characteristics in Literature vs. Observed Characteristics

Described Characteristics	Observed Characteristics
As small as possible, i.e. < 5 members is best.	Typically, large, sometimes comprising >100 people with a horizontal structure reflecting functional specialisms.
Clearly defined membership with unambiguous team identity.	Poorly defined membership. Not unusual for teams to be so large and dispersed that team members do not know who else is on the team – hampering team identity.
Typically co-located with diversity centred around functional expertise and knowledge.	Highly diverse team members geographically dispersed all over the globe.
Face-to-face, real-time communication supporting trust building, knowledge sharing and support.	Significant communication challenges (technical, language, time, distance and culture). Although technology helps mediate communication between dispersed team members, asynchronous interactions lead to misunderstandings, over-collaboration, and conflict.
Clear, well defined and stable roles, goals and tasks.	Tasks, objectives, and roles often unclear, undefined, and constantly changing, requiring team members to self-regulate, resolve knowledge gaps and achieve goal alignment/congruence.
Defined, dedicated leadership.	Shared leadership, i.e. team members have multiple leaders typical of matrix management structures – often with competing demands and expectations.
Dedicated team membership reinforcing team identity and cohesion.	Multi-team membership, requiring the division of time, energy, priorities and loyalties.

1.3.1. A Changing Team Context

Teams are ubiquitous (Barrick et al., 1998, Hollenbeck et al., 2004, Sundstrom et al., 1990), a fact reflected in the immense variety of team types (Driskell and Salas, 2013). However, organisations are assimilating changes to their operating environments that significantly influence how such teams work, particularly with respect to the nature and magnitude of lateral interactions required between teams and team members. This has potentially negative consequences for practice, since the perceived rate of change is exceeding the ability of scholars and practitioners to explain the antecedents of performance and adjust practice. Worst yet, the associated failure costs are often hidden in productivity loss, or unintended consequences, such as dysfunctional behaviour, conflict, motivation loss, moral-disengagement, absence, turnover, etc. Examples of such changes include: -

⇒ The increasing role of the *Knowledge Work*[1] (Drucker, 1969, 2013, Bosch-Sijtsema et al., 2011) which increases task uncertainty and complexity (Higgs et al., 2005), such that knowledge work requires intensive collaboration between interdependent individuals who are often deployed in distributed structures (Goldman et al., 1995).

TEAM IMPACT - the ambiguity associated with knowledge work increases interdependence, creates role and goal conflict, and increases stress, especially for those individuals who are intolerant of ambiguity/uncertainty (e.g. studies of matrix organisations report that the complex decision-making processes within matrix structures result in role conflict, ambiguity, negative attitudes, motivational loss, moral disengagement, and other factors known to degrade performance (Alnuaimi et al., 2010, Bandura, 1990, Bandura, 2002, George, 1992, Karau and Williams, 1993, Kidwell Jr and Bennett, 1993, Latané et al., 1979, Liden et al., 2004, Roland, 2010)). This increases the demand on the quality and quantity of social-interactions between team members, and on the understanding of the motivations and behaviours needed to realise them.

⇒ *Globalisation* (Wageman et al., 2012a, p.301) results in the fragmentation and distribution of core processes, increases diversity (Cummings, 2004, Glick et al., 1995, Hambrick et al., 1998, Horwitz and Horwitz, 2007, Joshi, 2006), and has spawned a new form of distributed working, the 'Virtual Team'2 (Mitchell, 2012, Alnuaimi et al., 2010, Au and Marks, 2012, Berry, 2011, Brandt et al., 2011, Chidambaram and Tung, 2005, Gibson and Gibbs, 2006, Gibson et al., 2011, Hoegl et al., 2007, Johnsen, 2006, Kirkman and Mathieu, 2005, Kuesten, 2010, Hambley

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[1] Knowledge workers are workers whose main capital is knowledge. Examples include software engineers, physicians, pharmacists, architects, engineers, scientists, design thinkers, public accountants, lawyers, and academics, and any other white-collar workers, whose line of work requires the one to "think for a living". Knowledge work can be differentiated from other forms of work by its emphasis on "non-routine" problem solving that requires a combination of convergent, divergent, and creative thinking. But despite the amount of research and literature on knowledge work, there is no succinct definition of the term.

Source: https://en.wikipedia.org/wiki/Knowledge_worker

[2] The terms 'distributed team' and 'virtual team' are used interchangeably

et al., Lena et al., 2012, Levasseur, 2012, Malhotra et al., 2007, McDonough et al., 2001, Muethel and Hoegl, Oluremi et al., 2012, Pedro Gustavo Siqueira et al., 2012, Powell et al., 2004, Saonee et al., 2011, Tugrul et al., Turel and Yi, 2010, Zemliansky, 2012). The impacts associated with virtual working are not trivial. Surveys suggest that more than sixty-six percent (66%) of employees are now working virtually (Gilson et al., 2014, SHRM, 2012).

TEAM IMPACT - This brings a range of challenges associated with maintaining effective lateral social-interactions between diverse stakeholder groups Despite the increasing prominence of distributed working, it has been found to have both positive and negative impacts for organisations. Positively, by reducing cost, boosting productivity, increasing diversity, and spreading demand on scarce resources. Negatively, by requiring team members to assume roles in multiple teams (i.e. between sixty-five percent (65%) (Moreland et al., 1996) and ninety-five percent (95%) (Zika-Viktorsson et al., 2006) of knowledge workers participate in multiple teams simultaneously). The trend juxtaposes with reports that a significant proportion of distributed teams suffer performance failure. For example, in 2000, the Gartner Group found that fifty percent (50%) of virtual teams failed to achieve their goals (Schweitzer and Duxbury, 2010: p.268). More recent reports suggest that performance failure rates may actually be as high as eighty-two percent (82%) (Govindarajan and Gupota, 2001). Although technology enables distributed working, and brings together diverse, dispersed team members, virtual teams have difficulty: collaborating effectively, gaining a shared understanding of tasks and goals (Martins et al., 2004: p.806), and/or maintaining the necessary levels of trust and social-cohesion between team members (Coppola et al., 2004, Crisp and Jarvenpaa, 2015, Germain and McGuire, 2014, Robert et al., 2009). For example, the personality profiles of individuals typically engaged in scientific/technical roles frequently done through distributed structures, is inconsistent with the typical personality profile required to ensure that pro-social behaviours are spontaneous (Baron-Cohen, 1998).

⇒ De-layering of hierarchical structures (Bell and Kozlowski, 2012, Littler et al., 2003, McCann et al., 2008, Tannenbaum et al., 2012) results in decreased leadership and flat, wide structures that result in increased team size.

TEAM IMPACT - increased team size is known to be decretive to performance due to the exponential relationship between team size and interaction volume (Alnuaimi et al., 2010, Aubé et al., 2011, Bossard, 1945, Carton and Cummings, 2012, Graicunas, 1998, Hackman and Vidmar, 1970, Hoegl, 2005, Ingham et al., 1974, Kephart, 1950), which degrades team performance through inefficiency, over-collaboration, dysfunctional behaviour and burnout. According to data collected over several decades, the time spent on collaborative activities has increased by more than 50% (Cross et al., 2016), creating concerns that collaboration is having a negative impact on the productivity of knowledge workers. Indeed, it is reported that Knowledge Workers are spending so much time collaborating that they are unable to complete their tasks (Schumpeter, 2016). Given metrics indicating a global decline in productivity (OECD, 2016), and suggestions that organisational bureaucracies are increasing, not declining, there is an forming view that collaboration is becoming counter-productive (Hamel and Zanini, 2016), and the associated lateral social interactions within and between teams has a detrimental effect.

1.3.2. Threats to Teams

The consequence of these changes to the team context is that the 'traditional team form (Richardson, 2010, West and Lyubovnikova, 2012) is now thought to be so uncommon that it is in danger of extinction (Kirkman and Mathieu, 2005). Indeed, distributed teams are so different that they are sometimes unrecognisable as being teams at all. This has caused some researchers to argue that it is rare to find <u>any</u> teams that are not to some extent virtual (Kirkman and Mathieu, 2005: p.702), or have such fluid, permeable boundaries (Bosch-Sijtsema, 2007, Goldman et al., 1995) that participants are unable to identify team membership (Mortensen, 2004). Despite the widely reported advantages associated with team working, understanding how we might better compose and manage contemporary teams is a priority (Burt, 2000, Cole et al., 2002, Cummings, 2004, Kilduff and Tsai, 2003, Sparrowe et al., 2001, Murase et al., 2012) when conditions of virtuality (Kirkman and Mathieu, 2005) are so common to a wide variety of organisational settings.

1.4. The Increasing Need for Pro-Social Behaviours

According to Fisher et al. (2012), the interdependent nature of team work creates inherent challenges in the functioning of teams due to the need to integrate individual attributes through interactions between team members in order to achieve a combined team outcome (e.g., see Guzzo and Dickson, 1996, Hackman and Morris, 1975, 1987, 1990b, 1990a, 1998). Developing these thoughts, various writers (George, 1991, Martin-Raugh et al., 2016) have recognised the increasing importance of pro-social behaviours: -

> *…while some pro-social behaviours are integral to role prescriptions, and therefore a key dimension of job performance; other pro-social behaviours are <u>extra-role</u>, whereby individuals may not be formally required to display pro-*

> *social behaviours, neither may such behaviours be acknowledged by the organisation's reward system, yet extra-role pro-social behaviours are crucial for organisational effectiveness because organisations cannot specify, in advance, all the behaviours necessary for it to achieve its goals (p.299).*

Others refer to *'extra-role'* behaviours as *Contextual Performance* (Borman and Motowidlo, 1993, Hogan and Holland, 2003, Hough, 1992, Hurtz and Donovan, 2000, Motowidlo and Van Scotter, 1994, Peeters et al., 2006b, Van Scotter and Motowidlo, 1996). Therefore, the spontaneous display of extra-role pro-social behaviours by individuals is so essential for effective organisational function (Katz, 1964) that pro-social behaviours are a key capability for those that operate in this type of team environment (Duclos and Barasch, 2014, Garcia-Banda et al., 2011, Martin-Raugh et al., 2016, Penner et al., 1995, Puffer, 1987). Indeed, this capability has become so fundamental to teamwork that social inter-connectedness has developed its own organisational currency – *Social Capital* (Seibert et al., 2001), whereby the extent of one's *connectedness* is viewed as a success factor analogous with effective team function and social interaction (Ayoung et al., 2011, Bercovitz and Feldman, 2011, Espinosa et al., 2014, Fang et al., 2015, Henttonen, 2010, Reagans et al., 2004, Saonee et al., 2011, Sparrowe et al., 2001, Vodosek, 2003, Wehrli, 2008, Ying and Norman, 2014, Zhong et al., 2012).

1.5. The Role of Team Boundary Management

Faced with ambiguity, complexity associated with knowledge work, flatter, distributed structures requiring intensive lateral social interactions and interdependent working enabled by pro-social behaviours, teams are required to employ formal processes if they are to avoid the negative consequences of over-collaboration. Boundary Management, composing of Boundary Spanning, Boundary Buffering, and Boundary Reinforcement activities, is one such team process (Faraj and Yan, 2009). Boundary Management has therefore become increasingly important (Marrone et al., 2007) for teams as the emerging organisational form in team based organisations (Shonk, 1992), horizontal/matrix organisations (Byrne, 1993), and virtual organisations (Galbraith, 1995), each of which relies on semi-autonomous, self-regulating teams whose boundaries are permeable at the intra and inter-organisational levels (Yan and Louis, 1999). Faraj and Yan (2009) provide a conceptualisation of Team Boundary Management, while recognising how the changes of organisational structures discussed extensively above have led to increased demands on organisational teams, i.e. where permeable boundaries create added burdens on team members, spanning their own team's boundaries, buffering the team from disruptive demands, and reinforcing their boundaries to strengthen their identity.

Faced with task uncertainty/complexity, scarce resources, Boundary Spanning refers to *boundary loosening* actions a team takes to reach out to and engage with its environment in order to obtain resources and support (Faraj and Yan, 2009). Defending against the Boundary Spanning activities of external teams, Boundary Buffering is a process of disengagement, where a team seeks to protect itself from uncertainty and disturbances by closing itself off from unwanted exposure in its environment: preventing disturbances and uncertainty, negative input caused by undesired access to team boundaries, distractions, and leakage of valuable resources (Faraj and Yan, 2009, Yan and Louis, 1999). In contrast to Boundary Spanning and Boundary Buffering, Boundary Reinforcement helps teams internally set and maintain their boundaries, by increasing member awareness and sharpening team identity. In other words, Boundary Reinforcement is an inward facing activity that has become increasingly important in the flatter, post-bureaucratised structures in contemporary organisations, by enabling teams to attract and preserve the energy and attachment of their members, while increasing team identity and commitment (Faraj and Yan, 2009).

1.6. Team Diversity and Individual Differences

Paradoxically, while my management education taught me that diversity amongst team members tends to benefit performance (Bell et al., 2010, Garrison et al., 2010, Glick et al., 1995, Jehn et al., 1999, Van Dijk et al., 2012), in practice, I found that people form relationships with similar others, i.e. those with whom they share things in common. Termed as *'Homophily'* (McPherson et al., 2001), this phenomenon is explained by *Similarity-Attraction Theory* (Anderson, 2009, Van Vianen and De Dreu, 2001) and *Attraction-Selection-Attrition Theory (ASA)* (Schneider, 1987). I observed first-hand how homogeneity of individual differences impacted organisations, positively and negatively, and recognised the importance that team composition had to practice.

1.6.1. Personality Assessment

Exposed to psychometric assessment in my early career, I recall my excitement about the potential of discovering my personal development needs, latent potential, and getting insights into the answers to deep questions, like – *Who am I, and what am I capable of,* etc. This proposition, to predict behaviour based on predetermined trait characteristics, is so compelling that organisations have been trying to exploit the information gained from such assessments for well over a century.

I first experienced the *Myers-Briggs Type Indicator* (MBTI) (Briggs, 1976, Myers, 1962) in the late 90s and the results were shared amongst my peers for team development purpose.

I recall discussions about our *types* and *preferences*. While these were interesting, they did little to improve my understanding of how I might apply this knowledge, though they did provide some insight into colleagues I didn't know well. I questioned the benefit of such knowledge within the context of my organisation – a concern shared by many others, despite the popularity of the MBTI (Boyle, 1995, Capraro and Capraro, 2002, Stein and Swan, 2019, Thompson and Borrello, 1986).

As my career progressed, I regularly came into contact with a variety of personality assessments. Promoted by established HR practice, I saw how ineffectively these tools were used. Beyond recruitment and selection processes, assessment data was rarely consulted, whether to compose teams, support training, or assist in creating personal development plans. As an executive, I was often bemused by the differences between the *predicted* and *actual* behaviours of individuals whose personalities had been assessed. In my experience, these seldom matched expectations. In some cases, the differences were so stark I wondered if the science behind these assessments was bad; or if there was a problem of utility and implementation

Despite the reliance on these tools by Human Resource functions, and an entire recruitment and selection industry, my experience was consistent with the earliest of researchers who argued that:

> *measures of personality were unreliable for making employee selection decisions and that data provided by such assessments should to be used with caution (Guion and Gottier, 1965: p.159);*

…later expanded by Furnham (Chapter 37, Christiansen and Tett, 2013, P.838),

> *despite their enthusiasm for using psychometric tools, HR professionals seemed to have little experience or knowledge about well-known and validated personality and intelligence tests (Furnham, 2008), though they tend to be positive [about their usefulness] (Furnham and Jackson, 2011).*

1.7. Research Problem

The changing contextual environment of teams described in earlier sections (Marrone, 2010, Wageman et al., 2012b, Wageman et al., 2012a) confound understanding of how to optimally compose teams for success because these environmental conditions create greater demand for lateral social interactions and interdependent working. This amplifies the need for team members to spontaneously display pro-social behaviours and promote contextual performance as a core competence.

Ameliorating the effects of task complexity and resource scarcity through interdependent working and pro-social behaviour, while avoiding the negative consequences associated with over-collaboration, teams must employ team processes such as Boundary Management. Consequently, Boundary Management has been found to predict team outcomes, such as Performance (Marrone, 2010, Marrone et al., 2007), and emergent states, such as Cohesion (Ancona, 1990, Choi, 2002, de Jong et al., 2014, Marrone et al., 2007).

1.7.1. Team Composition

Team Composition, defined as the configuration of team member attributes (Levine and Moreland, 1990), has a powerful influence on team processes and outcomes (Kozlowski and Bell, 2003) since the composition of work teams is defined by the individual characteristics of their members. The rationale underlying the research on team composition is that individual characteristics of team members, i.e. their personality, demographics, etc., will compile to serve as *Inputs* that influence Team *Outcomes* directly (and indirectly) through team *Processes* (O'Neill and Allen, 2011). This is because personality traits are particularly salient to the task contributions team members make to team outcomes, and the way that team members interrelate to each other during the course of their work.

Team composition has received considerable attention over the last century and literature relating to the personality--performance relationship (at individual and team levels) is prominent, and includes multiple meta-analyses relating to personality and performance (and other important organisational outcomes) (Barrick et al., 2001, Tett et al., 1991, Tett and Christiansen, 2008). There is also a considerable literature covering the Boundary Management and Performance relationship (e.g. Caldwell and O'Reilly, 1982, Ancona and Caldwell, 1992, Ancona and Caldwell, 2000, Ancona and Caldwell, 1998, Ancona and Caldwell, 2007, Faraj and Yan, 2009, Marrone et al., 2007, Marrone, 2010). However, there is no literature, or prior empirical studies, examining the team composition variables needed to explain the role of boundary management in the personality-performance relationship. This represents a lacuna in our understanding, a finding reinforced by calls for the investigation of the deep-level compositional factors [3] associated with boundary management processes (Dey, 2017), calls also reinforced by Seibert and DeGeest (2017)

> *although a number of studies link personality to emergent team processes or behaviours that support team effectiveness, there is little research that provides evidence that these processes and behaviours are the link through which team personality is related to team outcomes. Future research needs to develop models in which team personality is linked to performance via its effects on team processes and behaviours known to be associated with team effectiveness (p.393).*

1.7.2. Team Effectiveness

Scholars posit that team composition is an important input variable of team outcomes such as performance and team effectiveness (Kozlowski and Bell, 2003). Consistent with (Kozlowski and Ilgen, 2006, p.79), this study conceptualises *Team Effectiveness* by adopting measures of *Performance*, *Team Cohesion* and *Team Viability*. Against a backdrop of increasing lateral interactions and interdependent working, Boundary Management activities are expected to differentially moderate the relationships between Team Personality and *Team Effectiveness* outcomes. This is because team success is not defined by a narrow measure of performance alone, but by the ability to sustain performance through repeated cycles over the long term. In complex work environments, teams must collaborate intensively, this requires positive, pro-social relations that promote cooperation and Team Cohesion. Similarly, team success is measured beyond single performance cycles. This relies of pro-social behaviours that promote long term Team Viability.

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[3] *Surface-level composition variables refer to overt demographic characteristics that can be reasonably estimated after brief exposure, such as age, race, education level, and organizational tenure. Deep-level composition variables refer to underlying psychological characteristics such as personality factors, values, and attitudes* BELL, S. T. 2007. Deep-level composition variables as predictors of team performance: A meta-analysis. *JOURNAL OF APPLIED PSYCHOLOGY,* 92**,** 595-615.

1.8. Research Question

This leads to the central question addressed by this research: -

> ***How, when**, and **under what conditions**, do team personality traits influence team outcomes moderated by team boundary management.*

This question seeks to address the gaps in our theoretical, the resolution of which will help practitioners better understand how to compose teams for optimal performance.

1.9. Approach

This study is conducted in a team context based on knowledge working within a multi-site distributed structure; and, given the operating conditions presented by the contemporary team context, it will control for *Team Size* and *Collaboration*. Further, although there are a variety of lenses that can be used for this type of research, the unit of interest in The Team, consequently this is a team-level study. Data will also be collected at two time points approximately three months apart, allowing for the temporal nature of Team Inputs, Processes, and Team Outcomes (Mathieu et al., 2013) – discussed in more detail in **Chapter 2**.

1.10. Interdependence

Interdependence Theory explains how individuals react to one another in different situation structures, an idea developed from the principle that behaviour is a function of the person and the environment or, from the perspective of team research, the team and its members (Lewin, 1946). Therefore, *Interdependence Theory* provides that the extent of interdependence strongly influences team behaviours and outcomes. This is especially the case in team contexts that, for reasons of structure and/or task complexity, necessitate high levels of interactive collaborative working. Consequently, there are continuing calls for team research to include considerations of interdependence. (Kozlowski and Bell, 2003) – see **Chapter 2** for more discussion.

1.11. Input-Process-Output Heuristic (I-P-O)

The conceptualisation of team effectiveness that has shaped theory and research over the last 40 years is based on the *Input–Process–Output* (I-P-O) heuristic provided by McGrath (1964), where: *Inputs* refer to the composition of the team in terms of individual's characteristics, such as personality traits; *Processes* refers to activities that team members engage in to resolve task demands, such as boundary management; and *Outputs* include:

(a) Performance judged by relevant others external to the team; (b) meeting of team needs (Cohesion in this case); and (c) Viability (Kozlowski and Ilgen, 2006, p.79). In this study, *Team Personality* Traits represent the Inputs. *Team Boundary Management* is the Team Process; and *Team Effectiveness* is the Team Outcome – see **Chapter 2** for more discussion.

1.11.1. Inputs - Personality Traits

Sackett and Lievens (2008) report sizeable relationships between variables in the personality domain and important work outcomes (p.424). Yet others have found that personality traits are an important input to team composition (Anderson, 2009, Barry and Stewart, 1997, Bell, 2007, Halfhill et al., 2005, Humphrey et al., 2009, Kramer et al., 2014, Neuman et al., 1999, Prewett et al., 2016, Quigley and Gardner, 2007).

1.11.1.1. Trait Theory

Trait Theory concerns the measurement of personality traits, which, according to this perspective, are stable over time (Staw et al., 1986, Staw and Ross, 1985), differ between individuals (represented by *individual differences*), and influence behaviour. Evidence of the longitudinal stability of traits provides support for the trait model (McCrae, 1991, Beckmann and Wood, 2017, Cobb-Clark and Schurer, 2012, Specht et al., 2011) and is the basis for the assumption that personality traits are stable enough to make measurement meaningful.

1.11.1.2. Team Personality Traits

In team-level research, it is important to match the level of analysis between the variables being studied (Chan, 1998, Kozlowski and Klein, 2000). Team Composition variables pose a particular problem because, although individual difference variables are, by definition, at the individual level, the interest in team composition is in the unique combinations of individuals that compose a team (Mohammed et al., 2002), and/or how individual differences combine in a team-level operationalisation. Consequently, the relationship between the aggregate of the team's composition variables and team performance will likely be moderated by how the construct is operationalised at the team level, where more appropriate operationalisations reveal stronger relationships between the team composition variable and team performance (Arthur Jr et al., 2007, Bell, 2007, p599). Therefore, when relating team composition variables, such as personality traits, to a team-level criterion, such as team effectiveness, both the predictor and the criterion should be measured at the team level (Prewett et al., 2009, p.275) – see **Chapter 2** for a more detailed discussion.

1.11.1.3. Linearity of Traits

The implicit assumption in the literature concerning the Personality-Performance relationship is that the relationship between them is linear. This can lead to the conclusion that *'more is better'*. A number of researchers have challenged the assumption of linearity and called for more research into the nature of the curvilinear relationship between Personality and Performance (Murphy and Dzieweczynski, 2005, Le et al., 2011). Despite the obvious importance for management practice, there are precious few empirical studies illuminating this curvilinear relationship (Benson and Campbell, 2007, Carter et al., 2016, Cucina and Vasilopoulos, 2005, LaHuis et al., 2005, Le et al., 2011, Pierce and Aguinis, 2013, Robbins et al., 2006, Vasilopoulos et al., 2006, Vasilopoulos et al., 2007, Whetzel et al., 2010). This study responds to these calls.

As an example, moderated by Task Complexity, the study by Le et al. (2011) found support for the hypothesis that the relationship between traits and Task Performance are curvilinearly related such that the relationship is initially positive but becomes weaker as trait strength increases; the relationship subsequently diminishes and disappears as Conscientiousness increases further (p.114 and 116). Scholars have argued this on the basis that, beyond a certain point, high Conscientiousness may no longer promote Task Performance because excessively conscientious individuals can be overly rigid, inflexible, and compulsive perfectionists that pay too much attention to small details while overlooking more important goals (Mount et al., 2008, Tett, 1998). Highly conscientious people are likely to be more prone to self-deception and rigidity, which may inhibit learning new skills or acquiring new knowledge, ultimately leading to lower Performance (LePine et al., 2000, Martocchio and Judge, 1997). A similar pattern was noted with Emotional Stability. As an example, Le et al. (2011) found support for the hypothesis that the relationship between trait Emotional Stability and Task Performance were curvilinearly related such that the relationship is initially positive but becomes weaker as trait strength increases; the relationship subsequently diminishes and disappears as Emotional Stability increases further (p.114 and 116). The polar extremes of Emotional Stability are known to result in maladaptive behaviour. This makes sense considering traits are said to exist on a continuous scale. Curvilinear relationships have also been noted with Extraversion. Driskell et al. (1987) suggested a curvilinear relationship between *sociability* and team effectiveness, implying that high mean sociability may interfere with instrumental task activities. Equally, a team composed of individuals who are dominant and assertive can stimulate friction and result in a team composed of all leaders and no followers (Barrick et al., 1998, Barry and Stewart, 1997) Dominant team members tend to engender less positive interpersonal relations (Driskell et al., 1993) and are less likely to attend to the task inputs of other team members in decision making (Driskell and Salas, 1992), (Christiansen and

Tett, 2013, p.748). No prior studies were found to investigate the existing of curvilinear relationships between Agreeableness, or Openness with either Boundary Management or Team outcomes. This study attempts to address this gap – see **Chapter 2** for a more detailed discussion.

1.11.1.4. The Influence of Trait Activation (Interaction)

Trait Activation Theory (TAT) (Allport, 1966, Kenrick and Funder, 1988, Tett and Guterman, 2000, Tett and Burnett, 2003, Tett et al., 2013) build on earlier theories of motivation by providing that traits are latent propensities for individuals to behave in certain ways, and, in order for personality traits to be *expressed*, they require *situations* that provide trait relevant *situational cues* (Kenrick and Funder, 1988, Tett and Guterman, 2000, Tett and Christiansen, 2007). Consequently, intrinsic satisfaction is gained from expressing one's traits, just as eating satiates hunger (Tett et al., 2013). In other words, trait-relevant cues within situations result in *Trait Activation* (Blickle et al., 2013: p.1146). Traits and situations are therefore *two sides of the same coin* (Eysenck and Eysenck, 1985). Therefore TAT presents an interactionist view of job performance, where certain work situations allow the expression of specific underlying personality traits, and facilitates job performance (Tett and Burnett, 2003).

The presence of team-level effects on individual behaviours arising from characteristics of the team's task, or from *homogenous* team characteristics, is a long-established phenomenon (Forsyth, 2018). Past research on team performance has suggested that *homogeneous teams* tend to develop stronger *team norms* than do more diverse teams (Kirkman et al., 2004b). For example, team research has illustrated that dominant opinion within a team can influence the direction and the magnitude of team member opinions, e.g., polarisation, (Goethals and Zanna, 1979), as team identification increases team member's commitment to shared goals, while triggering hostile behaviour towards out-groups (e.g., (Hogg and Hains, 1996, Hogg and Turner, 1987, Hogg and Williams, 2000). Finally, member behaviour is partially governed by the *strength of group norms* (Gelfand et al., 2006). In this way, high elevations of team personality traits create *situations* that contain the relevant cues for expressing individual traits, whereas modest or low elevations of team personality traits creates *situations* that constrain individual trait expression. Because team homogeneity generally corresponds to stronger norms, *heterogeneity* in team personality traits would enable the expression of individual traits within the team – assuming an equal influence from different member personalities and an absence of unique social pressures that may arise in diverse teams. In particular, negative traits and behaviours are often more powerful in group contexts than positive ones (Baumeister et al., 2001). Because *bad is stronger than good*, it may be difficult for team members to express traits associated with effective teamwork if other team members score lower on these traits. Conversely, assuming equivalent levels of tea, personality traits, trait diversity may lead to weaker norms for behaviour, allowing greater expression of individual personality traits. However, trait diversity may decrease create social pressures that reduce the expression of individual personality traits, such as impression management, or social matching. As variance in team trait elevation decreases at higher elevations, it is even possible that a three-way interaction accounts for variance in individual performance, in which individual personality traits show positive relationships with performance when trait variance is low and trait elevation is high. Thus, team trait diversity presents a complex system of relationships with team personality elevation. Taking this perspective, the elevation and diversity of Team Personality Traits is likely to be an important driver in exerting *top-down* effects (Prewett et al., 2016) on norms of behaviours and team-level outcomes, including Team Effectiveness. Since this is a team-level study, TAT suggests that the general strength of a trait that is present within a team will create a *situational context* for the team based upon the personality profile of the team and the interactions of personality traits with other situational factors that serve to activate trait related behaviour across all team members. For example, a team that is generally extraverted at the team level will exert a *top-down* influence on the team leading to extraverted behaviour being activated across those team members that are extraverted (Prewett et al., 2016). This has important implications for Team Composition because it shows that Team Composition considerations are not limited to deliberations of the team's personality traits solely from a *person-team-fit* perspective. It must also consider how those trait combinations will interact with the situational factors represented by the team's environment that will serve to activate trait related behaviours in ways that are desirable – see **Chapter 2** for a more detailed discussion.

1.12. Team Personality and Team Effectiveness

1.12.1. Five Factor Model (FFM)

The *'Five Factor Model'* (FFM), comprising of traits: Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness, and otherwise known as 'the Big Five' (Digman, 1990, 1996, Goldberg, 1983, 1990, 1993, McCrae and Costa, 1987, McCrae, 1989, 1991, McCrae and John, 1992, McCrae et al., 2005, McCrae and Costa Jr, 2008), is the personality model chosen for use in this study. This is due to it being the most frequently used taxonomy for classifying personality within the team personality and performance literature. More specifically, the *Big Five Inventory (BFI)* (John and Srivastava, 1999) has been selected due to its paucity and potential to reduce survey fatigue, compared to the full version provided by the *NEO-PI-R* which includes two-hundred and forty-two questions (Costa and McCrae, 1992) – see **Chapter 2** for a more detailed discussion.

1.12.1.1. Neuroticism (Emotional Stability)

Emotional stability is the tendency to be secure, calm, self-confident, and poised while avoiding the negative emotions associated with Neuroticism, such as: anxiety, sadness, embarrassment, vulnerability, frustration, anger, hostility, guilt, disgust, depression, the inability to cope with stress and control one's impulses, and the propensity to have irrational ideas (Molleman et al., 2004, Van Vianen and De Dreu, 2001, Costa Jr and McCrae, 1992). It can therefore be concluded that elevated levels of Emotional Stability are expected to positively predict Team Performance (Barrick et al., 1998, Haythorn, 1953, Heslin, 1964, Kichuk and Wiesner, 1998, Molleman et al., 2004, Thoms et al., 1996); while elevated levels of Neuroticism will result in the opposite.

A high elevation of Team Emotional Stability will create a context where team members are expected to interact constructively and courteously (Ashton and Lee, 2007), promoting service orientation and inter-personal relations, since elevation in this trait is related to Team Cohesion, and the effective management of disagreements between team members (Bradley et al., 2014, Bradley et al., 2013a, Bradley et al., 2013b, Bradley et al., 2012). Thus, teams that are generally high on this trait may encourage a positive social and emotional environment that is favourable, because it serves to motivate performance, a positive team atmosphere, and team outcomes. Conversely, a low elevation of this trait can lead to a negative and tense team climate, leading to a loss of motivation and morale (Driskell et al., 2006). The effect of team composition on trait expression is illustrated by the *bad apple effect* (Felps et al., 2006), in which a small number of team members low on a beneficial personality trait may disproportionally affect the expression of those traits in other members (Neuman and Wright, 1999). For example, a prior study found that teams with two socially anxious members and two socially calm members generated almost the same number of ideas as teams composed of all anxious members, but significantly less ideas than teams composed entirely of socially calm members (Camacho and Paulus, 1995). These authors suggest that socially calm team members feel more comfortable expressing ideas when other members are also socially calm than when other members are anxious high – see **Chapter 2** for a more detailed discussion.

1.12.1.2. Extraversion

Extraversion is important to the smooth functioning of social mechanisms within a team and it is strongly linked to intra-team processes and contextual Performance, i.e. Performance relating to the social context in which a team operates (Borman and Motowidlo, 1993).

Characterised as the extent to which an individual is: assertive, active, friendly, enthusiastic, energetic, upbeat, optimistic, social, talkative, high spirited and generally outgoing, (Costa and McCrae, 1992), extraverts like to be around people most of the time, crave excitement and stimulation and tend to be of a cheerful disposition.

Despite the positive benefits of having extraverted individuals in a team, the inclusion of too many high extroverts in a team may be detrimental to team outcomes since extroverts tend to like to work in teams merely for the social interaction it provides them (Neuman et al., 1999), which may distract attention from task completion (Barry and Stewart, 1997, Mohammed and Angell, 2003). Because they tend to be talkative and assertive, extroverts are inclined to be dominant (Kichuk and Wiesner, 1998), and too many dominant individuals in a team is likely to lead to conflict (Mazur, 1973).

High elevations of Team Extraversion may positively relate to team performance, despite this being at odds with much of the theoretical work in this area, which cites Extraversion as a factor where team heterogeneity is preferred to homogeneity (Humphrey et al., 2007). Such research posits that extraverted members within the same team would compete for status, such as leader-oriented roles, and neglect other important roles and team goals (Barry and Stewart, 1997). However, empirical research has generally not supported variance in Extraversion as a correlate of team performance (Bell, 2007, Prewett et al., 2009), while the generally weak correlations between variance in team Extraversion and team performance suggests that competition for status can be constructive, perhaps by encouraging members to exert more effort toward team goal attainment. In addition, low variance in team Extraversion may encourage shared or collective leadership in the team, which is associated with positive outcomes (Carson et al., 2007). Furthermore, Extraversion involves more than dominance, or need for power: It also includes *sociability* and *friendliness*, both which are traits that may lead to cooperativeness and positive affectivity in the team when maximized (McNiel and Fleeson, 2006). From this perspective, it is thought that high elevation in Team Extraversion will positively relate to team performance by promoting information sharing, collaboration, healthy rivalry, and achievement striving – see **Chapter 2** for a more detailed discussion.

1.12.1.3. Openness to Experience

Openness to experience is the extent to which an individual is: original, sensitive to aesthetics, inquisitive/curious, imaginative, broadminded, daring, tolerant of ambiguity and uncertainty, independent thinking, and willing to experiment (McCrae and Costa, 1987, LePine, 2003, Molleman et al., 2004). In contrast, individuals who are low in Openness to Experience tend to be down-to-earth, practical, traditional, and set in their ways (Costa Jr and McCrae, 1992).

High elevation of Team Openness to Experience should facilitate member adaptability and help members resolve unique or complex challenges. For example, some scholars have found that teams with greater openness were more successful in adapting to changing contexts in decision-making (LePine et al., 2000), likely explained because member adaptability is predicted by individual-level Openness to Experience. However, it’s also appropriate to argue that team member adaptability is also enabled by the flexibility of other team members. That is, individual flexibility and imagination may be constrained if other team members fail to reciprocate in kind. Thus, it is expected that high elevation of Team Openness will positively relate to Team Performance since team elevation on Openness to Experience should enable the expression of member flexibility. Conversely, members who are otherwise flexible may hesitate to express flexibility if other members behave inflexibly, since behaving flexibly when others are not should violate norms for reciprocity and perceptions of fairness (Blau, 1964), thus discouraging flexibility in future work interactions – see **Chapter 2** for a more detailed discussion.

1.12.1.4. Agreeableness

Individuals high in Agreeableness can be characterised as being: courteous, friendly, tolerant, cooperative, considerate, modest, trustworthy, helpful, altruistic, empathetic, and caring (Costa and McCrae, 1992); they are non-competitive (Graziano et al., 1997) and conflict averse in their social interactions (Graziano, 1994). Therefore, Agreeableness is expected to manifest itself through its positive affect in team social processes and contextual performance (Peeters et al., 2006a), and may be the trait that is most concerned with interpersonal relationships (Graziano et al., 1996). Therefore it is expected to have high predictive validity for tasks requiring collaboration, positive social-relations (Barrick et al., 2001), and pro-social behaviours (Stewart et al., 2005, Mumford et al., 2008). In contrast, individuals who are low in Agreeableness tend to be direct, uncaring, intolerant, unsympathetic, critical, sceptical, hard-headed and competitive (Costa Jr and McCrae, 1992), and consequently are rated (by others) as less socially desirability (Graziano et al., 1996). Previous studies have found that having just a single team member that is low in Agreeableness may be disruptive and negatively impact Performance (Barrick et al., 1998, Bell, 2007).

High elevations of Team Agreeableness will create a context where members are expected to interact constructively and courteously (Ashton and Lee, 2007), which should bolster service orientation and team member relations. Elevation in this trait is related to team cohesion and the effective management of disagreements between team members (Bradley et al., 2014, Bradley et al., 2013a, Bradley et al., 2013b, Bradley et al., 2012). Thus, teams that are generally high on this trait may encourage a positive social environment that is favourable as it serves to motivate member performance, positive team outcomes. However, low elevation in this trait can lead to a negative and tense team climate, harming individual motivation and morale (Driskell et al., 2006). Empirical work has indicated that negative emotions in one individual are readily adopted by others (Barsade, 2002), and the physiological effects of negative emotions are longer lasting than those of positive emotions (Rein, McCraty, & Atkinson, 1995). Taken together, these results suggest that negative traits associated with Agreeableness, are more likely to be expressed if other team members also express them. Conversely, teams with strongly supportive interpersonal environments will tend to express positive traits associated with Agreeableness. Thus, Team Agreeableness should relate to team performance when elevation of Team Agreeableness is high – see **Chapter 2** for a more detailed discussion.

1.12.1.5. Conscientiousness

Conscientiousness represents the degree to which individuals are: achievement oriented, self-motivated, persevering, hardworking, thorough, orderly, punctual, dependable, responsible, and self-disciplined, (Barrick and Mount, 1993, Costa and McCrae, 1992, Goldberg, 1993). Individuals high in Conscientiousness tend to set themselves high standards, strive to achieve their goals, and are well organised. In contrast, individuals in whom Conscientiousness is lacking tend to be disorganised, easy-going, and sometimes careless. Furthermore, such a deficiency has been shown to lead to various forms of moral disengagement, including social loafing, shirking, or free-riding (Harkins et al., 1980, Karau and Hart, 1998, 1993, Kidwell Jr and Bennett, 1993, Mohammed and Angell, 2003, Molleman et al., 2004, Neuman and Wright, 1999, Ulke and Bilgic, 2011).

Elevation in Team Conscientiousness will create a context where member effort is encouraged and loafing is discouraged, thus improving the work effort from team members. For example, individuals high in Conscientiousness are more likely to engage in *backing-up* behaviours and other forms of contextual performance (Morgeson et al., 2005). These behaviours can further reinforce *proscriptive performance norms* and communicate strong behavioural expectations to team members (Cialdini and Trost, 1998). A more Conscientious team should create a context in which member Conscientiousness is encouraged and rewarded, thus eliciting greater activation in Conscientiousness for those who are predisposed to behave that way (Mohammed and Angell, 2003). Conversely, a low conscientious team member is more likely to withhold effort, resulting in feelings of inequity in the other team members. Thus, rather than activating behaviours associated with Conscientiousness, social-loafing by even one team member may result in a desire by other members to reduce their contributions as a means of restoring equity. This phenomenon is known as the *sucker effect* (Hart et al., 2001) – see **Chapter 2** for a more detailed discussion.

1.12.2. Team Personality, Team Boundary Management, and Team Effectiveness

In combination, *Similarity Attraction* and *Trait Activation* Theories provide that when teams are required to work interdependently: -

1.12.2.1. Neuroticism and Boundary Management on Performance, Team Cohesion and Team Viability

> ***Team Neuroticism*** *will negatively predict* ***Performance****,* ***Team Cohesion*** *and* ***Team Viability*** *due to the negative impact neurotic behaviours have on social interactions; behaviours activated within a neurotic team faced with the perception of uncertainty, external threats, work pressure and/or role stress.* ***Neuroticism*** *will also negatively predict* ***Performance*** *through its interactions with* ***Boundary Buffering*** *and* ***Boundary Reinforcement*** *for the same reasons. Conversely, low trait neuroticism, referred to as Emotional Stability, is expected to positively predict Performance through Boundary Buffering and Boundary Reinforcement by reducing the situational strength of Team Neuroticism on less neurotic individuals, as will variance in neuroticism across the team. The differential relationships between Neuroticism, Boundary Buffering, Boundary Reinforcement and Performance are anticipated to be curvilinear, in keeping with previous findings.*

1.12.2.2. Extraversion and Boundary Management on Performance, Team Cohesion and Team Viability

> ***Team Extraversion*** *will negatively predict both* ***Performance*** *and* ***Team Cohesion*** *and* ***Team Viability*** *due to the pro-social behaviours that will be activated in extraverted individuals working within an extraverted team, especially by the opportunity for social interactions presented by Boundary Spanning and Boundary Buffering, but for different reasons.* ***Performance*** *may be negatively impacted by the preference extraverts have for social interactions which distract them from their task completion; meanwhile Team Cohesion may be negatively impacted by conflict arising from the dominant, assertive behaviours typical of high extraverts.* ***Extraversion*** *will also negatively* ***predict Team Cohesion*** *through its interactions with* ***Boundary Spanning****,* ***Boundary Buffering*** *and* ***Boundary Reinforcement*** *for the same reasons. The differential relationships between Extraversion, Boundary Spanning, Boundary Buffering and Boundary Reinforcement and Team Cohesion are anticipated to be curvilinear, in keeping with previous findings.*

1.12.2.3. Openness and Boundary Management on Performance, Team Cohesion and Team Viability

__Team Openness__ is expected to positively predict __Performance__ through an interaction with __Boundary Buffering__ especially when trait strength is low, since teams low in trait Openness create a reduced level of situational strength such that Team Openness will positively predict Boundary Buffering as these individuals tend to be pragmatic, more set in their ways, less likely to pursue novel situations, and more resistant to external influences on the team.

1.12.2.4. Agreeableness and Boundary Management on Performance, Team Cohesion and Team Viability

__Team Agreeableness__ is expected to positively predict __Team Cohesion__ and __Team Viability__ as agreeableness may be the most concerned with interpersonal relationships of all the five traits. __Agreeableness__ is expected to positively predict __Team Cohesion__ through interactions with __Boundary Spanning__, __Boundary Buffering__ and __Boundary Reinforcement__ since a highly agreeable team will activate agreeable behaviours across members of the team. Variance in Agreeableness is expected to negatively influence Team Cohesion. The differential relationship between Agreeableness, Boundary Spanning, Boundary Buffering and Boundary Reinforcement and Team Cohesion are anticipated to be curvilinear, in keeping with previous findings.

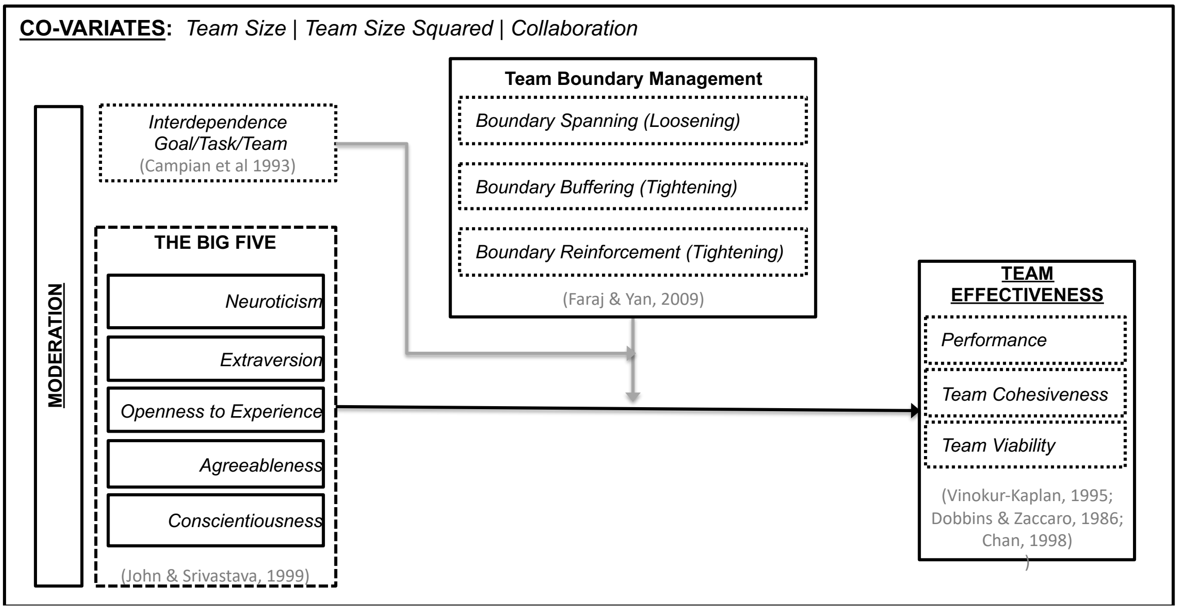
1.12.2.5. Conscientiousness and Boundary Management on Performance, Team Cohesion and Team Viability

When __Team Conscientiousness__ is high, variance in __Conscientiousness__ across the team will negatively predict __Performance__ and __Team Cohesion__ and __Team Viability__, since between person differences are known to lead to conflict and moral disengagement. __Conscientiousness__ is expected to negatively predict __Performance__ through interactions with __Boundary Buffering__ and __Boundary Reinforcement__ due to the top-down effect that a highly Conscientious team will exert in activating goal focussed behaviour of conscientious individuals across the team who may be less likely to attend to the inward facing activities required by Boundary Buffering and Reinforcement. The differential relationship between Conscientiousness, Boundary Buffering, Boundary Reinforcement and Performance suggests it is likely to be curvilinear, in keeping with previous findings.

1.13. Conceptual Model

To aid clarity, these relationships are outlined schematically in the diagram of the proposed conceptual model – see **Figure 1.1** below.

Figure 1.1: Conceptual model of relationships between personality, boundary management and team effectiveness outcomes



1.14. Aims

The aims of this research are to address the gaps in understanding by examining the relationships between: Team Personality Traits (i.e. the Five Factor Model), and team outcomes (Performance and Team Cohesion); the moderating influences of Team Boundary Management (Boundary Spanning, Boundary Buffering, and Boundary Reinforcement), and Interdependence.

1.15. Research Objectives

1. To identify how, when and under what conditions Boundary Management influences the relationships between team personality traits and Team Outcomes; and, in doing so to identify the associated team composition choices and compromises.
2. Through the theoretical lens of Trait Interaction, Trait Activation and Interdependence Theory, to extend understanding of the relationships between Team Personality, Boundary Management, and Team Outcomes.
3. To advance understanding of the practical implications associated with team composition, while providing a tool to assist practitioner's understanding of the

compositional choices, and compromises, arising from what Steiner refers to as the *simplification of unmanageable complexities* Steiner (1972: p.107).

1.16. The Importance of this Research

This research is important from the perspective of theory and practice. For example, Trait Activation Theory (TAT) (Allport, 1966, Tett and Burnett, 2003, Tett and Guterman, 2000), provides a strong theoretical basis to suggest that when teams work interdependently, team personality traits should (differentially) influence team outcomes through their interaction with team processes, since Personality Traits theoretically form a proximal link to processes, such as Boundary Management, and a distal link to Team Outcomes (Driskell et al., 1987). Decades of research into the personality and performance relationships speaks to the importance of investigations of Team Composition. Similarly, escalating complexity associated with undertaking knowledge work in distributed working environment has stimulated considerable research into the relationship between Boundary Management and Performance. In each case, scholar have called for investigations of the antecedents of Boundary Management, and its role in the personality and performance. These include scholars, like Seibert and DeGeest (2017) and, for example, Dey (2017), who called for the examination of deep-level compositional factors as antecedents of Boundary Management.

1.17. Contribution

This research will contribute to theory and practice in a number of ways. These are outlined briefly in this section but discussed more extensively in **Chapter 10**.

1.17.1. Theoretical Contribution

Previous studies and meta-analyses have elaborated understanding of the relationships between deep-level composition variables, such as personality traits, and team outcomes. However, the literature is fragmented, findings of empirical studies are equivocal, reported effect sizes are consistently small in both the individual (Hurtz and Donovan, 2000, Mount et al., 1998), and team level domain (Porter et al., 2003, Prewett et al., 2009, Prewett et al., 2016). Consequently, drawing conclusions about optimal team composition choices needed to elevate team performance are problematic – hence the calls for more research outlined in the previous section. This research contributes to theory by answering those calls through the theoretical lens of Trait Activation; and, in doing so, it extends understanding of the relationships between Team Personality, Boundary Management, and Team Outcomes, and the impact of those relationships on Team Composition. For example, examining the relationships between team personality and team boundary management extends understanding of the antecedents of boundary Management. It also extends understanding of the role of boundary management in the personality and performance relationship beyond the dyadic relationships generally represented in literature. It also responds to calls by scholars for team research to develop more complex, multivariate models, to better explain these relationships. Finally, it extends theory by investigating the curvilinearity, or absence of curvilinearity, in the interactions between Personality, Team Boundary Management, and their role in promoting Team Effectiveness. See **Chapter 10** for a more detailed discussion.

1.17.2. Practical Contribution

From a practitioner's perspective, the utility of data derived from personality assessment is challenging, since the dynamic nature of the modern workplace doesn't fit easily alongside the apparently static view of personality traits. Knowledge of the influence of Trait Activation will assist practitioners by providing insights into the opportunities and compromises associated with team composition. This will help to inform strategy and Human Resource (HR) practice about how teams should be composed to optimise pro-social behaviours while undertaking crucial team processes such as boundary management.

Similarly, based on my own experience, whilst organisations recognise the importance of developing social skills, and acknowledge its importance in job roles, few, if any, of the organisations in which I have been associated, recognise the influence of boundary management as a formal team process. This research provides the opportunity to correct this by informing organisations as to some of the antecedents of effective boundary management processes, and when those condition might best apply.

It is hoped that this research will also inform the approach to performance management, and training and development needs of individuals whose job function requires intensive social interaction. It will do so by providing a Tool to aid practitioners in their decision making. See **Chapter 10** for a more detailed discussion.

1.18. Summary

After a century of intensive team research, a variety of changing environmental factors have impacted contemporary organisations to such an extent that team collaboration practices have evolved beyond our understanding. This is reportedly impairing organisational performance. These trends include globalisation, the shift to knowledge work, and the evolution of distributed structures resulting in diversity and physical dispersion. These combine to increase demand on lateral social interactions between team members, which requires them to express spontaneous displays of pro-social behaviours, while effecting team processes, such a Boundary Management, that are helpful in avoiding the negative consequences associated with over-collaboration.

Despite a long tradition of workplace personality research, studies are limited, and their results have been found to be equivocal. There is also a lacuna between theory and practice, leading some to suggest that what we know about the role of team composition in developing team performance may not be fit for purpose. Such circumstances provide an incentive to advance understanding of the personality—performance relationship from the perspective of team composition, along with the conditions necessary to promote the pro-social behaviours required by a highly collaborative team context. This research aims to address these issues by contributing to theory, and practice, by offering practitioners with new knowledge embedded within a simple tool.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

This literature review of the body of knowledge that has previously examined the antecedents of team performance, collaborative team processes, such as Boundary Management, and Team Composition, seeks to illuminate the nature of the gaps identified in the previous section, and examines the opportunities presented by the calls of previous scholars to examine the personality and performance relation linked through team processes, and also the deep-level compositional factors as antecedents of boundary management processes.

Investigating these issues through the lens of Trait Activation Theory and assisted by the Input-Process-Output (IPO) heuristic, this chapter includes an evaluation of the key literatures relating to personality traits (and their operationalisation), Boundary Management, the relationships these variables have with Team Outcomes (Team Effectiveness.

2.2. Approach to Literature Review

In undertaking this literature review, a broad range of sources were considered, including published (academic) books, journal articles, Doctoral Theses, and conference papers covering a range of fields beyond the domain of Organisational Psychology.

The literature review involved a sequential and systematic approach, see **Appendix 1** for details. This provides a high degree of confidence that, of the large volume of literature that was considered, there are no previous studies that provide an explanation of: -

I. the antecedents of Boundary Management in contemporary organisations; or
II. the moderating role of Boundary Management in predicting the relationship between Team Personality traits and Team Effectiveness, including Performance and Team Cohesion and Team viability; or
III. the linear or curvilinear nature of the trait elevations associated with these relationships.

2.2.1. Sequence

This Chapter starts by restating the research problem provided in the previous chapter. Extending from this is a reminder about the rapidly changing organisational context challenging the premise and relevance of the traditional team form. This is justified on the basis that context is an important situational factor in the pattern of relationships between individual differences and team outcomes (Westerman and Simmons, 2007, p.301). Next, I review the literature relating to teams and previous investigations of personality traits in predicting performance outcomes. Since the relationship between personality traits and performance has been established across a variety of conditions at both individual and team levels (Barrick et al., 2001, Motowidlo and Van Scotter, 1994). Then, through the lens of Team Personality and Team Boundary Management, I consider the personality traits and processes necessary for contemporary *'teams'* to interact and coordinate their activity in order to promote team outcomes.

2.3. Research Problem

The changing contextual environment of teams described in earlier sections (Marrone, 2010, Wageman et al., 2012b, Wageman et al., 2012a), confound understanding of how to optimally compose teams for success, because these environmental conditions create greater demand for lateral social interactions and interdependent working. This amplifies the need for team members to spontaneously display pro-social behaviours and promote contextual performance as a core competence. Ameliorating the effects of task complexity and resource constraints through interdependent working and pro-social behaviour, while avoiding the negative consequences associated with over-collaboration, teams must employ team processes, such as Boundary Management. Consequently, Boundary Management has been found to predict team outcomes, such as performance (Marrone, 2010, Marrone et al., 2007), and cohesion (Ancona, 1990, Choi, 2002, de Jong et al., 2014, Marrone et al., 2007).

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2.3.1. Team Composition

Team Composition, defined as the configuration of team member attributes (Levine and Moreland, 1990), has a powerful influence on team processes and outcomes (Kozlowski and Bell, 2003) since the composition of work teams is defined by the individual characteristics of their members. The rationale underlying the research on team composition is that individual characteristics of team members, i.e. their personality, demographics, etc., will compile to serve as *Inputs* that influence Team *Outcomes* directly (and indirectly) through team *Processes* (O'Neill and Allen, 2011). This is because personality traits are particularly salient to the task contributions team members make to team outcomes, and the way that team members interrelate to each other during the course of their work.

Team composition has received considerable attention over the last century and literature relating to the personality--performance relationship (at individual and team levels) is prominent, and includes multiple meta-analyses relating to personality and performance (and other important organisational outcomes) (Barrick et al., 2001, Tett et al., 1991, Tett and Christiansen, 2008). There is also a considerable literature covering the Boundary Management and Performance relationship (e.g. Caldwell and O'Reilly, 1982, Ancona and Caldwell, 1992, Ancona and Caldwell, 2000, Ancona and Caldwell, 1998, Ancona and Caldwell, 2007, Faraj and Yan, 2009, Marrone et al., 2007, Marrone, 2010). However, there is no literature, or prior empirical studies, examining the team composition variables needed to explain the role of boundary management in the personality-performance relationship. This represents a lacuna in our understanding, a finding reinforced by calls for the investigation of the deep-level compositional factors [4] associated with boundary management processes (Dey, 2017), calls also reinforced by Seibert and DeGeest (2017)

> *although a number of studies link personality to emergent team processes or behaviours that support team effectiveness, there is little research that provides evidence that these processes and behaviours are the link through which team personality is related to team outcomes. Future research needs to develop models in which team personality is linked to performance via its effects on team processes and behaviours known to be associated with team effectiveness (p.393).*

[4] Surface-level composition variables refer to overt demographic characteristics that can be reasonably estimated after brief exposure, such as age, race, education level, and organizational tenure. Deep-level composition variables refer to underlying psychological characteristics such as personality factors, values, and attitudes ibid.

2.3.2. Team Effectiveness

Scholars posit that team composition is an important input variable of team outcomes such as performance and team effectiveness (Kozlowski and Bell, 2003). Consistent with (Kozlowski and Ilgen, 2006, p.79), this study conceptualises *Team Effectiveness* by adopting measures of *Performance*, *Team Cohesion* and *Team Viability*. Against a backdrop of increasing lateral interactions and interdependent working, Boundary Management activities are expected to differentially moderate the relationships between Team Personality and *Team Effectiveness* outcomes. This is because team success is not defined by a narrow measure of performance alone, but by the ability to sustain performance through repeated cycles over the long term. In complex work environments, teams must collaborate intensively, this requires positive, pro-social relations that promote cooperation and Team Cohesion. Similarly, team success is measured beyond single performance cycles. This relies of pro-social behaviours that promote long term Team Viability.

2.4. Research Question

Together, these led me to the following research question: -

> ***How***, ***when***, *and* ***under what conditions***, *do team personality traits influence team outcomes moderated by team boundary management.*

This question seeks to address the gaps in our theory, the resolution of which will help practitioners better understand how to compose teams for optimal performance and the associated conditions.

2.5. Teams and Team Work

2.5.1. Team Definition

Numerous definitions of groups, teams, and other forms of collectives have been offered over the years, some sharing attributes with only subtle differences, others providing a more dramatic shift. For example, Salas et al. (1992) define a team as: -

> *a set of two or more people who interact, dynamically, interdependently, and adaptively, toward a common and valued goal/ objective/ mission, who have each been assigned specific roles or functions to perform, and who have a limited life-span of membership (p.4).*

This definition, and associated characteristics, has been adopted in this study.

NOTE - the terms: *Groups* and *Teams*[5] are used interchangeably in this thesis to refer to Teams based on the Salas definition outlined above.

2.5.2. Benefits of Teamwork

Organisations are often structured using groups of individuals working interdependently to accomplish team outcomes (e.g., see Fisher et al., 2012, Guzzo and Dickson, 1996, Hackman and Morris, 1975, 1987, 1990b, 1990a, 1998). Consequently, it's likely that most people have experienced working in teams of one kind or another. The popularity of such structures is understandable given the wide variety of benefits said to accrue from aggregating resources. For example, teams satisfy employee's social needs (Whyte, 1955), foster participation (Thurow, 1983), and are well suited to complex work (Hoerr, 1989). However, teams can also create problems for organisations and display counter-productive behaviours, including *social loafing* (Alnuaimi et al., 2010), *shirking* and *free-riding* (Jones, 1984)*,* and group think *(Choi and Kim, 1999, Janis, 1982);* leading to *coordination/motivation/process losses*, and *dysfunctional conflict* (Hackman, 1987, Janis, 1982, Jehn, 1995, Karau and Williams, 1993, 1997, 1998, Latané et al., 1979, Steiner, 1966). The vast diversity of team types reinforces their ubiquity in the workplace, hence the importance of qualifying general statements about teams with definitions, and situational factors, such as the team type, task type, etc., as a means of providing some boundary conditions.

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[5] The diversity in team types has been managed by the practical approach taken to select research subjects, including a structured approach to job/task specification supported by O*NET CAMPION, M. A., MORGESON, F. P. & MAYFIELD, M. S. 1999. O*NET'S theoretical contributions to job analysis research. In N.G. Peterson, M.D. Mumford, W.C. Borman, P.R. Jeanneret, E.A. Fleishman, (Eds.), An occupational information system for the 21st century: The development of O* NET, 297-304. Washington, DC: American Psychological Association. In: PETERSON, N. G., MUMFORD, M. D., BORMAN, W. C., JEANNERET, P. R. & FLEISHMAN, E. A. (eds.) An occupational information system for the 21st century: The development of O* NET. Washington DC: American Psychological Association, O*NET. 2015. O*NET OnLine [Online]. Internet. Available: http://www.onetonline.org [Accessed 08/01/2015 2015].. This is described more extensively in the Methodology section included in **Chapter 3** below.

2.5.3. Hierarchical Team Structures and Boundary Conditions

Organisational team structures are typically hierarchical. In contrast, this study has focussed on teams that are relatively unstructured in the way they go about their tasks, require some degree of self-management, have defined leadership but are equally likely to have emerging/transactional leaders and/or multiple leaders. Therefore, this study examines the influence of team personality on various Team Outcomes in an organisational context that is involved in knowledge work, is dynamic, fluid, and has relatively unstructured task-teams that work virtually to some extent. These conditions require a high degree of interdependent working and social interaction (Driskell and Salas, 2013, p.745). Therefore, the spontaneous display of extra-role pro-social behaviours by individuals is so essential for effective organisational function (Katz, 1964) that effective pro-social behaviours are a key capability for those that operate in this type of team environment (Duclos and Barasch, 2014, Garcia-Banda et al., 2011, Martin-Raugh et al., 2016, Penner et al., 1995, Puffer, 1987). Indeed, this capability has become so fundamental to teamwork that social inter-connectedness has developed its own organisational currency – *Social Capital* (Seibert et al., 2001), whereby the extent of one's *connectedness* is viewed as a success factor analogous with effective team function and social interaction (Ayoung et al., 2011, Bercovitz and Feldman, 2011, Espinosa et al., 2014, Fang et al., 2015, Henttonen, 2010, Reagans et al., 2004, Saonee et al., 2011, Sparrowe et al., 2001, Vodosek, 2003, Wehrli, 2008, Ying and Norman, 2014, Zhong et al., 2012). Managing the lateral interactions associated with intensive interdependence, while avoiding the negative impact of over-collaboration, necessitates that teams adopt effective team processes, like Boundary Management.

2.6. Team Processes: Boundary Management

2.6.1. The Role of Boundary Management

In reference to processes and outcomes, past research typically refers to teams as isolated entities separate from their organisations (Choi, 2002: p.186). In practice, teams do not operate in isolation. They realise their goals through interdependent relationships and behaviours with other organisational teams, and teams in external organisations (Barrick et al., 2007). In recent times, teams have been considered a part of the traditional hierarchical structure of organisations. To some extent, this may have insulated them from external exposure (van Knippenberg, 2003). It was only in the 1980's that team research started to introduce an external viewpoint (Yan and Louis, 1999).

2.6.2. Definition of Boundary Management

Boundary Management, defined as *the team's actions to establish linkages and manage interactions with parties in the external environment* (Ancona, 1990, Ancona and Caldwell, 1992, Marrone et al., 2007, Marrone, 2010: p.914), helps teams to meet performance goals and/or task objectives, and it is comprised of a variety of activities including: *ambassadorial/representation actions*, *activities supporting coordination and/or task Performance*, *general information search* and *environmental scanning*, and *guarding activities*, each of which are said to be critical to Team Performance (Ancona and Caldwell, 1992: p.640-642). However, Marrone notes that boundary activities are not restricted to those behaviours that are beneficial, functional, or desirable [to the organisation], and subsequently reports that team effectiveness is more likely when members engage in activities that (a) promote the team and secure resources, and (b) establish and nurture tighter links with other teams linked through the workflow.

2.6.3. Historical and Theoretical Development

Research into Boundary Management is well established with studies dating back to the writings of early social-psychologists (Homans, 1950, Lewin and Cartwright, 1952). Expanded throughout the 1960s, 1970s (Tushman and Scanlan, 1981b) and early 1980's by scholars of the Open Systems tradition, (Katz and Kahn, 1978), and those studying Boundary Spanning behaviour (Roberts and O'Reilly, 1979, Tushman, 1977) and autonomous work groups (Cummings, 2004).

Boundary Management activities are becoming increasingly important for teams as the emerging organisational forms: team based organisations (Shonk, 1992), horizontal/matrix organisations (Byrne, 1993), virtual organisations (Galbraith, 1995), and network organisations (Powell, 1990), rely on semi-autonomous, self-regulating teams whose boundaries are permeable at the intra and inter-organisational levels (Yan and Louis, 1999). This renders more traditional functional silos obsolete, and leads writers to argue that: -

> *boundary activities are migrating inward to the work unit level, making boundary work increasingly challenging (p.26).*

Effective boundary management directly benefits team effectiveness (Carlile, 2004), is important for knowledge transfer within and between organisations (Argote et al., 2003), and for *protection* against threats from outside of the team (Aldrich and Herker, 1977).

Much of the research on boundary management has followed two streams of work. The more recent, following Ancona (1990), and Ancona and Caldwell (1992), seeks to identify strategies that teams can use to manage their external environments, while finding ways in which Boundary Management activities promote Team Outcomes. Contrasting with this, earlier studies of individual level social-psychological research reported that those who carry out Boundary Spanning, while gaining status and influence, also experience role overload as a result of facing simultaneous and often conflicting demands (Kahn et al., 1964, Katz and Kahn, 1978). This creates a dilemma for those concerned, i.e. whilst teams engaged in Boundary Management improve Performance by managing their external environments more effectively, in doing so, those team members may experience *role overload* that is detrimental to the team's cohesion and long-term viability. Addressing this paradox has important practical implications; while Boundary Management activities are important to Team Outcomes, team members tend to under engage in externally directed activities, instead focussing on internal activities and processes (Marrone et al., 2007: p.1424).

Over the last three decades in particular, theoretical and empirical work has emerged that has advanced understanding of team Boundary Management compared to those early reports (Roberts and O'Reilly, 1979, Tushman, 1977). Despite this, the antecedents, consequences, and impact of Boundary Management activities are still not fully understood (Ancona and Caldwell, 1998, Choi, 2002, Faraj and Yan, 2009, Joshi et al., 2009, Marrone, 2010, Yan and Louis, 1999). For example, in trying to capture boundary activity phenomenon in the team context, some studies have focused on how specific team members communicate with external agencies to promote team functioning (Faraj and Yan, 2009). But they have not considered how teams operates with regard to their boundaries. Other studies have focused on boundary activities as a team construct that contrasts between *inward-looking* boundary tightening activities, and *outward-looking* activities intended to *loosen* team boundaries (Johnson and Chang, 2000). Developing this theme, researchers have argued that these contrasting boundary activities are complementary and synergistic, rather than supplementary and conflicting (Ancona and Caldwell, 1998, Choi, 2002, Howell and Shea, 2006, Marrone, 2010). Finally, while early researchers either examined antecedents (Campion et al., 1996, Drach-Zahavy and Somech, 2010, Howell and Costley, 2006, Yan and Louis, 1999), or outcomes of boundary activities (Ancona and Caldwell, 1998, Joshi et al., 2009), few have explored the Boundary Management activities in relation to specific antecedents and/or outcomes (Ancona and Caldwell, 1998). This research study contributes to this scant body of work.

2.6.3.1. Influential Contributors

A large number of articles have been reviewed but this section leans heavily on Jennifer Marrone's multilevel review of past research on team Boundary Spanning (Marrone, 2010), along with the writings of a few other luminaries who have advanced Boundary

Management research: (e.g. Ancona and Caldwell, 1988, Choi, 2002, Faraj and Yan, 2009, Joshi et al., 2009, Mortensen, 2004, Tushman and Scanlan, 1981a). Boundary Management is an established research topic. Even so. Marrone identifies gaps and poses many questions that help to identify the current lack of knowledge about Boundary Spanning. For example, Marrone posits that some of the contextual organisational conditions identified in previous sections require organisational teams to increasingly coordinate interdependent work and bridge disconnected parties by actively managing relationships external to the team itself through what is termed as *Boundary Spanning*, or team boundary management (Marrone, 2010: p.911, Cross et al., 2013). This creates a clear reliance on such teams to develop pro-social behaviours, since boundary management is primarily a social team process.

A number of studies have reported that Boundary Management activity is a predictor of Team Performance: (Ancona and Caldwell, 1990, Ancona and Caldwell, 1992, Ancona, 1984, Hansen, 1999, Marrone et al., 2007, Wong, 2004), and it is therefore a key consideration of a team's composition and behaviour. Citing Cummings, while repeating observations from the previous section, Ancona and Caldwell (2000: p.295) report that

> *the greater the task complexity and degree of Interdependence with other organisational units, the more the team will need to engage in a complex web of <u>external</u> relationships in order to manage the coordination, knowledge transfer, and political manoeuvring necessary to accomplish the team's goals and objectives (Cummings, 2004).*

2.6.4. Inward Vs. Outward Boundary Management Activities

Researchers have acknowledged that team performance is not merely an outcome of the internal functioning of teams (Ancona and Caldwell, 1992, Ancona and Caldwell, 1992b, Joshi, 2006, Marrone et al., 2007, Oh et al., 2006, Reagans et al., 2004). External relations are equally crucial in order to meet organisational goals, (Druskat and Kayes, 1999, Tsai and Ghoshal, 1998). While distinguishing between *internal* and *external* team processes, these also share commonalities in representing the team level actions needed to achieve collective performance goals (Marks et al., 2001, Mathieu et al., 2008), while originating in the actions of individuals. Externally focussed activities enable diversity in information obtained by the Boundary Spanning team (Hansen, 1999), and coordination between interdependent teams in ways that are crucial to supporting innovation, problem solving, learning, and goal alignment (Mohrman et al., 1995, Salas et al., 2009). Consequently, they are distinct from internal team processes in that they capture the interactions across teams and parties both within the embedding organisation, and beyond organisational boundaries.

For example, research into distributed organisations has shown that Boundary Spanning between teams enables the generation of new knowledge and knowledge sharing (Gasson, 2005, Malhotra and Majchrzak, 2004, Malhotra et al., 2007). Researchers have conceptualised external activities of teams in a variety of ways. For example, Thompson (1967), proposes Interdependence as a model for studying relationships among teams. Others have operationalised Interdependence and measured the intensity of external interactions using communication frequency among teams (Van De Ven and Ferry, 1980). Marrone notes that more recent perspectives on team function call for a deeper examination of externally directed team processes (Ancona, 1984, 1988, 1990, 1992, Faraj and Yan, 2009, Mathieu et al., 2001, Marrone et al., 2007) in addition to internal team processes, such as *conflict resolution* and *task coordination* (see Mathieu et al., 2008).

In contrast, internal activities are those intragroup processes occurring within the team boundary, such as *forming*, *enforcing team norms*, *communication*, *coordination*, *planning*, and *decision-making*. While internal and external team activities appear to be conceptually distinct, this is unlikely to be the case in practice as they compete against each other for scarce team resources, and/or, reinforce each other in a symbiotic relationship (Choi, 2002: p.186). Therefore it is likely that teams need to find a delicate balance between internal and external focus if they are to avoid degrading performance, or suffering the effects of motivational loss, declining social cohesion, and erosion of team identity (Sundstrom et al., 1990: p.130), or collaboration overload. The relationship between internal/external activities and team effectiveness is conceptualised by Choi in **Figure 2.1** below. Choi's diagram illustrates the theoretical *'sweet-spot'* where boundary-tightening and boundary-loosening activities are optimal. In practice, this requires team members to negotiate an acceptable compromise. This study simultaneously considers team boundary loosening and tightening activities.

Figure 2.1: Internal Vs. External Activities, Choi, 2002:

2.6.5. The Importance of Boundary Management

External activities play a crucial role in developing shared understanding, values, and a common cognitive structure among organisational members through managerial influences and interactions between members (O'Reilly and Chatman, 1996). Conversely, the permeability of team boundaries may largely determine the extent to which an organisation can ingrain shared values across its sub-units.

Boundaries function as a membrane: wrapping members within a team, filtering the flow of communication, information, knowledge, and enabling other social influences. It is for this reason that if the boundary separating the team from its environment is not permeable, the formation of an organisation wide culture can be blocked by group sub-cultures, leading to negative competition between groups, conflict, coordination failure, and performance loss (Ashforth and Mael, 1989).

2.6.6. Boundary Management Activities

Faced with ambiguity, complexity associated with knowledge work, flatter, distributed structures requiring intensive lateral social interactions and interdependent working enabled by pro-social behaviours, teams are required to employ formal processes if they are to avoid the negative consequences of over-collaboration. Boundary Management, comprising of Boundary Spanning, Boundary Buffering, and Boundary Reinforcement activities is such a team process (Faraj and Yan, 2009).

In order to enable effective team functioning, a team’s mission is to create boundaries that are both permeable enough to allow resources and information in, yet sufficiently impermeable to avoid doubt about team membership and accountability for the team’s collective outputs (Ancona and Caldwell, 2000: p.295). The main challenge for teams undertaking Boundary Spanning work is to create boundaries that are permeable enough to allow resources and information to flow in to the team, while avoiding the uncertainty about who is on the team, and whether those members are accountable for the team’s collective outcomes (Hackman, 2002). Building on Yan and Louis (1999), Faraj and Yan (2009) provide a conceptualisation of Team Boundary Management in organisations. Taking an *Open Systems* approach, they recognised how the changes of organisational structures discussed extensively above, have led to increased demands on organisational teams, i.e. permeable boundaries create increased demands on team members, spanning their own boundaries, buffering themselves from disruptive demands, and reinforcing their own boundaries to establish their identity. To this end, Faraj and Yan (2009) identified three distinct types of team boundary work in their study: *Boundary Spanning, Boundary Buffering*, and *Boundary Reinforcement*.

2.6.6.1. Boundary Spanning (loosening)

Boundary Spanning refers to *boundary loosening* actions a team takes to reach out to and engage with its environment in order to obtain resources and support (Faraj and Yan, 2009). These actions are generally known as *Scouting,* and *Coordinating*, and involve activities such as bargaining, negotiating, contracting, co-opting, collaborating, coordinating, building alliances, and coalitions. Perspectives on boundaries as frontiers for transactions among systems, and interfaces between systems and their environment represent the foundations for the concept of spanning as a key form of boundary management activity (p.606). Previous studies of Boundary Spanning (Ancona and Caldwell, 1990, 1988, 1992, 1992b) have found that *'ambassadors'* and *'task coordinators'* worked with contacts in the larger organisation in which they operated, to acquire information, resources, and the support necessary to complete the task in hand. Boundary Spanning activities cannot only be accomplished by team members in their formally defined roles and capacities, but also by social networking, i.e. through activities specifically undertaken to build and maintain links among people for a variety of purposes. This led Yan and Louis (1999) to conclude that: *it has become a truism that personal networking supports organisational [boundary] spanning* (p.33).

In summary, Boundary Spanning contributes to Team Performance by enabling the team to detect internal and external demands, securing the resources needed to meet those demands, promoting the team's work, and building goodwill among stakeholders.

2.6.6.2. Boundary Buffering (tightening)

Boundary Buffering is a process of disengagement, where a team engaged in buffering is seeking to protect itself from uncertainty and disturbances by closing itself off from unwanted exposure in its environment: preventing disturbances and uncertainty, negative input caused by undesired access to team boundaries, distractions, and leakage of valuable resources (Yan and Louis, 1999). Ancona and Caldwell (1988) empirically demonstrated how *'sentries'* and *'guards'* served to buffer teams, policing group boundaries, controlling the quality and quantity of inputs received by the team, and preventing outflows of critical information and resources that would otherwise erode team performance. As such, buffering is considered to be an essential team maintenance process, leading Mohrman et al. (1995) to report that: *knowledge workers are simultaneously involved in multiple teams, a stretch that often causes conflicting priorities and works against the effectiveness of the team*, (p.256).

In summary, Boundary Buffering contributes to Team Performance by strengthening the team's boundaries against external interference and creates a protected internal environment.

2.6.6.3. Boundary Reinforcement (tightening)

Faraj and Yan (2009) presented *Boundary Reinforcement* as a new and unstudied boundary management activity, although Yan and Louis (1999) have previously discussed this as '*Bringing Up Boundaries'*. Boundary Reinforcement is defined by the way in which the team internally sets and maintains its boundaries by increasing member awareness and sharpening team identity. It involves creating a coherent unit for team members regardless of the diversity of their backgrounds. This is achieved through two related pursuits. Firstly, by attracting team members' attention, energy and resources towards the teams' mission, thus developing a centripetal force. Secondly, by creating a supportive climate in which a shared sense of identity emerges (Druskat and Wheeler, 2003). Yan and Louis (1999: p.33) elucidate this with examples of bringing up boundaries: *inviting team members to participate in developing the vision, encouraging support, helping behaviours, and developing a sense of safety and support,* [all of which help to] *strengthen the team's distinction from other teams* (Somech and Khalaili, 2014). In other words, Boundary Reinforcement is an inward facing activity that has become increasingly important in the post-bureaucratised structures in contemporary organisations, by enabling the team to attract and preserve the energy and attachment of its members, while increasing team identity and commitment.

2.6.7. Boundary Management: A Team-level Construct

Boundary Management has been conceptualised as an aggregate, compositional, team level phenomenon (Ancona and Caldwell, 1992, Ancona and Caldwell, 1992b, Oh et al., 2004, Reagans et al., 2004, Tsai and Ghoshal, 1998, Tsai, 2000, Weisz et al., 2004), leading Joshi et al. (2009: p.733) to consider team Boundary Spanning as a shared team property that originates in the experiences, perceptions, attitudes, values, cognitions, or behaviours of team members, (Klein and Kozlowski, 2000a: p.215). This makes Boundary Management research interesting in relationship to personality traits, which are representative of characteristics cited by Joshi.

2.6.8. Antecedents, Moderators, and Team Outcomes

There are logical reasons to expect positive relationships between boundary loosening activities and Team Outcomes. The importance of the relationship between external communication and team performance has been previously reported (Nelson, 1989).

Boundary Management *self-efficacy, tenure* and *experience* have emerged as strong motivational drivers of Boundary Management behaviour as they *lead to higher goal setting and more realistic task Performance strategies* (Marrone, 2010: p.924). Druskat and Wheeler (2003) found a direct relationship between a team leader's external Boundary Spanning actions and team outcomes, although they also found negative correlations between Boundary Spanning coaching interventions and cross-boundary activity which, they speculated, created frustration and over-dependence on leaders. Team Psychological Safety has also been found to be a strong predictor of Boundary Spanning (Edmondson, 1999, Kish-Gephart et al., 2009, Tucker and Edmondson, 2003) as it influences the likelihood that members would take risks and accept the challenges of engaging in external orientated behaviours. In contrast, Faraj and Yan (2009) found that Boundary Spanning facilitated team Psychological Safety and Performance (although they did not find support for a mediating role of Psychological Safety between Boundary Spanning and Performance outcomes). Investigating the relationships between inter-team Goal Interdependence and team functional heterogeneity on Team Innovation through the mediators of Boundary Loosening and Boundary Tightening activities, Faraj and Yan (2009) extended the understanding from previous research that these activities are complementary and positively predict Team Innovation.

Germane to this investigation, Marrone explains there is little understanding of: how individual Boundary Management behaviours combine at the team level, or of the processes through which members develop an understanding of their environment, how to manage it collectively, or the importance of doing so. Neither, she says, is there much understanding of the impact of structural variables (such as team size) on Boundary Management, or about the number of boundary spanners for a given team size, or about what the antecedents of these composition choices are.

This study posits that Team Boundary Management is particularly suitable for this type of research since Boundary Management will emerge as a consequence of Trait Activation within the team, where Boundary Management contributes to the *situational cues* that activate trait related behaviours that are conducive to Boundary Management and to promoting Team Outcomes.

2.7. Team Outcomes: Team Effectiveness

The literature covering Personality, Performance, Boundary Management and Team Interdependence is vast and any number of outcome variables could have been chosen. Given the constraints posed by sample size and statistical power, and the requirement for paucity, outcome variables were limited to: Performance (Vinokur-Kaplan, 1995) (using the approach originally proposed by Heslin (1964: p.249) whereby the evaluation of the final product by an agency outside the group); and Cohesion (Dobbins and Zaccaro, 1986). This follows a similar conceptualisation of Team Effectiveness (Kozlowski and Ilgen, 2006).

Advanced by McGrath (1964) almost fifty years ago, the Input-Process-Outcome (IPO) heuristic has served as a framework for studying Team Effectiveness. This has already been outlined and is discussed in more details below. Echoing the outcomes of interest in team research, Cohen and Bailey (1997) classified effectiveness into three categories: *Performance, attitudes,* and *behaviours*. Other writers have presented a broader spectrum of Performance variables (Sundstrom et al., 1990) and rendering neat categorisations difficult. Hence the Performance construct has received considerably less attention (Ilgen, 1999), resulting in criterion measures of Performance tending to be idiosyncratic and organisationally specific. Team effectiveness is multidimensional, consisting not only of measures of Team Performance based on quantity, quality, and/or end-user satisfaction based on team outcomes, but also on measure of the team's ability to function interdependently in the future, in other words, in terms of its cohesion and viability (Hackman, 1987, Sundstrom et al., 1990). Previous research has also addressed the temporal nature of performance, for example, suggesting that the effects of personality on performance may change over time (Lievens et al., 2009, Thoresen et al., 2004). This is reflected in the Methodology and Design proposed in **Chapter 3**. Consequently, data used in this study will be collected over two time periods with an appropriate time-interval that is sufficiently short to minimise team membership instability through attrition, which would degrade the sample collected, and yet long enough to provide an appropriate assessment of Team Effectiveness viewed across a time period that has a reasonable number of production cycles. This is further discussed in **Chapter 3**.

As noted in **Chapter 1**, these variables were chosen because, in general, team success should not be defined by a narrow measure of performance alone, but also by the ability of the team to sustain performance through repeated cycles of production over the long term. In complex work environments, teams must collaborate intensively, this requires positive, pro-social relations that promote cooperation and Team Cohesion. Similarly, it also relies of pro-social behaviours that promote long term Team Viability, otherwise the team will not be able to sustain high performance. Considering Team Cohesion and Team Viability in the context of Boundary Management is appropriate, given the aims and nature of each of the boundary management activities. For example, externally directed Boundary Spanning activities can compete for attention and dilute the effort teams expend on the internal processes necessary to develop and maintain team identity, such a Boundary Buffering and Reinforcement (Ancona, 1990, Choi, 2002). Marrone et al. (2007) cites two mechanisms, occurring simultaneously that exert conflicting influences on Team Viability. On one hand, the benefits derived through boundary Spanning, such as attracting resources and social support from beyond the team may help to cultivate Team Cohesion and Viability over time. While on the other hand, the challenges presented by *role overload* that team members may experience while boundary spanning may ultimately reduce Team Cohesion and Viability, along with satisfaction with their team experience more generally (p.1428).

2.7.1. Performance

Performance measures the extent to which the team achieves its goals and objectives. I used *Team Leader* performance ratings because more objective measures of performance were unavailable and are, in any case, recognised as being problematic, and subject to manipulation (Hollingshead et al., 1993). This is also because previous scholars have suggested that compared with more traditional team forms, the performance of knowledge workers is often multidimensional and thus hard to assess appropriately (Henderson and Lee, 1992). For example, the members of the organisation of which the team is a part may adopt different performance criteria than do external stakeholders. Beal et al. (2003) differentiate between *Performance behaviours* and *Performance outcomes*, where behaviours are actions that are relevant to achieving goals, and outcomes are the consequences and results of performance behaviours.

Examples of the wide range of studies including measures of Performance outcomes include: generally consistent with Heslin (1964: p.249), who posits *the evaluation of the final product by an agency outside the group*, Kirkman and Rosen (1999) employed supervisor ratings of customer service, Mathieu et al. (2006) measured external customer satisfaction, Kirkman et al. (2004a) used evaluations of satisfaction with team service, Mathieu et al. (2006) used a composite measure of archival data that was sensitive to differences across teams, Langfred (2000) used supervisors ratings of accuracy and quality of work, Faraj and Yan (2009) used stakeholder performance ratings of the extent to which teams achieved their goals. In contrast with these measures, some studies have used blended composite measures of team outcomes based on a balanced scorecard type of approach (Barrick et al., 1998, Hiller et al., 2006, Van Der Vegt and Bunderson, 2005).

Since team definitions require that teams produce something useful to the organisation, team literature is replete with performance criteria. Mathieu et al. (2008) organise their review of Team Performance literature in three categories: O*rganisational-level Performance, Team-level Performance, behaviours* and *outcomes*; and *role-based Performance*. This study is focusses on Team-level Performance, assessed by the team's leader and at the second data collection time interval.

2.7.2. Team Cohesion

There are two conceptualisations of cohesiveness of interest in team literature. The first emanates from the psychology tradition that views cohesion as a psychological state, or shared desire of team members to remain in the team. Following this tradition Festinger (1950) defined group cohesiveness as *the resultant of all the forces acting on individuals to remain within a group* (p.204). Therefore, cohesion was categorised as an *emergent state* resulting from interactions between team members, and their attitudes towards each other, i.e. the extent of interpersonal congruence and attractiveness (Petru Lucian, 2006). As an emergent psychological state, cohesion is closely related to team processes, outcomes, and other emergent states. When cohesion is high, team members will be highly motivated to achieving the team task, and more committed to the team (Beal et al., 2003). Cohesion, therefore, is expected to be positively associated with Team Performance. The second conceptualisation of cohesiveness comes from sociology, which views cohesion as a set of social network characteristics, and where it is generally agreed that a team is cohesive if it's social network has particular structural characteristics, e.g. it has high density, or it can be described as a clique (Beal et al., 2003). In this case a particular social network structure emerges, rather than a psychological state. This perspective implies that teams are nested structures and highly cohesive teams are embedded in less cohesive ones and the features and properties of a highly cohesive team are beyond any individual actors in the team. A number of shortcomings have been noted in cohesion literature. For example, the failure to explicitly state the appropriate levels-of-analysis, e.g. individual, dyad, group, organisation, etc., and noting that the level of analysis might be different from the level of the construct of interest resulting in mis-specification (James et al., 1993). This study unequivocally conceptualises Team Cohesion at the team-level, along with all of the other variables of interest.

Interdependence has an important relationship with cohesion. Researchers have found that high levels of cohesion positively affects team performance when work tasks are also highly interdependent, since team cohesion affects constructs such as team identification, coordination, cooperation, and communication (Roberts et al., 1978).

2.7.3. Team Viability

Despite suffering from construct confusion (Mathieu et al., 2008), Team Viability remains a popular criterion of Team Effectiveness. In some cases, it is measured as a collective sense of belonging, while in others it is likened to temporal membership stability, or the extent to which individuals wish to remain members of the team over time. Whilst it is reported to be conceptually important, viability is often not used as a primary criterion due to its self-report nature and problems found with discriminant validity (Barrick et al., 2007, Stewart and Barrick, 2000).

Team Boundary Management may support Team Viability through the collective efforts of team members at the team level – enabling teams to acquire resources, support, and guidance from external parties, in turn, promoting a productive internal team dynamic and increasing overall team satisfaction. Although Marrone et al. (2007) reports that the impact of team Boundary Spanning on Team Viability is largely unexplored, Ancona (1990) provided some support that, over time, high levels of individual contentment and Team Cohesion were reported in teams that actively engaged the external environment.

2.7.4. Team Boundary Management and Team Outcomes

Faraj and Yan (2009) failed to find a direct effect between Boundary Spanning (loosening) and Team Performance, although they did observe that Boundary Spanning helps teams to achieve their goals when resources are abundant, but hinders performance when resources are scarce. This lends some support to the findings of Ancona and Caldwell (1988), and may be a function of the paradox suggested by Ancona and Caldwell (1992b), later confirmed by Marrone et al. (2007), i.e. that the performance benefits of Boundary Spanning come with an increased risk of role over-load, moral disengagement, and conflict, etc, since Boundary Spanning in situations where resources are scarce will create the conditions that would lead to role over-load, stress, conflict, etc. A number of scholars have reported positive and negative relationships associated with Performance, Team cohesion and Team Viability, e.g. (Ancona, 1990, Ancona and Caldwell, 1990, Ancona and Caldwell, 1992b, Edmondson, 2003, Marrone et al., 2007, Tesluk and Mathieu, 1999). Against a backdrop of intense lateral interactions and interdependent working, Boundary Management activities are expected to differentially influence the relationships between Team Personality and Team Effectiveness.

2.8. Team Interdependence

2.8.1. Interdependence Theory

Originating from the fields of social psychology and organisational theory, Interdependence Theory explains how individuals react to one another in different situation structures, an idea developed from the principle that behaviour is a function of the person and the environment or, from the perspective of team research, the team and its members (Lewin, 1946). Deutsch's theory of cooperation and competition is especially influential. Deutsch (1949), proposes three alternative goal interdependencies that define how individuals perceived their goals to be related: *Cooperation*, *Competition*, and *Independence*. In the case of *Cooperative Interdependence*, individuals rely on one another in order to achieve their goals, in a group context the members of a group must cooperate social and task interactions if they are to achieve the goals of the group. Under *Competitive Interdependence* the opposite is the case, whereby individuals perceive their goals to be negatively related where one is successful when others fail; and, finally, under *Independent Interdependence*, individuals don't see their goals to be at all related to those of others (Richardson, 2010, p72). Citing Katzenbach and Smith (1993), Barrick et al. (2007) report that it is the extent of Interdependence between group members that distinguishes between a real team and a working group. They progress explaining the two conceptions of team Interdependence: (a) structural and (b) psychological (Thompson, 1967, Wageman, 1995). In the structural conception the level of Interdependence between members differs according to the team's task (Thompson, 1967). In contrast, in the psychological conception, Interdependence begins with the task requirements but extends to the social demand to cooperate and work together to achieve collective outcomes such as goals (McGrath et al., 2000, Wageman, 1995). Research has shown that task Interdependence—the extent to which team members must work with each other, or the extent to which group members need to share information (Mesmer-Magnus and DeChurch, 2009), expertise, and other resources to complete their work (Cummings, 1978)–is associated with the need for greater communication and coordinated effort among individuals for effective Goal Accomplishment (Stewart and Johnson, 2009). In this respect, Interdependence relies on developing rapport among group members.

2.8.2. Social Interaction Moderated by Interdependence

The influence of the team's task on processes and outcomes has long been recognised and various scholars have noted that the tasks teams perform present important contingencies that influence team effectiveness (Hackman, 1990a, Hackman, 1990b). In order to minimise process losses, individuals rather than teams best perform low-complexity tasks (Steiner, 1972). In contrast, work that is highly complex is best suited to team working, since interactions between team members with different sets of skills and objectives may provide synergistic gains. Consequently Hackman (1987) contended that one of the most salient threats to effective team working is a task that doesn't require team working at all (Richter et al., 2011: p.2753). Task complexity has been frequently identified as a key variable in group studies (Hambrick et al., 1998). Leaning on Bell and Kozlowski (2002), the writers posit that the nature of interactions between teams and team members are moderated by task-complexity, since this influences the degree of Interdependence between actors, and therefore the technology that is deployed to support dispersed team working. Although team tasks have been described in a multitude of ways (Goodman, 1986, Gully, 2000, 2002, 2012, Hackman and Morris, 1975, McGrath, 1984, 1991, Tesluk et al., 1997), a commonly emphasised feature is the extent of Interdependence between team members. Team Interdependence has been conceptualised in three ways (Kozlowski et al., 1999, Shea and Guzzo, 1987b, Shea and Guzzo, 1987a): (a) team members share various inputs and therefore must coordinate how resources are allocated and coordinated within the team; (b) team members share a common-fate or interest in the outcomes of the work Performance by the team (such as team based rewards); (c) the extent to which team members must coordinate their actions or processes in order to accomplish their work, (Mathieu et al., 2007: p.894). In their seminal work on the subject, Hackman and Morris (1975) (and more recently, Argote and McGrath (1993)), argued that team Interdependence serves as a stimulus that affects team processes and performance, moving Kozlowski and Bell (2003) to assert that *new research that fails to consider the effects of task Interdependence for the team phenomenon in question has little relevance to building knowledge in the work groups and teams literature* (p.383). This view has been supported by numerous investigations of the influence of team Interdependence on team processes and Performance (e.g. Janz et al., 1997, Saavedra et al., 1993, Shea and Guzzo, 1987a, Steiner, 1972, Stewart and Barrick, 2000, Wageman, 1995, 1999), noting that greater Interdependence should facilitate greater interaction amongst group members. It should also enhance communication, learning, development of group norms and cooperative behaviours, (Shea and Guzzo, 1987a), with the result that teams high in Interdependence out-perform those with low Interdependence by nature of work design being appropriately aligned with cooperative effort (Goodman, 1986). This led Mathieu et al. (2007) to find that team processes partially mediate the relationship between team Interdependence and Team Performance (p.904).

2.9. Moderation

Moderator variables specify when certain effects will hold…a moderator is a qualitative (e.g., sex, race, class) or quantitative (e.g., level of reward) variable that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable (Baron and Kenny, 1986, p.1174).

In this study, the IPO heuristic serves as the conceptual basis for explaining how personality characteristics of team members influence team functioning and performance (LePine et al., 2011). Team inputs, such as *personality traits,* predict outcomes, such as *Performance* through moderating processes, such as Team Boundary Management. In other words, individual characteristics (Personality Traits) theoretically form a proximal link to behavioural processes, such as Boundary Management, and a distal link to team outcomes (Driskell et al., 1987).

2.10. Input-Process-Output Framework (IPO)

The long history of team research has led to numerous performance frameworks (see Mathieu et al., 2008 for a review), many of which are founded on the Input-Process-Output (IPO) model (Hackman and Morris, 1975, Hackman, 1987, McGrath, 1964, Steiner, 1972).

With origins rooted in *System Theory* (Von Bertalanffy, 1956, 1968, 1972), the IPO model was developed as a means of organising team research (Roe et al., 2012 cites: McGrath, 1964; McGrath & Altman, 1966, Hackman and Morris, 1975). The model assumes that *Inputs* (characteristics of the individual, team, and/or organisation) lead to *Processes* (team activities required to achieve the task – planning, coordination, leadership, decision-making, communication, conflict resolution…) which together influence *Outputs*, defined as by-products of team activities that may be valued by one or more constituencies, such as Performance, Effectiveness, Team Cohesion, Team Viability, etc. (Hackman and Morris, 1975, Pelled et al., 1999, Mathieu et al., 2007: p.893). In this way, the IPO heuristic serves as the conceptual basis for explaining how the personality characteristics of team members influence team processes and performance (LePine et al., 2011).

In their meta-analysis, Prewett et al. (2009) noted the value in examining team process variables from an Input-Process–Outcome perspective, where personality is theoretically more proximally related to team processes than to team outcomes (Driskell et al., 1987); and further, where there seemed to be stronger (empirical) relationships between personality and process than between the personality and outcome measures for the traits: Extraversion, Agreeableness, and Emotional Stability. Positing that team personality appears to be more closely associated with team process and behaviours than with Team Performance outcomes, Prewett et al. (2009) recommended that:-

> *future research should include team behaviours and outcomes to fully investigate the mediating links of team behaviours between team personality traits and team outcomes (Prewett et al., 2009: p.290-292).*

Against a theoretical backdrop of Trait Activation and Interdependence Theories, this study adopts the IPO model as the organising framework since personality, in combination with team processes (Boundary Management) provide the necessary situational factors needed to activate predictable trait related behaviours in order to achieve the desired outcomes.

2.11. Team Composition

Previous studies of individual level variables have focussed on compositional factors, such as personality traits and characteristics, preferences, cognitive ability, demography, and so on (Bell, 2007, Devine and Philips, 2001, Mount and Barrick, 1998, Mount et al., 1998, Valacich et al., 2006). For example, one of the earliest studies of the Personality-Performance relationship was undertaken by Mann (1959) in the expectation that this would be the vanguard of further research. However, almost forty years elapsed before the Personality-Performance relationship was examined as intensively as Mann had hoped (Barrick et al., 1998, Barry and Stewart, 1997, Bell, 2007, Driskell et al., 1987, Driskell et al., 2006, Halfhill et al., 2005, Humphrey et al., 2007, Lepine et al., 1997, Peeters et al., 2006b, Prewett et al., 2009, Prewett et al., 2016, Salgado and Tauriz, 2014). The rationale underlying the research on team composition is that individual characteristics of team members, i.e. their personality, demographics, etc., will compile to serve as inputs that influence Team Performance directly (and indirectly) through group processes and emergent states (O'Neill and Allen, 2011). According to Moreland and Levine (1992), team composition research can be categorised into three dimensions: (a) characteristics of team members (e.g., number, abilities, demographics, personality traits), (b) measurement of these characteristics, and (c) the analytical perspective used to approach team composition (Bell, 2007). Literature on organisational teams has reported patterns of personality variables that predict both individual and team outcomes, such as Performance, and Satisfaction (Antonioni and Park, 2001, Barrick et al., 1998, Kristof-Brown et al., 2005). When organisations create teams, attempts are made to exploit individual differences to engender an optimal configuration of characteristics needed to result in effective Performance (Campion et al., 1993, Humphrey et al., 2007, 2011, Kichuk and Wiesner, 1997, 1998, Morgeson et al., 2005). To this end, Humphrey et al. (2007) proposed a method by which individuals might be 'seeded' onto teams to yield optimal group personality composition (Whelan et al., 2009).

2.11.1. Team Composition as an Input Variable

A type of team input, team composition has a significant influence on team effectiveness (Heslin, 1964, Kozlowski and Bell, 2003, Levine and Moreland, 1990), and is of special interest to management practitioners since it can be manipulated in ways that are complimentary to achieving desirable organisational outcomes (Bell, 2007). Consequently, the broad consensus about the potential value of team composition has resulted in it becoming one of the most studied team variables (Guzzo and Dickson, 1996, Hollenbeck et al., 2004).

Team composition is captured in terms of two general themes: what characteristics should be considered; and, what are their distributional properties in the team (Mathieu et al., 2017). More recent research has progressed this to include the compositional influences of personality (Barry and Stewart, 1997, Bradley et al., 2012, Fisher et al., 2012, Lepine et al., 1997). Despite its popularity, the team composition influences of personality are difficult to apply in practice. This is due, in part, to the lack of understanding in the area (Foushee and Helmreich, 1988, Morgan Jr and Lassiter, 1992), and the complexity and dynamic nature of personality traits, and the situational variables with which they interact.

In a comprehensive meta-analysis examining the relationship between team level Personality and Performance, Bell (2007) found that, overall, team personality does predict Team Performance. However, LePine et al. (2011) reported that the findings from research on the relationship between team personality and team effectiveness are problematic and difficult to decipher, a factor previously noted by Heslin (1964). Unfortunately, these problems persist, obfuscating results contained in literature, and making it difficult to understand how the various streams of team research fit together. The picture that emerges is that team composition matters to team processes and team performance, but it is contingent on a variety of conditional factors (Bell, 2007, Van Dijk et al., 2012).

2.11.1.1. Team Composition and Boundary Management

Ancona and Caldwell (2000) summarise three features of team composition that are pertinent to Boundary Management: (a) *diversity*; (b) *social connectedness* of team members; and (c) the assignment of *team roles* (: p.296). Additionally, Choi (2002) adds the dimensions of group development and leadership style.

2.11.1.2. Team Composition and Personality

According to Funder (2001), personality refers to:

> *structures and propensities that reflect or explain characteristic patterns of an individual's thoughts, emotions, and behaviours, and is inherently socially derived (Cattell, 1943).*

Kamdar and Van Dyne (2007) posit that *personality can be conceptualised in terms of Genotypic and Phenotypic traits* (p.1287), and is an inherently complex psychological characteristic that is an outcome of many interacting influences, ranging from genetics to culture; and where researchers have studied the psychological individuality and differences that distinguish one person from another (Tett et al., 2013). With origins in Trait Theory (Allport, 1937, 1961, 1966, Eysenck, 1991), and Trait Activation Theory (TAT) (Allport, 1966, Tett and Burnett, 2003, Tett and Guterman, 2000), research of Personality and Job Performance has a heritage that is a hundred and fifty years long.

While team composition variables include a variety of notable member demographic attributes (age, gender, tenure, functional expertise, and experience, etc.), personality traits are thought to be especially salient (Barrick et al., 2001, Bell, 2007, Bradley and Hebert, 1997, Driskell et al., 1987, 2006, Heslin, 1964, Hurtz and Donovan, 2000, LePine et al., 2001, Mann, 1959, Neal et al., 2012, O'Neill and Allen, 2011, Prewett et al., 2009, Quigley and Gardner, 2007, Tett et al., 1991). This is because personality traits are particularly relevant to task contributions that members make to team outcomes. In particular, they concern the way that team members interrelate to each other during the course of their work.

Research, reviews of research, and meta analyses of studies on personality and its role in team composition have been extensive in recent years (Bell, 2007, Tett et al., 1991, Hough, 1992, Hurtz and Donovan, 2000, Humphrey et al., 2007, 2011, Kozlowski and Ilgen, 2006, LePine et al., 2011, Mathieu et al., 2008, Mathieu et al., 2013, Mount et al., 1998, Moynihan and Peterson, 2001, Salgado, 2003, see Ilgen et al., 2005, for a review, Peeters et al., 2006a). They have advanced our understanding of why some teams are more successful than others, and they have provided a basis for predicting organisational outcomes. Indeed, few topics in the fields of Organisational Behaviour, Work and Organisational Psychology have attracted more attention in the last twenty-five years, all the more remarkable by the fact that Personality Trait Theory is enjoying a renaissance (Pervin, 1994, Woods et al., 2013).

2.12. Personality

2.12.1. Trait Theory

As reported by a variety of writers, *Trait Theory* in enjoying a resurgence of interest such that some see the field as having arrived at a consensus, about: the basic structure of personality; about equating a particular model of Trait Theory; and about the role of Trait Theory within the field of Personality (Pervin, 1994). Trait theorists are primarily interested in the measurement of personality traits, which, according to this perspective, are stable over time (Staw et al., 1986, Staw and Ross, 1985), differ between individuals, and influence behaviour. Evidence of the longitudinal stability of traits provides support for the trait model (McCrae, 1991) although researchers are extending our understanding of how significant life-impacting crises influence personality (Pervin, 1994). This creates the view that *within-person* variability creates significant implications, and opportunities, for the study of personality (Fleeson, 2004: p.83). The focus of this study is *between-person variability* of *Personality Traits*, rather than *within-person variability*, associated with *Personality States*.

An early influence in the study of traits, Allport (1937) explained that central traits are basic to an individual's personality, whereas secondary traits are peripheral. Categorising *Common Traits* as those recognised within a culture and which might vary across cultures, *Cardinal Traits* are those that an individual might most easily recognise in themselves and in others. Trait theorists, particular those operating within the field of Teams research, have since focussed on group statistics rather than on individuals, something that Allport termed as *nomothetic* and *idiographic*.

Early theorists faced a number of challenges to their research. These included: -

⇒ a proliferation in the number of potential traits that might be used to characterise personality; and

⇒ contention about the use of broad or narrow factors of personality, which became known as the *Bandwidth Debate*; and

⇒ a strong theoretical challenge by *Situationists*, which became known as the *person-situation debate* (for an overview and recent discussion see: Cooper and Withey, 2009, Fleeson, 2004, Hogan, 2009, Lucas and Donnellan, 2009, Meyer et al., 2010).

Together these created a mid-century hiatus for trait research.

2.12.2. Historical Development of Personality Trait Research

Activity relating to research on personality traits can be categorised in two phases.

2.12.2.1. Early Theorising

The first phase was characterised by studies of relationships between numerous personality inventories and various aspects of job Performance. Mann (1959) presented a review of personality and performance in small groups and was organised around the traits of intelligence, emotional adjustment, Extraversion, dominance, masculinity, conventionalism, and interpersonal sensitivity. Results focussed on the relationships of individual personality and individual outcomes and the number of personality traits propagated such that it is reported there were 17,953 descriptors of personality (Allport and Odbert, 1936). Heslin (1964) proposed an early narrative review of personality in relation to team level Performance outcomes. The dependent variable in this study was *Group Performance* defined as *the evaluation of the final product by an agency outside the group* (p.249). Heslin found significant variation in the methods researchers had used to aggregate group member's characteristics, in some cases accounting for the characteristics of particular role holders, whilst in others, an average score of the characteristics of interest calculated from individual members responses, (LePine et al., 2011). This led Heslin to emphasise the importance of accounting for these complexities in team level personality research. He also suggested that sophisticated multivariate methods were required.

The conclusion of this body of research was that personality and job Performance were unrelated in any meaningful way, leading Guion and Gottier (1965: p.159), to famously report that measures of personality were *unreliable for making employee selection decisions*. This view was further hardened by an all-out attack on trait psychology (Mischel, 1968). This weighed heavily on the personality research community and resulted in a thirty-year hiatus until a project sponsored by the US military in the 1980s gave rise to a change in fortune of personality assessment. This research is suggested to be the most influential piece of research of that era (Hough and Oswald, 2008) as it re-framed thinking in a way that required predictors and criterion variables to be more multi-dimensional and construct oriented. Contrasting the negative findings of Guion and Gottier (1965) with the opposing findings of Ghiselli (1966) concerning the usefulness of personality variables, the breakthrough came with use of a discretionary approach of only selecting personality scales that were conceptually appropriate to the job of work. The research team found that when they summarised extant literature relating personality variables to job related criteria according to both personality constructs and work related criterion constructs, meaningful validity coefficients emerged (Hough et al., 1990). These researchers, along with others, set the stage for heavily cited meta-analysis of Barrick and Mount (1991).

2.12.2.2. Contemporary Theorising

This later phase, leading up to the present day, is characterised by three trends. The first was the increased deployment of organisational teams and the consequent interest in developing approaches to increase Team Performance. The second was the development of inferential statistical techniques, like Confirmatory Factor Analysis (CFA) (Brown, 2006, Marsh et al., 1998, Schreiber et al., 2006), enabling the identification of specific clusters of traits that correlate reliably into a small number of first order constructs. For example, Eysenck (1963) suggested that personality was reducible to three major traits. Others have proposed that more traits were required to reliably study personality. This led to the development and extensive use of the *'Five Factor Model'* (FFM), otherwise known as 'the Big Five' (Digman, 1990, 1996, Goldberg, 1983, 1990, 1993, McCrae and Costa, 1987, McCrae, 1989, 1991, McCrae and John, 1992, McCrae et al., 2005, McCrae and Costa Jr, 2008), which has become the most frequently used taxonomy for classifying the numerous and diverse personality traits to a more manageable number making personality a more accessible subject. Thirdly, is the use of meta-analytic approaches, which have enabled researchers to summarise results quantitatively across numerous primary studies. In doing so, clarifying the relationship between personality and performance, and showing personality traits to be valid predictors of real-life criteria (Barrick et al., 2001, Schmidt and Hunter, 1998). For example, meta-analyses have shown that Conscientiousness and

Emotional Stability correlate positively with performance criteria in virtually all jobs across different organisations and countries (Barrick et al., 2003, Barrick et al., 2001, Salgado, 1997), while the predictive power of the remaining three personality traits—Agreeableness, Extraversion, and Openness to Experience—relies more strongly on the specificity of criteria and selected occupational groups (Bergner et al., 2010). Together these studies have provided more optimistic results in the predictive quality of personality traits on performance compared to the previous era (Barrick et al., 2001).

Although research conclusions remain equivocal, and universal agreement on the FFM is elusive, it remains the most popular and consistently used framework in Personality Research. Indeed, from the management practitioner's perspective, there can be little doubt about the compelling appeal of predicting future Performance by measuring individual's personality traits in context of composing teams for maximum effectiveness (Rothstein and Goffin, 2006, Tett et al., 1991).

2.12.3. Inventories of Personality Traits

A variety of personality inventories have been developed. For a detailed review see Chapter 10, Christiansen and Tett (2013, p.191-225), and Chapter 2, Widiger (2017, p.11-32). Prominent examples include: *NEO-PI-R* (Costa and McCrae, 1992), *Hogan Personality Inventory* (HPI) (Hogan, 1986), the *16PR* (Conn and Rieke, 1994), the *Personal Characteristics Inventory* (PCI) (Mount et al., 1995), the *California Personality Inventory* (CPI) (Gough and Bradley, 1996), the *Big Five Inventory (BFI)* (John and Srivastava, 1999), and the *Eysenck Personality Questionnaire* (Dazzi, 2011, Eysenck, 1963) to name but a few. While there is ongoing debate about how best to organise and label personality, trait researchers generally agree about the nature and structure of personality. Early works by Fiske (1949), Tupes and Christal (1961), and Norman (1963b) paved the way for personality researchers to converge on five broad dimensions that constitute *'normal'* (sub-clinical / neuro-typical) personality; more commonly termed the *Big Five* or *Five-Factor Model (FFM)* of personality.

Most trait theorists describe personality in terms of a hierarchical taxonomy where higher-order factors (traits) are subsumed with more granular, lower-level facets (cf. Saucier and Ostendorf, 1999, Widiger, 2017, p.16, Driskell et al., 2006). More simplistically, the FFM represents a broad set of traits that are themselves a construct of many facets that have characteristics in common.

2.12.4. Five Factor Model (FFM)

The *'Five Factor Model'* (FFM), comprising of traits: Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness, and otherwise known as 'the Big Five' (Digman, 1990, 1996, Goldberg, 1983, 1990, 1993, McCrae and Costa, 1987, McCrae, 1989, 1991, McCrae and John, 1992, McCrae et al., 2005, McCrae and Costa Jr, 2008), is the personality model chosen for use in this study because it is reported to be the most widely used model of personality in the research domain of this study.

Team member personality is an important factor in team functioning and Performance (Bell, 2007). Originally developed from (Goldberg, 1983, 1990, 1992), the Big Five personality framework characterises five factors: *Extraversion (or surgency), Agreeableness, Conscientiousness, Emotional Stability (or Neuroticism),* and *Openness to Experience (or intellect)* (McCrae and John, 1992, Costa Jr and McCrae, 1992, Digman, 1990, 1996, Goldberg, 1990)[6]. The reduction to five replicable personality factors is not intended to limit measurement of personality to only five factors, rather to provide a broad framework for scientific investigation of the many potential measures of individual differences (Goldberg, 1993). As such, reviews of studies based on the Big Five provide support for the validity of this reduction (e.g, Digman, 1990, McCrae and John, 1992, Wiggins and Pincus, 1992). The main premise and appeal of this framework is that the personality factors are reported to remain stable and consistent over time, and across cultures and differing situations (John and Srivastava, 1999, McCrae and Costa, 1997), although recently emerging research outside of the field of Work and Organisational Psychology challenges this view, suggesting the possibility that personality traits may affect, and be affected by a variety of influences, including work (Wille et al., 2012, Woods et al., 2013, Wu and Griffin, 2012). This study acknowledges the possibility presented by these suggestions through its theoretical association with Trait Activation. It is also recognised that there is considerable interest in the new field of volitional personality change (Baranski et al., 2017, Caspi and Roberts, 2001, Caspi et al., 2005, English and Carstensen, 2014, Hudson and Fraley, 2015, Hudson and Fraley, 2016, Hudson and Roberts, 2014, Hudson et al., 2012, Roberts, 2006, Roberts,

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[6] Although there are some important distinctions between the Five Factor Model (FFM), and the Big Five model, WIDIGER, T. A. 2017. *The Oxford Handbook of the Five Factor Model*, Oxford University Press. The terms are used interchangeably in this report.

2009, Roberts and Caspi, 2001, Roberts et al., 2017, Roberts et al., 2006, Tasselli et al., 2018), although this specific topic is beyond the scope of this research project,

The FFM was chosen for this research due to it being the most frequently used taxonomy for classifying personality within the team personality and performance literature. More specifically, the *Big Five Inventory (BFI)* (John and Srivastava, 1999) has been selected due to its paucity and potential to reduce survey fatigue, compared to the full version provided by the *NEO-PI-R* which includes two-hundred and forty-two questions (Costa and McCrae, 1992). More details are provided in later sections of **Chapter 4** below. **Figure 2.2** below summarises this hierarchy of personality traits. The Big Five Factors and their facets are created from John and Srivastava (1999: p.110).

Figure 2.2: Facets of Big Five Traits

Extraversion vs. introversion	Gregariousness (sociable)	Conscientiousness vs. lack of direction	Competence (efficient)
	Facet (and correlated trait adjective)		Order (organized)
	Assertiveness (forceful)		Dutifulness (not careless)
	Activity (energetic)		Achievement striving (thorough)
	Excitement-seeking (adventurous)		Self-discipline (not lazy)
	Positive emotions (enthusiastic)		Deliberation (not impulsive)
	Warmth (outgoing)	Emotional stability vs. Neuroticism	Anxiety (tense)
Agreeableness vs. antagonism	Trust (forgiving)		Angry hostility (irritable)
	Straightforwardness (not demanding)		Depression (not contented)
	Altruism (warm)		Self-consciousness (shy)
	Compliance (not stubborn)		Impulsiveness (moody)
	Modesty (not show-off)		Vulnerability (not self-confident)
	Tender-mindedness (sympathetic)		
Openness vs. closedness to experience	Ideas (curious)		
	Fantasy (imaginative)		
	Aesthetics (artistic)		
	Actions (wide interests)		
	Feelings (excitable)		
	Values (unconventional)		

With the exception of Neuroticism and Extraversion, empirical work on the FFM has focussed horizontally on structures that link all five factors, rather than vertically on processes underlying behavioural differences within individual dimensions (see Goldberg, 1993 for a distinction between horizontal vs. vertical comparisons in personality). This important issue, referred to in literature as the *Bandwidth Debate* or *Bandwidth-Fidelity dilemma* (Ashton et al., 2014, Cronbach and Gleser, 1965, Hogan and Roberts, 1996, Ones and Viswesvaran, 1996, Paunonen et al., 1999), Salgado et al. (2013), (Schneider et al., 1996, Stewart, 2008), is not discussed more substantively in this thesis, except to point out that this study focuses on personality at the aggregate trait level, rather than at facet level.

2.12.5. Trait Elevation: Linear or Curvilinear?

The implicit assumption in much of the literature concerning the Personality-Performance relationship is that the relationship between them is linear. In practice, this can lead to the inevitable conclusion that *'more is better'*. A number of researchers have challenged the assumption of linearity and called for more research into the nature of the curvilinear relationship between Personality and Performance (Murphy and Dzieweczynski, 2005, Le et al., 2011). This study responds to these calls.

Despite the obvious importance for management practice, there are precious few empirical studies illuminating this curvilinear relationship (Benson and Campbell, 2007, Carter et al., 2016, Cucina and Vasilopoulos, 2005, LaHuis et al., 2005, Le et al., 2011, Pierce and Aguinis, 2013, Robbins et al., 2006, Vasilopoulos et al., 2006, Vasilopoulos et al., 2007, Whetzel et al., 2010).

Although, typically, high mean-levels of each of the Big Five traits may be conducive to teamwork, there are significant constraints to this generalisation as some Personality-Performance relationships have been found to be curvilinear. For example, following the Yerkes-Dodson Law (Yerkes and Dodson, 1908, Yerkes et al., 2007), and resembling an inverted 'U' function, higher mean trait levels may increase performance to a point, but very high (or very low) trait elevations may be counterproductive (Christiansen and Tett, 2013). Such traits, proposed by some to be unipolar or bi-polar (Samuel, 2011, Widiger and Presnall, 2013), and elucidated previously by Cronbach and Meehl (1955) are, as a consequence, likely to be maladaptive, resulting in unpredictable (or undesirable) outcomes for individuals, teams, and organisations.

Maladaptive personality traits can be regarded as characteristic patterns of thoughts, feelings, and behaviours that either directly (e.g., distress) or indirectly (e.g., disorganization) lead to negative outcomes (Mullins-Sweatt and Widiger, 2010, Ro and Clark, 2009, Ro and Clark, 2013). Thus, maladapted bipolar traits have well-defined opposing trait poles that may both relate to negative outcomes at their extremes (Williams and Simms, 2017). As an example, moderated by Task Complexity, the study by Le et al. (2011) found support for the hypothesis that the relationship between traits Conscientiousness (and Emotional Stability) and Task Performance are curvilinearly related such that the relationship is initially positive but becomes weaker as trait strength increases; the relationship subsequently diminishes and disappears as Conscientiousness (and Emotional Stability) increases further (p.114 and 116). This seems to make intuitive sense considering traits are said to exist on a continuous scale. Indeed, in the example above, scholars have rationalised this on the basis that, beyond a certain point, high Conscientiousness may no longer promote Task Performance because excessively conscientious individuals can be overly rigid, inflexible, and compulsive perfectionists that pay too much attention to small details while overlooking more important goals (Mount et al., 2008, Tett, 1998). Further, highly conscientious people are likely to be more prone to self-deception and rigidity, which may inhibit learning new skills or acquiring new knowledge, ultimately leading to lower Performance (LePine et al., 2000, Martocchio and

Judge, 1997). Moscoso and Salgado (2004) argued that extreme levels of Conscientiousness may not be beneficial to Job Performance at all: -

> *"because the maladaptive tendencies of Conscientiousness (compulsive style) produce an interference with the practices considered as signs of a good quality job" (p. 360).*

In relation to Extraversion, Driskell et al. (1987) have also suggested a curvilinear relationship between sociability and team effectiveness, implying that high mean sociability may interfere with instrumental task activities. Equally, a team composed of individuals who are dominant and assertive (high dominance) can stimulate friction and result in a team composed of all leaders and no followers (Barrick et al., 1998, Barry and Stewart, 1997). Research suggests that dominant team members tend to engender less positive interpersonal relations (Driskell et al., 1993) and are less likely to attend to the task inputs of other team members in decision making (Driskell and Salas, 1992), (Christiansen and Tett, 2013, p.748). Neuroticism/Emotional Stability has also been found to have a curvilinear relationship with Performance. As an example, Le et al. (2011) found support for the hypothesis that the relationship between trait Emotional Stability and Task Performance were curvilinearly related such that the relationship is initially positive but becomes weaker as trait strength increases; the relationship subsequently diminishes and disappears as Emotional Stability increases further (p.114 and 116). The polar extremes of Emotional Stability are known to result in maladaptive behaviour.

No prior studies were found to investigate the existing of curvilinear relationships between Agreeableness, or Openness with either Boundary Management or Team outcomes. This study attempts to address this gap.

2.12.6. Personality as a Team-Level Construct

The vast majority of research into personality in organisational psychology has focussed on relationships at the individual level, often linking individual personality characteristics to individual behaviours—personality traits with job Performance is an example. Whilst this is useful and important, personality is expected to have a strong influence on the manner in which team members interact, which in turn will influence Team Performance and behaviour (Hofmann and Jones, 2005). Recent research (Ployhart et al., 2006) suggests that organisational-level manifestations of personality, whether as an aggregate of individual personality e.g. attraction-selection-attrition model; Schneider (1987), or as correlates of aggregate personality, may contribute to important business outcomes. However, according to Tett et al. (2013), although robust relationships have been found between personality traits and numerous criteria where personality is a micro-level construct defined as a property of an individual, there is more theory than empirical research examining the nature, antecedents, and consequences of *collective personality* despite evidence suggesting that teams and organisations may manifest collective personalities that, while sharing some features of individual's personalities, combine in a way that results in the aggregate construct being conceptually and empirically different (Bliese, 2000, Bliese et al., 2007, Chan, 1998, Charns et al., 2012, Chen et al., 2003, Kozlowski and Klein, 1999, 2000, Morgeson and Hofmann, 1999).

In team-level research, it is important to match the level of analysis between the variables being studied (Chan, 1998, Kozlowski and Klein, 2000). Team Composition variables pose a particular problem because, although individual difference variables are by definition at the individual level, the interest in team composition is in the unique combinations of individuals who compose a team (Mohammed et al., 2002), and/or how individual-level variables combine to reflect a team-level operationalisation. Consequently, it is likely that the relationship between team members' composition variables and team performance will be moderated by how the construct is operationalised at the team level, with more appropriate team-level operationalisations revealing stronger relationships between the team composition variable and team performance (Arthur Jr et al., 2007, Bell, 2007, p599). Therefore, when relating team composition variables, such as personality traits, to a team-level criterion, such as team outcomes, both the predictor and the criterion must be measured at the team level (Prewett et al., 2009, p.275).

This study operationalises Team Personality traits by a process of *Mean-Centering*.

2.12.7. Emergent Phenomena and Fit

There are two ways in which collective personality emergence has been reported: *Team Composition* and *Similarity Attraction*. Although the influence of Similarity Attraction is recognised and discussed, the main purpose of this study is to investigate how practitioners might counter the negative aspects of Similarity Attraction, through a deliberate process of Team Composition.

2.12.7.1. Team Composition

Team Performance can be influenced by Team personality composition, i.e. the similarity (homogeneity) of differences in Team personality traits as internal factors (Tett et al., 2013), or group personality compilation, or heterogeneity of differences—bearing in mind that the effect of Team personality composition on Team Performance is likely to be dependent upon task characteristics also, i.e. external factors (Bradley et al., 2013a).

A Team Composition model of team personality emergence is used in this model as the nature of the team's tasks determines the nature and degree of groups members interaction and coordination patterns, where some tasks require personality traits of members to be similar (composition), while others requires the Team to have members with complimentary personality traits (compilation) (Moynihan and Peterson, 2004). Overall, the specific compositional effects are not well understood in literature (Kramer et al., 2014).

2.12.7.2. Similarity Attraction and Attraction-Selection-Attrition

According to Similarity-Attraction Theory (Anderson, 2009, Van Vianen and De Dreu, 2001), individuals in teams composed of members with similar personality traits are likely to experience higher well-being because members are attracted to the similarities in traits they see in each other. In this case, it is not the homogeneity, or heterogeneity that matters, but the variability of the personality trait in a team that matters, and its mean level (Byrne, 1971, 1997). Analogously, the Attraction-Selection-Attrition model (ASA) (Schneider, 1987) posits that organisations become more homogenous in a broad spectrum of characteristics due to processes of attracting, selecting, and retaining individuals that are similar to those already in the organisation. This is supported by reports that organisations can be differentiated from each other in terms of the modal personalities of their people (e.g., Ployhart et al., 2006, Satterwhite et al., 2009).

2.12.8. Operationalisation and Trait Aggregation

Thus far team personality has been viewed as the aggregation of the team members' personality traits. Barrick et al. (1998) identified three methods to operationalise personality composition in teams using one of a number of team-level indices. These are based on: the mean score of the group; the variability (variance and range) of individual scores within a group; and finally on the minimum and maximum scores within the group. Halfhill et al. (2005) proposed an alternative approach, describing the personality of the team as a whole by using the same terms used to describe individuals. Early reports indicate that the FFM may indeed be useful for describing teams as a whole (Stewart, 2003).

In order to study team personality, researchers have to convert individual personality trait scores into a measure of team personality composition using one of four group-level indices: *mean, variance, minimum,* and *maximum* scores, (Chan, 1998, Hofmann and Jones, 2005, Stewart, 2003). The method of aggregating individual level scores to the team level has received considerable attention but there is still no consensus on the best method, as there may not be a single best method.

Several theories have emerged to help guide aggregation decisions: *trait-orientated* and *task-orientated* approaches (Barrick et al., 1998, Halfhill et al., 2005). The operationalisation method is usually chosen through a consideration of the personality variable, the nature of the task, and how the two are expected to interact, (e.g. see Bell, 2007, Humphrey et al., 2011, LePine et al., 2011, Peeters et al., 2006a, Prewett et al., 2009, Kristof-Brown et al., 2005). For example, task-oriented traits are those traits that aid in completing the team-task, whereas team-oriented traits are those that help smooth the functioning of the team (Lepine et al., 1997). Despite the popularity of Steiner's task typology, there is little support for it in meta-analyses and it is considered to be less applicable in field settings because teams handle multiple activities rather than one specific task (Bell, 2007: p.607). consequently Task-oriented approaches are not considered further in this study.

2.12.8.1. Trait Oriented Approaches

Researchers typically differentiate between two personality characteristics of team composition: the elevation and variability of a trait within a team (Barrick et al., 1998, Mohammed and Angell, 2003, Neuman et al., 1999, O'Neill and Allen, 2011). With the aim of optimising Team Performance, trait-oriented theories propose that team membership/composition choices should be guided by the person-team fit in respect of *Supplementary* and *Complementary* team fit for specific personality traits.

2.12.8.1.1. Supplementary Fit

Supplementary fit implies that team members should have similar levels of the same trait to optimise Performance because this similarity stimulates attraction between similar team members (Mount and Muchinsky, 1978, Muchinsky and Monahan, 1987). Therefore, if a trait were accretive to Performance, trait homogeneity would optimally occur at the top-end of the scale. For example, teams with members who have uniformly high levels of Conscientiousness are likely to agree high Performance goals, effort, and planning. In contrast, teams who are heterogeneous in Conscientiousness are likely to be in conflict about these issues; and teams with similarly low levels of Conscientiousness are likely to agree low Performance goals, effort, and planning.

Aggregation methods for supplementary traits should ideally reflect consistently high trait levels across the team as measured by mean and minimum scores, to positively predict Performance. Whereas heterogeneity on a supplementary trait will predict a negative relationship with Team Performance (Prewett et al., 2009).

2.12.8.1.2. Complementary Fit

In contrast, complimentary fit emphasises trait heterogeneity over homogeneity and diversity of the trait is prioritised over maximising team trait scores because team members with a unique trait level may fill a specific need within the team, or have a specialised function (Muchinsky and Monahan, 1987). Extraversion is one such example of this where an individual high in this trait score is ideally suited to fulfilling a leadership role (Humphrey et al., 2007), but a team full of high scoring extraverts may create conflict during role negotiation, constantly challenge each other, and struggle to achieve consensus. As a result of this, heterogeneity, or variance, in the strength of this trait in the team will positively predict Team Performance, since the team needs a leader and followers, and maximising this team trait will be detrimental to Performance.

In this study, traits were operationalised and aggregated based on the trait-oriented approach. Although the task-oriented approach was considered, it was considered to be too difficult to administer and would require a far greater sample of data than was achievable in the time scale allowed to complete this project.

2.12.9. Trait Aggregation of the Big Five

Advancing the findings of Bell (2007), Prewett et al. (2009) conducted a meta-analysis focussing on the Big Five personality traits (Costa and McCrae, 1992) with the exception of Openness to Experience, because, the writers reported, the theoretical approaches to this trait were significantly different to the other Big Five Factors. In contrast, other researchers propose that all five traits should be considered simultaneously when testing the effects of specific traits on team outcomes (Kozlowski and Klein, 2000, McGrath, 1998, Peeters et al., 2006a). Christiansen and Tett (2013) compares the results of these meta-analyses in **Table 2.1** below.

Table 2.1: Summary of Meta-Analytic Results of Effects of Personality on Team Performance by Aggregation Method, (Christiansen and Tett, 2013, p.751)

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Christiansen and Tett (2013) also provide a number of predictions for the various trait aggregation treatments. These predictions are contrasted with meta-analytic results of effects of personality on Team Performance by aggregation method are shown in **Table 2.1** above – see **Table 2.2 to Table 2.6** below.

Table 2.2: Trait Aggregation Predictions: Emotional Stability (Neuroticism) (p748)

Aggregation Method	***Treatment***	***Agrees with Table 2.7***
Mean	Emotional stability scores will positively relate to Team Performance	Yes, (Bell, 2007), (Prewett et al., 2009)
Maximum	Emotional stability scores will be unrelated to Team Performance	Yes, (Prewett et al., 2009)
Minimum	Emotional stability scores will positively relate to Team Performance	Yes, (Bell, 2007)
Variance	Emotional stability will be related to Team Performance in that low variance at the positive pole (high Emotional Stability) will yield good Performance; low variance at the negative pole (low Emotional Stability) will yield poor Performance, and high variance will lead to moderate Performance	No

Table 2.3: Trait Aggregation Predictions: Extraversion (p749)

Aggregation Method	***Treatment***	***Agrees with Table 2.7***
Mean	Extraversion scores will positively relate to Team Performance. We note a curvilinear relationship between Extraversion and Team Performance in that very high and very low levels of Extraversion may degrade Performance, whereas intermediate levels of extra-version may result in higher Performance	Yes, (Bell, 2007), (Prewett et al., 2009)
Maximum	Extraversion scores will positively relate to Team Performance	Yes, (Prewett et al., 2009)
Minimum	Extraversion scores will positively relate to Team Performance	No
Variance	Extraversion will positively relate to Team Performance	Yes, (Prewett et al., 2009)

Table 2.4: Trait Aggregation Predictions: Openness (p749)

Aggregation Method	***Treatment***	***Agrees with Table 2.7***
Mean	Openness scores will positively relate to Team Performance	Yes, (Bell, 2007)
Maximum	Openness scores will be unrelated to Team Performance	Yes, (Bell, 2007)
Minimum	Openness scores will positively relate to Team Performance	No
Variance	Openness will positively relate to Team Performance	No

Table 2.5: Trait Aggregation Predictions: Agreeableness (p750)

Aggregation Method	***Treatment***	***Agrees with Table 2.7***
Mean	Agreeableness scores will positively relate to Team Performance	Yes, (Bell, 2007), (Peeters et al., 2006a), (Prewett et al., 2009)
Maximum	Agreeableness scores will be unrelated to Team Performance	No
Minimum	Agreeableness scores will positively relate to Team Performance	Yes, (Bell, 2007), (Prewett et al., 2009)
Variance	Agreeableness will be related to Team Performance in that low variance at the positive pole (high Agreeableness) will yield good Performance, whereas low variance at the negative pole (low Agreeableness) will yield poor Performance. High variance will generally be unsupportive of Team Performance	Yes, (Peeters et al., 2006a), (Prewett et al., 2009)

Table 2.6: Trait Aggregation Predictions: Conscientiousness (p751-752)

Aggregation Method	***Treatment***	***Agrees with Table 2.7***
Mean	Conscientiousness scores will positively relate to Team Performance	Yes, (Bell, 2007), (Peeters et al., 2006a), (Prewett et al., 2009)
Maximum	Conscientiousness scores will be unrelated to Team Performance	Yes, (Prewett et al., 2009)
Minimum	Conscientiousness scores will positively relate to Team Performance	Yes, (Bell, 2007), (Prewett et al., 2009)
Variance	Conscientiousness will be related to Team Performance in that low variance at the positive pole (high Conscientiousness) will yield good Performance, whereas low variance at the negative pole (low Conscientiousness) will yield poor Performance. High variance in Conscientiousness will generally result in low Team Performance	Yes, (Peeters et al., 2006a), (Prewett et al., 2009)

2.13. Trait Activation and Interaction

2.13.1. Trait Activation (Interaction) Theory (TAT)

Trait Activation Theory (TAT) (Allport, 1966, Kenrick and Funder, 1988, Tett and Guterman, 2000, Tett and Burnett, 2003, Tett et al., 2013) builds on earlier theories of motivation by arguing that, since traits are latent propensities for individuals to behave in certain ways, in order for personality traits to be expressed, they require *situations* that provide trait relevant *situational cues* (Kenrick and Funder, 1988, Tett and Guterman, 2000, Tett and Christiansen, 2007). Consequently, intrinsic satisfaction is gained from expressing one's traits, much as eating satiates hunger (Tett et al., 2013). In other words, trait-relevant cues within situations result in trait activation (Blickle et al., 2013: p.1146). Traits and situations can therefore be considered to be two sides of the same coin (Eysenck and Eysenck, 1985). Therefore this theory presents an interactionist view of job performance, suggesting that certain situations at work allow the expression of specific underlying personality traits, which facilitate job performance (Tett and Burnett, 2003). By way of an example specific to this study, Boundary Management processes, including Spanning, Buffering and Reinforcement, provide extraverts with the opportunity to express extraverted behaviours in the course of their social interactions both within the team, and between teams when task completion requires interdependent working.

Tett and Burnett (2003) and Tett and Guterman (2000) proposed a model of trait activation arguing that trait relevant differences among situations influence the expression of latent traits as work behaviours. Therefore, a trait that is present will remain dormant unless a situation stimulates it to action - thereby giving it predictive utility. This model provides for five elaborations, (i) the articulation of three distinct levels of traits-relevant cues—the task level (day to day duties), social level (interacting with co-workers), and organisational level (culture, climate, policies, etc); (ii) the separation of *bidirectional* trait-expressive behaviour and Job Performance critical for understanding how a given personality trait can be positively or negatively linked to Job Performance; (iii) recognition that the situational cues that activate traits to produce trait-expressive behaviours are also used to evaluate that behaviour as Performance; (iv) incorporation of extrinsic rewards in reaction to evaluated Performance; and (v) recognition that work behaviour is both a cause and effect of work place demands. More generally, TAT provides that people want to work where (a) job tasks, social interactions, and organisational culture and climate all provide ample opportunity for them to express their traits, and, having done so, trait expressive behaviours are recognised, appreciated and rewarded by those in a position to do so (Tett et al., 2013).

2.13.1.1. Team-level Effects

The presence of team-level effects on individual behaviours arising from characteristics of the group's task or from homogenous team characteristics is a long-established phenomenon in psychology (Forsyth, 2018) and previous research on team performance has suggested that homogeneous teams tend to develop stronger team norms than more diverse teams (Kirkman et al., 2004b). For example, team research in social psychology has illustrated that dominant opinion within a team can influence the direction and the magnitude of individual member opinions (e.g., polarisation; (Goethals and Zanna, 1979) as team identification increases team member's commitment to shared goals while triggering hostile behaviour towards out-groups (e.g., (Hogg and Hains, 1996, Hogg and Turner, 1987, Hogg and Williams, 2000). Finally, member behaviour is partially governed by the strength of team norms (e.g., (Gelfand et al., 2006). In this way, high elevation of team personality traits creates *situations* that contain the relevant cues for expressing individual traits, whereas modest or low elevations of team personality traits creates *situations* that constrain individual trait expression. Because team homogeneity generally corresponds to stronger norms, it's reasonable to suggest that greater heterogeneity in team personality traits would enable the expression of individual traits within the team. However, this expectation assumes an equal influence from different member personalities and neglects unique social pressures that may arise in diverse teams. In particular, negative traits and behaviours are often more powerful in team contexts than positive ones (Baumeister et al., 2001). Because *bad is stronger than good*, it may be increasingly difficult for team members to express traits associated with effective teamwork if other team members score lower on these traits. Conversely, assuming equivalent levels of tea, personality traits, trait diversity may lead to weaker norms for behaviour, allowing greater expression of individual personality traits. However, trait diversity may decrease create social pressures that reduce the expression of individual personality traits, such as impression management, or social matching. As variance in team trait elevation decreases at higher elevations, it is even possible that a three-way interaction accounts for variance in individual performance, in which individual personality traits show positive relationships with performance when trait variance is low and trait elevation is high. Thus, team trait diversity presents a complex system of relationships with team personality elevation.

Taking this perspective, the elevation and diversity of Team Personality Traits is likely to be a key driver in exerting *top-down effects* (Prewett et al., 2016) on norms of behaviours and team-level outcomes, including performance. Since this is a team-level study, TAT suggests that the general strength of a trait that is present within a team will create a situational context for the team, that will activate trait related behaviour across all team members. For example, a team that is generally extraverted at the team level will exert a *top-down* influence on the team leading to extraverted behaviour being activated across those team members that are extraverted (Prewett et al., 2016). This has important implications for Team Composition.

2.13.2. Trait Interaction

Notwithstanding the intuitive relationship between personality and behaviour, meta-analyses have indicated that these relationships may actually be quite weak (Hurtz and Donovan, 2000). Therefore, understanding why personality seems to explain less behavioural variance than we would expect has consumed scholarly interest for more than fifty years. Understandably there is a variety of opinion. For example, some posit that our expectations are misguided in attributing variation in behaviour to *personality*, rather than to *situations*, and, in line with TAT, situations trigger the expression of specific personality traits such that traits may only be relevant predictors of behaviour in a given context (Tett and Burnett, 2003). Another view proposes that lower validities are due to measurement limitations related to self-report surveys permitting impression management, or *speeding* and *faking* (Mueller-Hanson et al., 2003). Relatedly, Shoss et al. (2012) argued that this may be because of the way that personality variables are examined in research studies, i.e. where traits are considered as competing predictors in a regression model which focuses on the relationships between traits and outcomes whilst failing to give proper consideration to the influence that a specific configuration of traits may have in a given study. This, they say, makes intuitive sense on the basis that a single trait, or dimension, affords a poor representation of a person. Accordingly these scholars, along with some others (Hofstee et al., 1992), have argued that it is a combinations of traits, rather than single traits, that influence behaviour and, consequently, considering an individual's standing on multiple personality traits can provide a more meaningful understanding of the influence personality has on behaviour in a work setting. As an example, two individuals, X and Y, are both high in Extraversion and, according to personality theory relating to trait expression, are both likely to be attracted to working with others (Costa and McCrae, 1998). However, where X is personable, Y tends to be domineering. Individual differences such as these have significant impact for their co-workers since X is friendly and compassionate, whilst Y is not (Hofstee et al., 1992).

Traits not only interact with each other, but they also interact with the traits of other people, and reciprocally between people and their environment. Although Situations influence people's behaviours, people also influence and alter their environment by nature of those behaviours (Schneider, 1983, 1987). Consequently, the importance of considering both personality and situational characteristics is particularly salient in today's organisations (Schmidt et al., 2012: p.926).

However, there is limited research on the interaction of individual personality differences on Performance (Schmidt et al., 2012: p.926) despite the fact that what few empirical studies there are (Blickle et al., 2013) tend to support this configuration approach (Blickle et al., 2013, Judge and Erez, 2007, Witt, 2002, 2002, 2003). Instead, many personality-Performance studies focus on moderating influences, and situational variables (Penney et al., 2011). Witt et al. (2002) also reported that trait interaction is often overlooked in team personality research, this has guided researchers to expand models of the Personality-Performance relationship to account for cross dimensional effects of personality traits.

2.13.2.1. Trait-on-Trait Interactions

Hofstee et al. (1992) found interactions between personality traits and performance, by example, reporting that the relationship between Extraversion and Performance was positive for highly Conscientious individuals, but negatively related for low Conscientious individuals. **Table 2.7** summarises examples of previous studies on trait-on-trait interaction.

Table 2.7: Previous Studies of Trait-on-Trait Interactions

Study	**Findings**
(Witt, 2002)	dysfunctional outcomes will result when highly Conscientious people lack interpersonal competence
Goleman (1998)	found interaction effects between Agreeableness and Conscientiousness in predicting Performance across five samples
Judge and Erez (2007)	found that the combination of Extraversion and Emotional Stability better predicted Performance among customer service staff than did either trait on its own
Ode and Robinson (2009), and Ode et al. (2008)	report that Agreeableness moderated the relationship with Neuroticism such that it helped those high in Neuroticism to better regulate their emotions.
Penney et al. (2011)	More recently have set forth a number of hypotheses of the predictive value of binary trait relationships combining Conscientiousness and Emotional Stability with each other and with Agreeableness and Extraversion in relation to various workplace Performance variables

However, studies of interaction effects of personality at the team level have been equivocal (Witt et al., 2002) and barely a handful of studies have employed the framework (Burke and Witt, 2004, Judge and Erez, 2007, Witt, 2002, Witt et al., 2002). See **APPENDIX 2** for results of the post-hoc analysis of trait-on-trait interactions.

2.13.2.2. Situation Strength

The interactionist perspective provides that personality and the environment play key roles in influencing individual behaviour (Bowers, 2000). Situation strength represents the degree to which situational constraints are present in the environment (Caspi and Moffitt, 1993). Following this proposition, early interactionist research focused upon the relative influence of personality compared with the *strength* of the situation determining the behaviour. Meyer et al. (2010), drawing on others (Cooper and Withey, 2009, Forehand and Von Haller, 1964, Hattrup and Jackson, 1996, Mischel, 1973, 1977, Snyder and Ickes, 1985, Weiss and Adler, 1984), define Situation Strength as:

> *the implicit and explicit cues provided by external entities regarding the desirability of potential behaviours…where…situational strength is posited to result in psychological pressure on the individual to engage in and/or refrain from particular courses of action; this pressure in turn is posited to reduce relevant behavioural variance and attenuate subsequent trait-outcome relationships (p.122).*

While psychologists generally recognise that behaviour is a joint function of individual differences and situations (Chatman, 1989, Cronbach, 1957, Endler, 1993, Hattrup and Jackson, 1996, Mischel, 1977, Mischel, 1999, Mischel and Shoda, 1995, Weiss and Adler, 1984), the conceptualisation of situational factors, unlike with individual differences, is confusing (Funder, 2006), and many theoretical discussions provide little in the way of guidance for operationalising it - which can only serve to reduce the veracity of statements about its overall merit (Cooper and Withey, 2009). Despite these concerns, some Situational Theorists continue to argue that *situational strength* is among the most important situational forces to consider (Hattrup and Jackson, 1996, Hough and Oswald, 2008, Murphy and Dzieweczynski, 2005).

2.13.2.2.1. Strong Situations

Situations are strong to the extent that rules, structures, and cues provide clear guidance about the required behaviours (Meyer et al., 2010, Mischel, 1977, Weiss and Adler, 1984). It therefore follows that in *strong* situations where behaviour is constrained, everybody will behave in the same way, regardless of their unique personalities (Cooper and Withey, 2009: p.62), and, as a consequence, will demonstrate low variance in behaviour across various personality traits (Mischel, 1977), in other words, they will exhibit *behavioural homogeneity* (Meyer et al., 2009: p.1078).

2.13.2.2.2. *Weak Situations*

In contrast, weak situations comprise environments where social roles are unstructured (Ickes, 1982), organisational structures are decentralised (Forehand and Von Haller, 1964), and work tasks necessitate considerable discretion and autonomy, with limited influence over individual's behaviours (Peters et al., 1982). Judge et al. (2014) remarked that central to weak situations is the proposition that context is *ambiguously structured* (Mischel, 1973: p.276). It therefore follows that in *weak* situations where there are no clear expectations of behaviour, an individual's behaviour is more likely to be guided by their unique personality. Therefore, *weak* situations exert little influence over behaviour (Mischel, 1977). According to Schmidt et al. (2012) trait expression is consequently observed in overt behaviours that can either be Performance related, irrelevant to Performance, or even counter-productive to the organisation's goals and objectives (Tett and Burnett, 2003). In keeping with the Interactionist argument, the interaction between people and the environment is reciprocal--whereby situations influence people's behaviours, and people influence the environment (Schneider, 1987). Despite what has almost become a truism, the personality-situation relationship still generates significant controversy (Lucas and Donnellan, 2009), albeit that the reasons for this discord are long standing and have already been discussed above (Cronbach, 1957, Cronbach, 1975)—that measures of traits often have meagre effects on social behaviours (Bandura, 1999), and situational explanations lack the support of taxonomic frameworks (Buss, 2009: p.241, Funder, 2001, 2006, 2008: p.571). In a recent research study, Judge et al. (2014) integrated two models of situational/interaction by conceptualising situation strength (Meyer et al., 2010, Mischel, 1977, Weiss and Adler, 1984), alongside a theory of Trait Activation, after Tett and Burnett (2003).

2.13.3. Team Personality and Team Boundary Management

Except for a couple of initial attempts (Casciaro, 1998, Vodosek, 2003), *limited empirical effort has been expended on investigating how different personality traits influence social network formation and structure* (Ying and Norman, 2014: p.3). This is reinforced in the recent review by Dey (2017), who subsequently calls for consideration of deep-level compositional factors as antecedents of boundary management processes. As examples of previous studies: Barrick et al. (1998) found that teams of highly Conscientious individuals (mean and high), performed better than teams with lower Conscientiousness individuals. This necessitates consideration of trait strength in a differential role. Results also indicated that teams with members that were more Agreeable, and more Emotionally Stable (i.e. less Neurotic) also tended to have higher performance. All three of these between-person personality traits are represented by the higher order *Factor* α, otherwise referred to as the *Socialisation* Factor (Alessandri and Vecchione, 2012, Digman, 1997, Rushton and Irwing, 2008, Woods and Hardy, 2012), due to the tendency for individuals high in Factor α traits to have strong pro-social behaviours--a characteristic that is crucial to boundary loosening activity and its requirements to foster the wide variety of interpersonal relationships needed within distributed team structures. Further, Anderson et al. (2001), Russell et al. (1997), Vodosek (2003), Wehrli (2008), Ying and Norman (2014) found that trait Extraversion had a positive effect on the structure, heterogeneity of individual's social networks, and interpersonal relationships, while Ying and Norman (2014) found that trait Agreeableness played an important role in the strength of social network relationships.

2.13.3.1. Team Personality and Boundary Spanning (Loosening)

Because Boundary Spanning is a social process occurring between individual team members and members of other teams or groups, personality traits that are considered to be socially derived are of primary concern to this research study. For example, Conscientiousness and Agreeableness have consistently predicted performance regardless of task or social orientation. According to Borman and Motowidlo (1993) contextual performance reflects activities, such as Boundary Spanning, that supports the organisational, social and psychological environment, enabling effective team working as a result. Previous research has indicated that personality characteristics are likely to be good predictors of contextual performance (Borman and Motowidlo, 1993, Motowidlo and Van Scotter, 1994, Van Scotter and Motowidlo, 1996), and a variety of meta-analyses have found that Conscientiousness, Extraversion, Agreeableness, and Emotional Stability, in particular, are positively related to various aspects of contextual performance (Hogan and Holland, 2003, Hough, 1992, Hurtz and Donovan, 2000) to the extent that Task Interdependence requires broader social interaction outside of the team's boundary.

2.13.3.2. Team Personality and Boundary Buffering (Tightening)

In contrast to Boundary Spanning, Boundary Buffering is a process of detachment, where a team engaged in buffering activity is seeking to insulate itself from uncertainty and disturbances by closing itself off from unwanted exposure in its environment, thereby: preventing disturbances and uncertainty, negative input caused by undesired access to team boundaries, distractions, and diversion of valuable resources away from the team's goals (Yan and Louis, 1999). As such, buffering is considered to be an essential team maintenance process, especially since *knowledge workers are simultaneously involved in multiple teams, a stretch that often causes conflicting priorities and diminishes the effectiveness of the team* (Mohrman et al., 1995p.256). This is increasingly typical of contemporary boundary-less organisations, such as those operating in the knowledge sector, where team members must juggle competing demands and absorb the pressure to create a psychological boundary around them. At the same time, the increased extent of functional diversity within distributed team structures creates cross-functional differences and competing loyalties that must be managed effectively if teams are to maintain the focus of attention of their members. Because Boundary Buffering is a social process occurring between individual team members and members of other teams or groups, personality traits that are considered to be socially derived are of primary concern to this research study. Conscientiousness and Agreeableness have consistently predicted performance regardless of task or social orientation. According to Borman and Motowidlo (1993) contextual performance reflects activities, such as Boundary Buffering, that support the organisational, social and psychological environment, and enabling effective team working. Prior research has provided that personality characteristics are likely to be good predictors of contextual performance (Borman and Motowidlo, 1993, Motowidlo and Van Scotter, 1994, Van Scotter and Motowidlo, 1996), and a variety of meta-analyses have found that Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are positively related to various aspects of contextual performance (Hogan and Holland, 2003, Hough, 1992, Hurtz and Donovan, 2000). They should therefore also influence Boundary Buffering activity.

2.13.3.3. Team Personality and Boundary Reinforcement (Tightening)

Boundary Reinforcement involves creating a coherent entity for team members, regardless of the diversity of their backgrounds and individual differences. This is achieved through two related activities: firstly, *attracting team members' attention, energy, and resources towards the teams' mission, thus developing a centripetal force; se*condly, by *creating a supportive climate in which a shared sense of identity can emerge* (Druskat and Wheeler, 2003). Yan and Louis (1999: p.33) elucidated this with practical examples: *inviting team members to participate in developing the vision, encouraging support, helping behaviours, and developing a sense of safety and support,* all of which help to strengthen the team's identity and differentiation from other teams (Somech and Khalaili, 2014). In other words, Boundary Reinforcement is an inward facing activity that has become increasingly important in the post-bureaucratised structures within contemporary organisations, by enabling teams to attract and preserve the energy and attachment of their members, while increasing team identity and commitment to shared goals. Faraj and Yan (2009) found that Boundary Reinforcement contributed to both an emergent social state (psychological safety), and team performance, especially where the team was concerned with complex tasks. This, they say, underscores the importance of inwardly focussed boundary work in the team setting (p.613). Yan and Louis (1999) report that Boundary Reinforcement (which they refer to as *bringing up boundaries*) is accomplished through two related activities: firstly, attracting member's attention and resources towards the team's mission thus creating a centripetal force; secondly, creating a supportive climate that enables a shared sense of identity (Yan and Louis, 1999). This requires personality traits that enable emergent leadership without excessive conflict, trust building, and Emotional Stability, in order to deal with uncertainty. Because Boundary Reinforcement is a social process occurring between individual team members and members of other teams or groups, personality traits that are considered to be socially derived are of primary concern to this research study. Conscientiousness and Agreeableness have consistently predicted performance regardless of task or social orientation. According to Borman and Motowidlo (1993) contextual performance reflects activities, such as Boundary Reinforcement, that support the organisational, social and psychological environment, and enabling effective team working. Prior research has provided that personality characteristics are likely to be good predictors of contextual performance (Borman and Motowidlo, 1993, Motowidlo and Van Scotter, 1994, Van Scotter and Motowidlo, 1996), and a variety of meta-analyses have found that Conscientiousness, Extraversion, Agreeableness, and Emotional Stability are positively related to various aspects of contextual performance (Hogan and Holland, 2003, Hough, 1992, Hurtz and Donovan, 2000). They should therefore also influence Boundary Reinforcement activity.

2.14. Trait Expression

Each of the Big Five personality traits predispose a person to behave in a certain way (Peeters et al., 2006a, cf. Robertson & Callinan, 1998). A detailed explanation and review is provided in Widiger (2017, see Chapters 3 to 7). The sub-section below provides a general description of each of the traits, along with their expected orientation and related hypotheses.

2.14.1. Trait Neuroticism (Emotional Stability)

Emotional stability is the tendency to be secure, calm, self-confident, and poised while avoiding negative emotions such as anxiety, sadness, embarrassment, vulnerability, frustration, anger, hostility, guilt, disgust, depression, the inability to cope with stress and control ones impulses, and the propensity to have irrational ideas, each of which are embodiments of Neuroticism (Molleman et al., 2004, Van Vianen and De Dreu, 2001, Costa Jr and McCrae, 1992) which has also been associated with loneliness and the negative qualities in relationships (Henderson et al., 1981, Stokes, 1985). Neurotics believe themselves to be unattractive to others and, fearful of rejection, they tend to reject others before they are rejected themselves (Sangster and Ellison, 1978). Highly neurotic individuals tend initially to have low status in organisation groups, since the behaviours resulting from their Neuroticism, i.e. low self-efficacy, low self-esteem, high anxiety, etc., are perceived negatively, because they are associated with low performance expectations (Judge and Bono, 2001, Judge et al., 2002b). However, research shows that neurotics gain status as time goes by, because their natural anxiety causes them to be highly engaged in tasks. Similarly, the threat of others perceiving them negatively motivates them to prepare for and persist with tasks. This leads to neurotics exceeding the initial expectations of them (Bendersky and Parikh Shah, 2013: p.389). Noting that individual's moods can be infectious, Totterdell et al. (1998) reported that team members reciprocated the mood of other teammates. Therefore, not only are poorly adjusted neurotic team members unpleasant to be around, their negative affect can spread and permeate the team as a whole. The effect of group composition on trait expression is further illustrated in the *bad apple effect* (Felps et al., 2006), in which a small number of team members low on a beneficial personality trait may disproportionally affect the expression of those traits in other members. For example, a prior study found that teams with two socially anxious members and two socially calm members generated almost the same number of ideas as teams composed of all anxious members, but significantly less ideas than teams composed entirely of socially calm members (Camacho and Paulus, 1995). The authors suggested that socially calm team members feel more comfortable expressing ideas when other members are also socially calm than when other members are anxious. Other research has also found that minimum group personality scores can exert undue influence on group performance (e.g., (Neuman and Wright, 1999).

In contrast, Emotional Stability, the polar opposite of Neuroticism, has been associated with a number of phenomena related to interpersonal facilitation and interaction and may, therefore, contribute positively to teamwork, by creating a relaxed team atmosphere (Barrick et al., 1998, Molleman et al., 2004) that promotes stability, coordination and cooperation (Neuman et al., 1999), and task cohesion (Van Vianen and De Dreu, 2001), by reducing conflict and disruptive behaviour, enhancing Team Performance as a result, (Barrick et al., 2001, Driskell et al., 1987, Hough, 1992, Mount et al., 1998). It can therefore be concluded that elevated levels of Emotional Stability are expected to positively predict Team Performance (Barrick et al., 1998, Haythorn, 1953, Heslin, 1964, Kichuk and Wiesner, 1998, Molleman et al., 2004, Thoms et al., 1996).

Meanwhile, a high elevation of Team Emotional Stability will create a team context where members are expected to interact constructively and courteously (Ashton and Lee, 2007), which should bolster service orientation and team member relations, since elevation in this trait is related to team cohesion and the effective management of disagreements between team members (Bradley et al., 2014, Bradley et al., 2013a, Bradley et al., 2013b, Bradley et al., 2012). Thus, teams that are generally high on trait Emotional Stability may encourage a positive social and emotional environment that is favourable, because it serves to motivate performance, a positive team atmosphere, and team outcomes. Conversely, a low elevation of trait Emotional Stability (Neuroticism) can lead to a negative and tense team climate, leading to a loss of motivation and morale (Driskell et al., 2006).

In short, while research has suggested that homogeneous groups encourage the expression of individual traits in common with the group, the expression of personality traits that are adaptive for team performance depends on the elevation of the trait. Emotional Stability is theorised to behave similarly due to its contribution to interpersonal relationships within the team. Empirical work has indicated that negative emotions in one individual are readily adopted by others (Barsade, 2002), and the physiological effects of negative emotions are longer lasting than those of positive emotions (Rein et al., 1995). Taken together, these results suggest that negative traits associated with Neuroticism, such as anger, anxiety, or mistrust, are more likely to be expressed if another team member expresses them. Conversely, teams with strongly supportive interpersonal environments will cue the expression of positive traits associated with Emotional Stability. Thus, Emotional Stability should relate to performance when Team Emotional Stability elevation is high.

2.14.1.1. Trait Orientation: Neuroticism

Results of studies reporting on heterogeneity in Emotional Stability between team members have been mixed (negative effect: Mohammed and Angell, 2003, Prewett et al., 2009, Stewart, 2003, positive effect: Neuman et al., 1999, Bell, 2007 (based on study in field setting not lab setting)), although given the relationship between Agreeableness and Performance, one might intuitively conclude, as others have (Barrick et al., 1998, Neuman et al., 1999, Van Vianen and De Dreu, 2001), that the presence of even a few neurotic individuals in a team would degrade team effectiveness by disrupting cooperation, cohesion, and the team climate in general. Emotional Stability is expected to present as a *supplementary trait*, but in a somewhat complex manner, i.e. trait variability should be related to Team Performance in that low variance at the positive pole of Emotional Stability (team members similarly high on Emotional Stability) should yield high Performance; whereas low variance at the negative pole (team members similarly low on Emotional Stability) should yield low Performance; and high variance (team members mixed on Emotional Stability) should yield moderate Performance.

2.14.1.2. Hypothesis Development: Team Trait Neuroticism

2.14.1.2.1. Team Trait Neuroticism and Team Outcomes

Similarity Attraction and Trait Activation Theories suggest that when teams are required to work interdependently, Team Neuroticism is expected to differentially influence Performance, Team Cohesion and Team Viability depending upon team trait elevation and variance across the team. This is due to the: negative impact neurotic behaviours have on social interactions; and through negative affect of behaviours activated within a neurotic team faced with the perception of uncertainty, external threats, work pressure and/or role stress. Neuroticism is expected to have a concave curvilinear relationship with Performance, Team Cohesion and Team Viability through its interactions with Boundary Spanning, Buffering and Reinforcement; whereby when variance is low, high Team Neuroticism and Boundary Spanning will have a concave curvilinear relationship with Team Cohesion; and, high Team Neuroticism and Boundary Buffering and Reinforcement will similarly have a concave curvilinear relationship with Performance as a result of reducing the situational strength of Team Neuroticism on less neurotic individuals.

The differential relationships between Neuroticism, Boundary Spanning, Boundary Buffering, Boundary Reinforcement and Performance, Team Cohesion and Team Viability are anticipated to be curvilinear, in keeping with previous findings (Le et al., 2011p.114 and 116). It is therefore hypothesised that: -

2.14.1.2.2. Team Neuroticism on Performance

H1.1: Mean Team Neuroticism will have a CONVEX curvilinear relationship with Performance.

H1.2: Deviation in Team Neuroticism will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Performance (as set out in H1.1)

2.14.1.2.3. Team Neuroticism on Team Cohesion

H1.3: Mean Team Neuroticism will have a CONVEX curvilinear relationship with Team Cohesion.

H1.4: Deviation in Team Neuroticism will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Cohesion (as set out in H1.3)

2.14.1.2.4. Team Neuroticism on Team Viability

H1.5: Mean Team Neuroticism will have a CONVEX curvilinear relationship with Team Viability.

H1.6: Deviation in Team Neuroticism will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Viability (as set out in H1.5)

2.14.1.2.5. Team Neuroticism and Boundary Management on Performance

H1.7: Team Boundary Spanning will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Performance.

H1.8: Team Boundary Buffering will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Performance.

H1.9: Team Boundary Reinforcement will moderate the CONCAVE moderate the curvilinear association between Mean Team Neuroticism and Performance

2.14.1.2.6. Team Neuroticism and Boundary Management on Team Cohesion

H1.10: Team Boundary Spanning will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Cohesion.

H1.11: Team Boundary Buffering will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Cohesion.

H1.12: Team Boundary Reinforcement will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Cohesion

2.14.1.2.7. Team Neuroticism and Boundary Management on Team Viability

H1.13: Team Boundary Spanning will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Viability.

H1.14: Team Boundary Buffering will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Viability.

H1.15: Team Boundary Reinforcement will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Viability

2.14.2. Trait Extraversion

Extraversion has been shown to be related to a variety of phenomena related to interpersonal interactions, and establishing close relationships, and is posited to be especially beneficial when work situations require: interpersonal interaction, teamwork, and high Performance expectations (Barrick et al., 1998, Barry and Stewart, 1997), team processes, such as seeking help from other team members or teams (Porter et al., 2003), individuals to be attracted towards team working (Kristof-Brown et al., 2005), stimulate discussion within the team (Mohammed and Angell, 2003, Taggar, 2002), foster a climate in which team members feel confident to express themselves (Barry and Stewart, 1997) which is critical to the quality of decision making within the team (Schultz et al., 1995).

Trait Extraversion can be perceived as a combination of assertiveness/dominance and sociability/affiliation (Judge and Bono, 2000, Lucas et al., 2000). Some theorists view dominance as the primary marker of Extraversion and some view sociability as the primary component (Hough, 1992, Saucier and Ostendorf, 1999). In other words, there are relevant sub-factors underlying the broader Extraversion trait: (a) dominance (high scores reflect those who are controlling and assertive) and (b) sociability (high scores reflect those who are sociable and enjoy interacting with others.

Extraversion is important to the smooth functioning of social mechanisms within a team and it is strongly linked to intra-team processes and contextual Performance (i.e. Performance relating to the social context in which a team operates) (Borman and Motowidlo, 1993). Characterised as the extent to which an individual is: assertive, active, friendly, enthusiastic, energetic, upbeat, optimistic, social, talkative, high spirited and generally outgoing, (Costa and McCrae, 1992), extraverts like to be around people most of the time, crave excitement and stimulation and tend to be of a cheerful disposition. Therefore, a positive relationship is expected between mean levels of Extraversion and Team Performance, e.g. (Barrick et al., 1998, Bell, 2007), i.e. teams composed of members who are sociable and assertive will perform more effectively than teams composed of members who are introverted and withdrawn. In contrast, individual who have low levels of Extraversion are introverted, reserved, serious, value privacy and prefer to be alone, or in the company of a few close friends (Costa and McCrae, 1992), have lower social skills (Riggio, 1986), find it more difficult to approach and engage others in social interactions (Diener et al., 1984), attain lower status in social groups (Anderson et al., 2001), and find social situations less rewarding (Lucas et al., 2000).

Despite the positive benefits of having extraverted individuals in a team, researchers have reported that the inclusion of too many high extroverts in a team may be detrimental to Team Performance since extroverts tend to like to work in teams merely for the social interaction it provides them (Neuman et al., 1999), which may distract attention from task completion (Barry and Stewart, 1997, Mohammed and Angell, 2003). Similarly, because of their tendency to be talkative and assertive, extroverts tend to be dominant (Kichuk and Wiesner, 1998) and too many dominant individuals in a team will lead to conflict over team issues (Mazur, 1973) such as leadership (Barry and Stewart, 1997, Mohammed and Angell, 2003). Furthermore, Extraverts tend to be more noticeable than introverts in a social group (Hogan, 1991), which may draw them into conflict with others, and make them an easy target for negative affect (Vodosek, 2003).

In contrast, some scholars argue that high elevations of Team Extraversion may positively relate to team performance, despite this being at odds with much of the theoretical work in this area, which cites Extraversion as a factor where team heterogeneity is preferred to homogeneity (Humphrey et al., 2007). Such research posits that extraverted members within the same team would compete for status, such as leader-oriented roles, and neglect other important roles and team goals (Barry and Stewart, 1997). However, empirical research has generally not supported variance in Extraversion as a correlate of team performance (Bell, 2007, Prewett et al., 2009), while the generally weak correlations between variance in team Extraversion and team performance suggests that competition for status can be constructive, perhaps by encouraging members to exert more effort toward team goal attainment. In addition, low variance in team Extraversion may encourage shared or collective leadership in the team, which is associated with positive outcomes (Carson et al., 2007). Furthermore, Extraversion involves more than dominance, or need for power: It also includes *sociability* and *friendliness*, both which are traits that may lead to cooperativeness and positive affectivity in the team when maximized (McNiel and Fleeson, 2006). From this perspective, it is thought that high elevation in Team Extraversion will positively relate to team performance by promoting information sharing, collaboration, healthy rivalry, and achievement striving.

Perceiving extraverted trait characteristics favourably, extraverts tend to be attributed with high status within organisations, and are often appointed into leadership roles (Anderson et al., 2001, Hogan et al., 1994, John and Srivastava, 1999, Judge et al., 2002a). However, research into the *'Dark Side'* of extraverted behaviours (Hogan and Hogan, 2001, Judge et al., 2009) finds that in a work setting, the negative attributes of extraverts, i.e. inability to listen, unreceptive to other's input, etc., degrades this high status as group members interact over time. This is particularly the case where high degrees of interdependent working is required (Bendersky and Parikh Shah, 2013: p.389) as a team composed of individuals who are dominant and assertive (high dominance) can stimulate friction and result in a team composed of all leaders and no followers (Barrick et al., 1998, Barry and Stewart, 1997). Research suggests that dominant team members tend to engender less positive interpersonal relations (Driskell et al., 1993) and are less likely to attend to the task inputs of other team members in decision making (Driskell and Salas, 1992), (Christiansen and Tett, 2013, p.748).

High elevation of Team Extraversion will tend to create an environmental situation that activates the expression of Extraversion, or Introversion, in team members, primarily through participation in team discussions and coordinated activities, as extraverted members of the same team will likely *activate* each other's predisposed behaviours. Conversely, extraverted members on an otherwise introverted team may feel inhibited in the presence of introverted team members, a dynamic supported by the *Attraction Paradigm* (Byrne et al., 1971, Byrne and Griffitt, 1969, Byrne et al., 1967, Byrne, 1971). Introversion, however, is likely to yield poor individual performance on teams, regardless of whether the rest of the team is introverted or extraverted. If these expectations are true, then the relationship between Extraversion and job performance will be stronger when team-level Extraversion is high, and weaker when team-level Extraversion is low, provided that this trait is conducive to performance. Therefore, teams high on Extraversion will more likely facilitate the expression of Extraversion, whereas teams low in Extraversion will likely inhibit its expression.

Driskell et al. (1987) have suggested a curvilinear relationship between sociability and team effectiveness, implying that high mean sociability may interfere with instrumental task activities.

2.14.2.1. Trait Orientation: Extraversion

Extraversion presents itself as a *complementary trait*. A curvilinear relationship has been found between Extraversion elevation and Team Performance (Peeters et al., 2006b) where intermediate levels of Extraversion (Barry and Stewart, 1997, Bell, 2007), or heterogeneity of Extraversion elevation (Humphrey et al., 2007, 2011) lead to higher Team Performance. Teams high in Extraversion tend also to have higher Team Viability (Barrick et al., 1998).

2.14.2.2. Hypothesis Development: Team Trait Extraversion

2.14.2.2.1. Team Trait Extraversion and Team Outcomes

Similarity Attraction and Trait Activation Theories suggest that when teams are required to work interdependently, Team Extraversion will differentially influence both Performance, Team Cohesion and Team Viability depending upon team trait elevation and variance across the team. This is due to the pro-social behaviours that will be activated in individuals working within an extraverted team, especially by the opportunity for social interactions presented by Boundary Spanning, Buffering and Reinforcement, but for different reasons.

For example, in conjunction with Boundary Spanning and Boundary Reinforcement, Extraversion is expected to have a convex curvilinear relationship with Performance as a result of the preference extraverts have for social interactions which distract them from their Boundary Buffering priorities; and convex AND concave curvilinear relationships with Team Cohesion and Team Viability by way of conflict arising from the dominant, assertive behaviours typical of high extraverts, alternatively as a result of the extraverted behaviours activated by the opportunities for social interaction presented by Boundary Spanning. However, in combination with Boundary Buffering, high Team Extraversion would be expected to have a concave curvilinear relationship with Team Cohesion, since the pro-social behaviours required for Boundary Buffering are consistent with the activation of the trait during social interactions with other team members.

Finally, the differential relationships between Extraversion, Boundary Spanning, Boundary Buffering and Boundary Reinforcement and Performance, Team Cohesion and Team Viability are anticipated to be curvilinear, in keeping with previous findings (Le et al., 2011p.114 and 116). It is therefore hypothesised that: -

2.14.2.2.2. Team Extraversion on Performance

H2.1: Mean Team Extraversion will have a CONCAVE curvilinear relationship with Performance.

H2.2: Deviation in Team Extraversion will moderate the CONVEX curvilinear association between Mean Team Neuroticism and Performance (as set out in H2.1)

2.14.2.2.3. Team Extraversion on Team Cohesion

H2.3: Mean Team Extraversion will have a CONCAVE curvilinear relationship with Team Cohesion.

H2.4: Deviation in Team Extraversion will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Cohesion (as set out in H2.3)

2.14.2.2.4. Team Extraversion on Team Viability

H2.5: Mean Team Extraversion will have a CONCAVE curvilinear relationship with Team Viability.

H2.6: Deviation in Team Extraversion will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Viability (as set out in H2.5)

2.14.2.2.5. Team Extraversion and Boundary Management on Performance

H2.7: Team Boundary Spanning will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Performance.

H2.8: Team Boundary Buffering will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Performance.

H2.9: Team Boundary Reinforcement will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Performance

2.14.2.2.6. Team Extraversion and Boundary Management on Team Cohesion

H2.10: Team Boundary Spanning will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Cohesion.

H2.11: Team Boundary Buffering will moderate the CONVEX curvilinear association between Mean Team Neuroticism and Team Cohesion.

H2.12: Team Boundary Reinforcement will moderate the CONVEX curvilinear association between Mean Team Neuroticism and Team Cohesion

2.14.2.2.7. Team Extraversion and Boundary Management on Team Viability

H2.13: Team Boundary Spanning will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Viability.

H2.14: Team Boundary Buffering will moderate the CONVEX curvilinear association between Mean Team Neuroticism and Team Viability.

H2.15: Team Boundary Reinforcement will moderate the CONVEX curvilinear association between Mean Team Neuroticism and Team Viability

2.14.3. Trait Openness to Experience

Openness to experience is the extent to which an individual is: original, sensitive to aesthetics, inquisitive/curious, imaginative, broadminded, daring, tolerant of ambiguity and uncertainty, independent thinking, and willing to experiment (McCrae and Costa, 1987, LePine, 2003, Molleman et al., 2004). However, the motivational properties of this trait are not well understood because, in part, the trait has not been widely studied (e.g. Prewett et al., 2009, Penney et al., 2011, Peeters et al., 2006b), and also because it has been consistently reported as the weakest predictor of the FFM on individual level job Performance (Barrick et al., 2001, Blickle et al., 2013, Driskell et al., 1987, 2006, Porter et al., 2003) causing some to suggest it may be inconclusive and non-significant, (e.g. Penney et al., 2011, Salgado, 1997) and leading others to suggest that a two factor model of Openness may provide better results (Griffin and Hesketh, 2004). Burke and Witt (2002) have suggested that other personality variables may moderate the relationship between Openness-to-experience and Performance, since they found that low Openness was detrimental to the Performance of extraverts and those low in Emotional Stability. They later revised this view based on the second-order meta-analysis provided by (Barrick et al., 2001).

In contrast, individuals who are low in Openness to Experience tend to be down-to-earth, practical, traditional, and set in their ways (Costa Jr and McCrae, 1992).

Considering the endless clamour for employees to *'think outside the box'*, this lack of criterion-related validity is counterintuitive, since it seems reasonable to suggest that individuals who are inquisitive when faced with novel situations, adapt to change, and are creative problem solvers, would be amongst the highest of performers (Griffin and Hesketh, 2004: p.243).

McCrae (1996) reports that compared with the other four factors, Openness may have a key central influence on interpersonal and social phenomena as individuals who are curious and open-minded must have an interest in getting to know others both inside and outside of their social network. Results are equivocal (positive: Bell, 2007, Neuman et al., 1999, Stewart, 2003, negative: Van Vianen and De Dreu, 2001 (student sample)). Openness is suggested to be a better predictor when situations are novel or complex (Griffin and Hesketh, 2004), where there is increased likelihood of task-conflict (Antonioni, 1998), where its ability to predict Performance is contingent upon the outcome studied, (Barrick et al., 2005). Openness to experience may also help to decelerate the rate at which Performance declines over time, (Minbashian et al., 2013: p.8), and it may be associated with Performance to the extent that individuals high on this trait are more adaptable and responsive to the changes required to continue in a dynamic team environment, (LePine, 2003), and may perform at a higher level than their less open team mates over the long term, (Minbashian et al., 2013). Despite this, a team that is high in Openness to Experience might experience greater conflict, and low task-cohesion since the attraction of something new would distract focus from task Performance (Van Vianen and De Dreu, 2001).

High elevation of Team Openness to Experience should facilitate member adaptability and help members resolve unique or complex challenges. For example, some scholars have found that teams with greater openness were more successful in adapting to changing contexts in decision-making (LePine et al., 2000), likely explained because member adaptability is predicted by individual-level Openness to Experience. However, it's also appropriate to argue that team member adaptability is also enabled by the flexibility of other team members. That is, individual flexibility and imagination may be constrained if other team members fail to reciprocate in kind. Thus, it is expected that high elevation of Team Openness will positively relate to Team Performance since team elevation on Openness to Experience should enable the expression of member flexibility. Conversely, members who are otherwise flexible may hesitate to express flexibility if other members behave inflexibly, since behaving flexibly when others are not should violate norms for reciprocity and perceptions of fairness (Blau, 1964), thus discouraging flexibility in future work interactions.

2.14.3.1. Trait Orientation: Openness to Experience

There is little empirical evidence of the impact of variability in Openness in research studies although one can intuitively conclude that individuals at the polar extremes are unlikely to have satisfactory and productive relationships. Openness is thought to function as a *complementary trait*, as teams composed only of team members who are highly creative or intellectually oriented may never get past the point of exploring options (Humphrey et al., 2007). Thus, variability or heterogeneity in team member Openness may lead to higher Team Performance in uncertain and dynamic task conditions.

2.14.3.2. Hypothesis Development: Team Trait Openness

2.14.3.2.1. Team Trait Openness and Team Outcomes

Similarity Attraction and Trait Activation Theories suggest that Team Openness is expected to positively predict Performance. It is also expected to positively predict Performance through an interaction with Boundary Spanning especially when trait strength and variance are low, since teams low in trait Openness create an increased level of situational strength such that Team Openness will positively predict Boundary Spanning as these individuals tend to be attracted to problem solving and novel situations, such as those presented by Boundary Spanning. Conversely, Openness is expected to negatively predict Team Cohesion and Viability, as these individuals are pragmatic, more set in their ways, less likely to pursue novel situations, and more resistant to external influences on the team. It is therefore hypothesised that: -

2.14.3.2.2. Team Openness on Performance

H3.1: MEAN Team Openness will be POSITIVELY associated with Performance.

H3.2: Deviation in Team Openness will moderate the POSITIVE association between Mean Team Neuroticism and Performance (as set out in H3.1)

2.14.3.2.3. Team Openness and Boundary Management on Performance

H3.3: Moderated by Boundary Spanning, Mean Team Openness will be POSITIVELY associated with Performance.

H3.4: Moderated by Boundary Buffering, Mean Team Openness will be NEGATIVELY associated with Performance.

H3.5: Moderated by Boundary Reinforcement, Mean Team Openness will be NEGATIVELY associated with Performance.

2.14.4. Trait Agreeableness

Individuals high in Agreeableness can be characterised as being: courteous, friendly, tolerant, cooperative, considerate, modest, trustworthy, helpful, altruistic, empathetic, and caring (Costa and McCrae, 1992); they are non-competitive (Graziano et al., 1997) and conflict averse in their social interactions (Graziano, 1994). Therefore, Agreeableness is expected to manifest itself through its positive affect in team social processes and contextual performance (Peeters et al., 2006a), and of all of the Big Five traits, may be the trait that is most concerned with interpersonal relationships (Graziano et al., 1996). Agreeableness is therefore expected to have high predictive validity for tasks requiring collaboration, positive social-relations (Barrick et al., 2001), and pro-social behaviours (Stewart et al., 2005, Mumford et al., 2008). In contrast, individuals who are low in Agreeableness tend to be direct, uncaring, intolerant, unsympathetic, critical, sceptical, hard-headed and competitive (Costa Jr and McCrae, 1992), and consequently are rated (by others) as less socially desirability (Graziano et al., 1996).

Agreeableness predicts social-role behaviours (Stewart et al., 2005, Mumford et al., 2008), consequently, agreeable team members tend to adopt social-based roles (Prewett et al., 2009), and they tend to excel at interpersonal facilitation (Hurtz and Donovan, 2000, Mount et al., 1998, Neuman et al., 1999, Van Scotter and Motowidlo, 1996), cooperation (Barrick et al., 1998, Mohammed et al., 2002, Neuman and Wright, 1999, Taggar, 2002), conflict resolution (Barrick et al., 1998, Neuman and Wright, 1999, Taggar, 2002), open communication (Neuman and Wright, 1999), information seeking (Taggar, 2002), compliance with team goals, and alignment (Klimoski and Mohammed, 1994, Van Vianen and De Dreu, 2001).

Research on the relationship between Agreeableness and team outcomes is equivocal and studies have yielded mixed results (Rothstein and Goffin, 2006). Empirical studies generally confirm that higher levels of Agreeableness tend to lead to higher Team Performance (Barrick et al., 1998, Graziano et al., 1997, Kozlowski and Ilgen, 2006, Neuman et al., 1999, Neuman and Wright, 1999, Van Vianen and De Dreu, 2001). High elevations of Team Agreeableness will create a context where members are expected to interact constructively and courteously (Ashton and Lee, 2007), which should bolster service orientation and team member relations. Elevation in this trait is related to Team Cohesion and the effective management of disagreements between team members (Bradley et al., 2014, Bradley et al., 2013a, Bradley et al., 2013b, Bradley et al., 2012). Thus, teams that are generally high on this trait may encourage a positive social environment that is favourable as it serves to motivate member performance, positive team outcomes. It is therefore reasonable to suggest that this trait is especially salient to Team Boundary Management activities, such as Boundary Buffering and Reinforcement.

Previous studies have found that having just a single team member that is low in Agreeableness may be disruptive and negatively impact Performance (Barrick et al., 1998, Bell, 2007). This is referred to by others as the *bad apple effect* (Felps et al., 2006). Consequently, low elevation in this trait can lead to a negative and tense team climate, harming individual motivation and morale (Driskell et al., 2006). Empirical work has indicated that negative emotions in one individual are readily adopted by others (Barsade, 2002), and the physiological effects of negative emotions are longer lasting than those of positive emotions (Rein, McCraty, & Atkinson, 1995). Taken together, these reports suggest that negative characteristics associated with Agreeableness are more likely to be expressed if other team members also express them. Conversely, teams with strongly supportive interpersonal environments will tend to express positive traits associated with Agreeableness. Thus, Team Agreeableness should relate to team outcomes when elevation of Agreeableness is high.

2.14.4.1. Trait Orientation: Agreeableness

Trait Agreeableness is expected to function as a *supplemental trait* where the presence of several disagreeable team members, can disrupt Team Performance; low variance at the positive pole of Agreeableness (team members are similarly high on agreeability) will yield high Performance, and low variance at the negative pole (team members similarly low on Agreeableness) will yield lower Performance (Mohammed and Angell, 2003, Bradley, 2008, Felps et al., 2006).

2.14.4.2. Hypothesis Development: Team Trait Agreeableness

2.14.4.2.1. Team Trait Agreeableness and Team Outcomes

Team Agreeableness is expected to have a differential relationship with each of the team outcomes depending upon the trait elevation and variance across the team, and especially when considered in conjunction with Boundary Management activities that are socially derived, and since agreeableness may be the most concerned with interpersonal relationships of all the five traits. Therefore, Agreeableness is expected to have a concave curvilinear relationship with Performance, while having differential associations with Team Cohesion and Viability, especially through interactions with Boundary Spanning, Buffering and Reinforcement. A highly agreeable team will activate agreeable behaviours across the team which are consistent with the requirements for pro-social behaviours for each of these boundary management activities. Consistent with this approach, high Team Agreeableness and Boundary Buffering and Reinforcement would be expected to have a convex curvilinear relationship with Performance when Interdependence was low, and a concave curvilinear relationship with Performance when Interdependence was high. This is due to the conflict averse nature of highly agreeable individuals being unable to resist pressure from external influences, or avoiding group think during Boundary Reinforcement activities. The differential relationships between Agreeableness, Boundary Spanning, Boundary Buffering and Boundary Reinforcement, Performance, Team Cohesion and Team Viability are anticipated to be curvilinear, in keeping with previously reported findings (Le et al., 2011p.114 and 116). It is therefore hypothesised that: -

2.14.4.2.2. Agreeableness on Performance

H4.1: Mean Team Agreeableness will have a CONCAVE curvilinear relationship with Performance.

H4.2: Deviation in Team Agreeableness will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Performance (as set out in H4.1)

2.14.4.2.3. Agreeableness on Team Cohesion

H4.3: Mean Team Agreeableness will have a CONVEX curvilinear relationship with Team Cohesion.

H4.4: Deviation in Team Agreeableness will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Cohesion (as set out in H4.3)

2.14.4.2.4. Agreeableness on Team Viability

H4.5: Mean Team Agreeableness will have a CONVEX curvilinear relationship with Team Viability.

H4.6: Deviation in Team Agreeableness will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Viability (as set out in H4.5)

2.14.4.2.5. Agreeableness and Boundary Management on Performance

H4.7: Team Boundary Spanning will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Performance.

H4.8: Team Boundary Buffering will moderate the CONCAVE curvilinear association between Mean Team Agreeableness and Performance.

H4.9: Team Boundary Reinforcement will moderate the CONCAVE curvilinear association between Mean Team Agreeableness and Performance

2.14.4.2.6. Agreeableness and Boundary Management on Team Cohesion

H4.10: Team Boundary Spanning will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Team Cohesion.

H4.11: Team Boundary Buffering will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Team Cohesion.

H4.12: Team Boundary Reinforcement will moderate the CONCAVE curvilinear association between Mean Team Agreeableness and Team Cohesion.

2.14.4.2.7. Agreeableness and Boundary Management on Team Viability

> *H4.13: Team Boundary Spanning will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Team Viability.*
>
> *H4.14: Team Boundary Buffering will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Team Viability.*
>
> *H4.15: Team Boundary Reinforcement will moderate the CONCAVE curvilinear association between Mean Team Agreeableness and Team Viability.*

2.14.5. Trait Conscientiousness

Conscientiousness represents the degree to which individuals are: achievement oriented, self-motivated, persevering, hardworking, thorough, orderly, punctual, dependable, responsible, and self-disciplined, (Barrick and Mount, 1993, Costa and McCrae, 1992, Goldberg, 1993). Consequently, individuals that are high in Conscientiousness tend to set themselves high standards, strive to achieve their goals, and are well organised. In contrast, individuals in whom Conscientiousness is lacking tend to be disorganised, easy-going, and sometimes careless. Furthermore, in a team setting, such deficiencies have been shown to lead to various forms of moral disengagement, including social loafing, shirking, or free-riding (Harkins et al., 1980, Karau and Hart, 1998, 1993, Kidwell Jr and Bennett, 1993, Mohammed and Angell, 2003, Molleman et al., 2004, Neuman and Wright, 1999, Ulke and Bilgic, 2011). At the other extreme, the *dark side of Conscientiousness* results in a lack of flexibility and readiness to change and accept new ideas, each of which might be unacceptable in certain job roles, such as managerial roles, or dynamic task conditions requiring constant adjustments.

A number of studies have found that elevated levels of Conscientiousness have consistently provided the strongest predictors of Team Performance (Barrick and Mount, 1993, 1998, 2001, Bell, 2007, Bergner et al., 2010, Hurtz and Donovan, 2000, Lepine et al., 1997, Mohammed and Angell, 2003, Neuman et al., 1999, Neuman and Wright, 1999, Peeters et al., 2006a, Salgado, 2003, Salgado et al., 2013, Van Vianen and De Dreu, 2001). Consequently, researchers expect this trait to result in effort and perseverance towards team goal completion (LePine, 2003, Mohammed and Angell, 2003, Molleman et al., 2004, Neuman and Wright, 1999, Van Vianen and De Dreu, 2001), task commitment (Barry and Stewart, 1997, Taggar, 2002), cooperation (Molleman et al., 2004), and adaptability in the face of change (LePine, 2003).

With a few notable exceptions, there is little empirical evidence relating to the relationship between Conscientiousness and the extent to which individuals are likely to engage in social interaction and/or relationship building. Wanberg et al. (2000) found that Conscientiousness was associated with both a higher level of contacting others and using traditional job-search methods among job seekers. Hurtz and Donovan (2000) found that Conscientiousness related to higher degrees of interpersonal facilitation. More generally, Vodosek (2003) explores how the Big Five personality traits relate to social network formation. While Blumberg (2001) found that Conscientiousness is linked to both task and social roles. Conscientiousness is described as a *task-based criterion* (Stewart et al., 2005) that has been widely validated as a predictor of Individual and Team Performance.

Trait elevation in Team Conscientiousness will create a context where member effort is encouraged and loafing is discouraged, thus improving the work effort from team members. For example, individuals high in Conscientiousness are more likely to engage in *backing-up* behaviours and other forms of contextual performance (Morgeson et al., 2005). These behaviours can further reinforce proscriptive performance norms and communicate strong behavioural expectations to team members (Cialdini and Trost, 1998). A more Conscientious team should create a context in which member Conscientiousness is encouraged and rewarded, thus eliciting greater activation in Conscientiousness for those who are predisposed to behave that way (Mohammed and Angell, 2003). Conversely, a low conscientious team member is more likely to withhold effort, resulting in feelings of inequity in the other team members. Thus, rather than activating behaviours associated with Conscientiousness, social-loafing by even one team member may result in a desire by other members to reduce their contributions as a means of restoring equity. This phenomenon is known as the *sucker effect* (Hart et al., 2001).

2.14.5.1. Trait Orientation: Conscientiousness

Conscientiousness presents itself as a supplementary trait. Scholars suggest that team member Conscientiousness should combine additively such that the higher the mean level of Conscientiousness within the team, the more effectively the team will perform (Christiansen and Tett, 2013, p.750). Van Vianen and De Dreu (2001) report that homogeneity of trait Conscientiousness within a team will lead to Team Cohesion. In contrast, heterogeneity, or variability, of Conscientiousness may lead to conflict, morale disengagement, including shirking, free-riding (or social loafing) (Humphrey et al., 2007), and Performance loss (Mohammed and Angell, 2003, Molleman et al., 2004). Therefore, lower variation in Conscientiousness, and/or similarity at the positive pole of Conscientiousness, is likely to be positively associated with higher levels of Team

Outcomes (Barrick et al., 1998, Halfhill et al., 2005, Humphrey et al., 2007, 2011, Kichuk, 1996, Kichuk and Wiesner, 1998, Peeters et al., 2006a).

2.14.5.2. Hypothesis Development: Team Trait Conscientiousness

2.14.5.2.1. Team Trait Conscientiousness and Team Outcomes

When Team Conscientiousness elevation is high, variance in Conscientiousness across the team is expected to result in a concave curvilinear relationship with Performance, Team Cohesion and Team Viability, since between person differences are known to lead to conflict and moral disengagement. Conscientiousness is expected to have a concave curvilinear relationship with Performance through interactions with Boundary Buffering and Boundary Reinforcement due to the *top-down* effect whereby a highly Conscientious team will exert social pressure, activating goal focussed behaviour associated with conscientious individuals who may then be less likely to attend to the inward facing activities required by Boundary Buffering and Reinforcement. Meanwhile, moderated by Boundary Spanning, Team Conscientiousness is expected to have a convex curvilinear relationship with Team Cohesion and Team Viability, for similar reasons to those stated earlier in the section.

The differential relationships between Conscientiousness, Boundary Spanning, Buffering, and Reinforcement and Performance, Team Cohesion and Team Viability are likely to be curvilinear, in keeping with previously reported findings (Le et al., 2011p.114 and 116). It is therefore hypothesised that: -

2.14.5.2.2. Conscientiousness on Performance

H5.1: Mean Team Conscientiousness will have a CONVEX curvilinear relationship with Performance.

H5.2: Deviation in Team Conscientiousness will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Performance (as set out in H5.1).

2.14.5.2.3. Conscientiousness on Team Cohesion

H5.3: Mean Team Conscientiousness will have a CONCAVE curvilinear relationship with Team Cohesion.

H5.4: Deviation in Team Conscientiousness will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Cohesion (as set out in H5.3).

2.14.5.2.4. *Conscientiousness on Team Viability*

H5.5: Mean Team Conscientiousness will have a CONCAVE curvilinear relationship with Team Viability.

H5.6: Deviation in Team Conscientiousness will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Viability (as set out in H5.5).

2.14.5.2.5. *Conscientiousness and Boundary Management on Performance*

H5.7: Team Boundary Buffering will moderate the CONCAVE curvilinear association between Mean Team Conscientiousness *and Performance.*

H5.8: Team Boundary Reinforcement will moderate the CONCAVE curvilinear association between Mean Team Conscientiousness *and Performance*

2.14.5.2.6. *Conscientiousness and Boundary Management on Team Cohesion*

H5.9: Team Boundary Spanning will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Team Cohesion.

H5.10: Team Boundary Buffering will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Team Cohesion.

2.14.5.2.7. *Conscientiousness and Boundary Management on Team Viability*

H5.11: Team Boundary Spanning will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Team Viability.

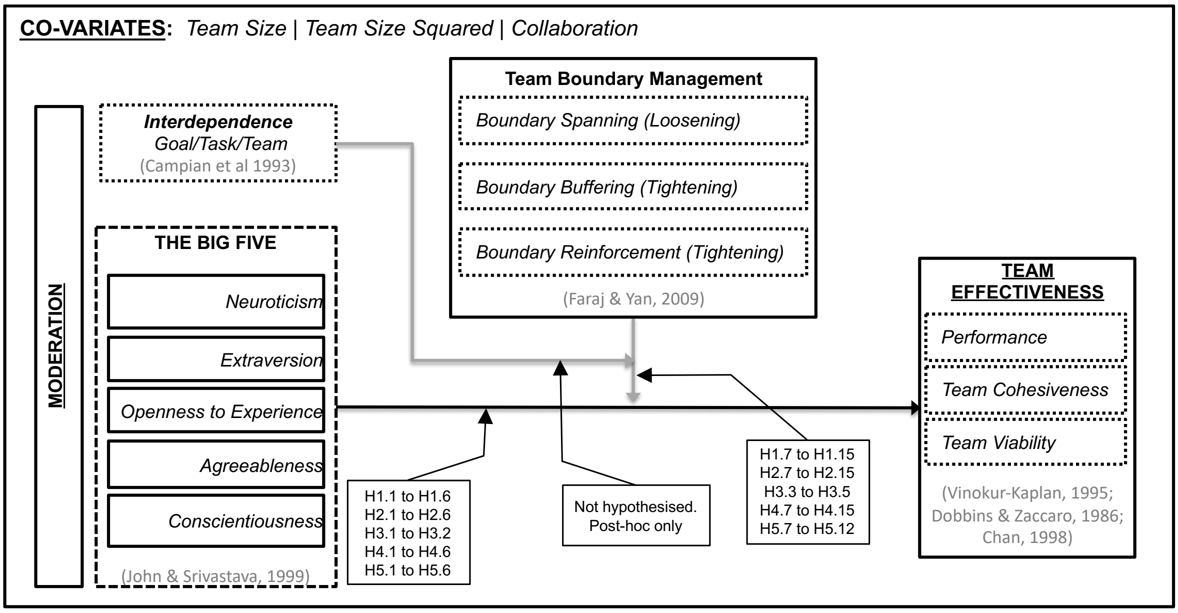
H5.12: Team Boundary Buffering will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Team Viability.

2.15. CONCEPTUAL MODEL

The theoretical model is illustrated in **Figure 2.3** below, and it identifies, from the literature review in Chapter Two above, the posited relationships between Team Personality, Team

Boundary Management, various team outcomes and other moderating factors such as Interdependence (Goal/Team/Task).

Figure 2.3: Conceptual Model including Hypotheses



2.16. Summary

In the course of undertaking a rigorous review of literature, including the vast body of knowledge that has previously examined the antecedents of team performance, and collaborative team processes, such as Boundary Management, and Team Composition, no literature, or empirical studies, where found that examined the team composition variables needed to support the boundary management—team outcomes relationship, or the role of boundary management in the personality-performance relationship. This is reinforced by a recent review by Dey (2017), who called for consideration of deep-level compositional factors as antecedents of boundary management processes. Similarly by Seibert and DeGeest (2017), leading them to call for future research to develop models in which team personality is linked to performance via its effects on team processes and behaviours known to be associated with team effectiveness (p.393). Together these identify significant gaps in our understanding, since the ability to predict performance using much of this literature has been compromised and eroded (Tannenbaum et al., 2012), along with our understanding of how to compose, manage and successfully develop team performance (2012). This is of obvious concern to the 'human-capital' intensive world of knowledge work, and it stimulates a need to further examine the mechanisms and conditions underlying the team personality and performance relationship.

CHAPTER 3: METHODOLOGY AND RESEARCH DESIGN

3.1. Introduction

This chapter outlines the methodological, analytical, and ethical considerations under which the research has been conducted.

A quantitative study based on a Positivist tradition, data was collected by survey online questionnaires, from sufficient number of participants to meet the demands of statistical power, validity and reliability. Following the Input-Process-Output (IPO) model, variables included existing validated scales for personality traits, Boundary Management, a variety of team outcomes, moderating variables, demographic variables and covariates.

Fifty-seven (57) teams were approached, and forty-eight (48) teams participated and provided their data by completing online questionnaires, with three-hundred and twenty-five (325) participants in total.

Data was analysed using IBM SPSS v25 in combination with the proprietary SPSS Add-In application, PROCESS, develop by Hayes (2018). All calculations were recorded with log files, and output files either stored as SPSS Output files, or exported to Microsoft Excel for further analysis.

The project has been conducted in accordance with the Aston Business School (ABS) Ethical Guidelines and Economic and Social Research Council (ERSC), with supervision provided by multiple experienced academic researchers (project supervisors).

3.2. Research Paradigm

A researcher's philosophical world-view and field of interest influences the methods adopted in their research design (Gioia and Pitre, 1990). For example, much of the work relating to teams emanates from the field of psychology, is rooted in the social and behavioural sciences, and typically follows a *Positivist* tradition. Consequently, team research typically tends to follow the *scientific method*, more commonly referred to as the *hypothetico-deductive* method, which prescribes a common design format with the following sequence: – literature review, hypothesis development, data collection, analysis, results, conclusions and recommendations (from the measured effects).

This research follows a *Functionalist Paradigm* using a Hypothetico-deductive method to guide the study. The aims of the study are consistent with a *Scientific Realist* approach (see Bhaskar, 2013) because, while aligning with the traditions in the field, and those of previous scholars that have supported the areas being researched, the study seeks to measure unobservable factors, like personality, for the purpose of extending existing theory and contributing to practical knowledge.

3.3. Research Design

3.3.1. Quantitative Research Design

The choice and/or mix of qualitative and quantitative research methods underpins the essence of these issues. Interpretivist researchers adopt qualitative methods, typically comprising of interviews and case studies, and they concern themselves with rigour and objectivity – defending against criticism from Positivists on these very issues. On the other hand, Positivist researchers deploy quantitative methods, typically questionnaires and surveys, concern themselves with sample size, errors (of one kind or another), statistical techniques of analysis, and defend against criticism from Interpretivists on grounds of relevance and fit between method and phenomena.

Whatever methods are adopted, and regardless of a researcher's philosophical paradigm, whether Realist or Interpretivist, the challenge for all researchers is common: how to make research relevant to practice whilst also ensuring a meaningful theoretical contribution.

Although the genesis of this study originates in practice, the discrete topics being investigated are already well represented in literature and have a strong theoretical basis. This has enabled alignment with existing research designs used many times previously by scholars in this tradition; and along the lines of the hypothetico-deductive method, incorporating the following sequence: -

1. Extensive review of literature identifying gaps as appropriate
2. Hypothesis development
3. Data collection (quantitative data are collected by survey questionnaires)
4. Analysis and reporting of results
5. Conclusions and recommendations

The execution of this project, and sections of this report are structured to reflect just such a design.

3.4. Method

There is robust literature on the relationship between personality and job performance (Tett et al., 1991), but one of the challenges of undertaking research into the personality-performance relationship is the consistently small to modest effect sizes reported (Hurtz and Donovan, 2000), amongst many others. This leads scholars to suggest that other factors, moderators and mediators, contribute to the explanation of the relationship between FFM traits and workplace behaviours and outcomes (e.g. see Barrick et al., 2013, Judge and Zapata, 2015, Widiger, 2017, p.396). In response to this, a range of more complicated (nuanced) methods of analysis have been recommended, including longitudinal studies, multi-level studies, moderation and mediation. For example, research has suggested that the effects of personality on performance may change over time (Lievens et al., 2009, Thoresen et al., 2004). Consequently, data for this study was collected over two time periods roughly three months apart. The time interval was based upon being short enough to minimise team membership instability which might degrade the sample, and yet long enough to allow an appropriate assessment of performance viewed across a number of performance cycles e.g. a significant number of team performance cycles were between 5 days and 14 days in length.

Since Heslin's early review (Heslin, 1964), the increased interest in the role of teams in organisational research (Devine et al., 1999, Manz and Sims, 2001) and development of the FFM, the majority of research on the role of personality traits has focused on the influence of team-level compositions involving singular personality traits as they relate to team level processes and outcomes. This study largely follows this approach and answers the calls for further studies linking team personality to team-level outcomes (Seibert and DeGeest, 2017), including calls for further research into the curvilinear relationships between personality traits and performance (Le et al., 2011), boundary management (Dey, 2017), and the related boundary conditions and moderating variables.

3.5. Data Collection

3.5.1. Cross-sectional Surveys

Survey questionnaires were used to capture data relating to the variables identified in the conceptual model above. Psychometric scales, including survey items used in this study were based on established, validated scales published in ranked (peer-reviewed) journals.

3.5.1.1. Data Collection and Questionnaire Deployment

Questionnaires were deployed to UK based participants using an established web-based survey application – Survey Monkey. This enabled each participating team leader and team member to be uniquely identified and completed questionnaires to be exported in a format amenable to later analysis using IBM SPSS.

The progress of survey completion was managed by a detailed log prepared in Microsoft Excel. The distribution of participants is shown in **Table 3.1** below.

Table 3.1: Distribution of Participants

Individuals Invited	Agreed	Completed T1	Completed T2	Unique Teams
392	374	334	322	57

A total of sixty-eight (n=68) Team Leaders agreed to participate and actually completed the survey at *Time 1*. However, eleven team leaders were unable to convince their teams members to participate, or had other constraints preventing wider participation. These results were not included in the study. The sample was further degraded by incomplete responses and team member attrition.

3.5.2. Sample and Procedure

Data collection and the research techniques proposed reflect the competing needs of this project to: deploy an appropriate methodology, constrain the scope of work according with its purpose, reflect the complexity and challenges explained previously by others, whilst maintaining a level of pragmatism based on the available time, access to research subjects, and the ability to collect sufficient data to secure adequate statistical power (Mathieu et al., 2012, McQuitty, 2004, Scherbaum and Ferreter, 2009).

3.5.2.1. Sample Size

The study is based on a sample size of n = 48 at team level, and n = 325 when considering all qualifying participants – although a number of teams were excluded from the study due to missing data, or in a small number of cases, team size fell short of the criteria required meet the *selection rate* from Dawson (2003) - to exclude groups from further analysis should they have low group level responses. Selection rate is a formula that assesses the accuracy of incomplete group data in predicting true scores as a function of number of responses per group (n) and group size (N). The cut-off point chosen reflects a selection rate ([N – n]/ Nn) of .32, since scores from groups with a value of <= .32, are generally correlated with true scores at .95 or higher (Richter et al., 2006: p.1257).

3.5.2.2. Sample Demographics

The demographic distribution of the sample population is as follows, see **Table 3.2**: -

Table 3.2: Sample Demographic Data

Gender	male 68.8% vs. female 31% (gender coded as male = 1)
English first language	100% (coded yes = 1).
Team Tenure	79.2% > 1 year
Organisation tenure	93.7% >1 year
Age range	28 to 58 (average 42.5)
Range in Team size	3 to 15, with 60% >5 (mean = 6.44)
Knowledge Workers	96%
Distributed Working	76% 'virtual' vs. 33% collocated
Industry Sector	Service sector = 69%, manufacturing = 29%, and Not-for-profit = 2% (coded 1 to 3)

3.5.3. Target Research Subjects

3.5.3.1. Job roles

The team leader subjects participating in this study were typically individuals holding roles including the general job descriptions: 'Programme Director, Programme Manager, Project Manager' or 'X-Functional Manager' in their title. Although this covers a broad spectrum of roles, these roles are described in O*NET (http://www.onetonline.org) and such a reference provides some consistency as to the situational dimensions within such teams. The following example is one such reference. Although the study was not limited to IT managers, functional similarities helped to inform and constrain job specifications amongst similar roles included in the study: -

15-1199.09 – (Information Technology (IT)) Project Managers

- Plan, initiate, and manage (information technology (IT)) projects. Lead and guide the work of technical staff. Serve as liaison between business and technical aspects of projects. Plan project stages and assess business implications for each stage. Monitor progress to assure deadlines, standards, and cost targets are met.
- Sample of reported job titles: IT Manager, IT Project Manager, Manager of IT, Program Manager, Project Manager, Project Manager/Team Coach, Senior Lead Project Manager, Senior Project Leader/Team Lead, Technical Project Lead (Project Manager), Transition Program Manager

These roles were chosen as the general management skills and knowledge across these roles are consistent with other similar roles, and management roles in general and research subjects held roles in organisations operating across a broad range of industry sectors including Manufacturing, Service, and Not-for-Profit sectors.

3.5.3.2. Participants

Although a significant portion of data was collected from within a single, multi-site organisation, approximately 25% of the remaining data were collected on teams in a cross section of other organisations and industry sectors. These are outlined in **Table 3.3** below.

Table 3.3 – Industry Sectors and Companies participating in this research study

INDUSTRY SECTOR	NUMBER
MANUFACTURING	4 Organisations
SERVICES	6 Organisations
NOT-FOR-PROFIT	2 Institutions

The aim of this was to increase the quality of conclusions and generalisability.

In order to ease the considerable access challenges, research subjects were selected from within my professional network, and, in a small number of cases, opportunistically using professional social media sites, such as LinkedIn.

3.5.3.3. Incentivised Participation

Participation was incentivised with participation in a prize draw offering four (4) iPad mini devices to those participants who provided a complete set of data used in the study. The devices are to be allocated to participants in a random draw at the end of the study.

3.5.3.4. Knowledge Work

A contextual feature common to all the teams that participated in this research was a generally high content of knowledge work within work routines.

3.5.3.5. Distributed, Matrix Management Structures

All participating teams operated, to varying degrees, within distributed, or matrix, structures – each of which are thought to contribute to the need for horizontal interactions between team members, and team processes such as boundary management. The writer visited all three of the research subject's (company X), UK distribution centres, met with their senior management teams, and conducted site inspections. This provided understanding of the processes being undertaking, along with insights into the ways of working within each site.

3.5.3.6. Short-Cycle, Project Type Work

Another feature common to the teams being studied was the relatively short timescales needed to complete their performance objectives. For example, although projects vary in duration from short to long term (many years), all of the project teams in this study progressed through their respective lifecycles within the three-months period of this study. This enabled a reasonable assessment of progress between the two data collection episodes at times 1 and 2. In the case of the teams from company X, the unique operating circumstances of the three participating distribution centres meant that teams would complete a fairly large number of operating cycles within the three-month period, since each cycle tended to last between three to five days. company X 's operating model also creates a high degree of variation and uncertainty in the project activities. This perfectly mirrors the life-cycle common to all projects, and general management/business activities. This provided team leaders in particular, substantial insight into the performance achieved by their respective teams.

3.5.4. Data Collection Sequence

a. Selection of pre-existing scales
b. Preparation of surveys and configuration of the survey delivery application (Survey Monkey)
c. Testing and quality control – comprising a small number of dummy runs (6) with the potential target audience, to proof and check the clarity of instructions and guidance notes.
d. Initial email contact with team leaders to secure participation of team – see **APPENDIX 14**.
e. Initial email contact with team members to secure participation - see **APPENDIX 14**.
f. Provide participant brief and supporting information including hyperlink to online questionnaire (includes informed consent)
g. Study 1 – Time 1 (T1)
    a. Team leaders – gathering of individual level cross- sectional survey data developed from established measurement scales
    b. Team members - gathering of individual level cross-sectional survey data developed from established measurement scales
h. Collate data
i. Study 2 – Time 2 (T2) - approximately 3 months after T1 to accommodate the temporal aspects of performance outcomes
    a. Team leaders/supervisors – gathering of cross- sectional survey data on performance developed from established measurement scales
    b. Team members - gathering of cross- sectional survey data on performance developed from established measurement scales
j. Collate data

k. Analysis and reporting results
    a. Descriptive Statistics – using SPSS v25
    b. Inferential Statistics – using SPSS v25
    c. Interactions – using SPSS v25 and PROCESS v3
    d. Simple Slope Analysis – using Dawson's excel spreadsheet: 2-way unstandardized with simple slopes (Dawson, 2014, Dawson and Richter, 2006)

Details of which survey items were collected in each time interval are included in **APPRENDIX 13: Questionnaires**. These are summarised in **Table 3.4** below.

Table 3.4: Data Collection: Variables in each Time Interval

Team Leader – T1	**Team Leader – T2**
Performance Boundary Management Personality Team Cohesion	Performance Team Cohesion Team Viability
Team Member – T1	**Team Member – T2**
Personality Boundary Management Collaboration Team Cohesion Interdependence	Personality Performance Team Cohesion Team Viability

3.5.5. Measures and Reliability

All survey items are based on established (validated) scales based on Likert-type responses unless otherwise indicated.

I have justified aggregating individual member responses using r_{wg} index after (Scherbaum and Ferreter, 2009). Median multi-item r_{wg} values ≥ 0.70 are generally considered sufficient to warrant aggregation. Reliability is assessed using a calculation of Cronbach Alpha (α) (Cronbach, 1966, 1955, 1970, 1984, 1990). Where appropriate, I have reported intra-class correlations (ICC_2) indicating reliability of the measures in modelling the effects. Aggregate team level scale consistencies are calculated using the average mean-centred item response – aligning measurement reliability with the level of analyses used (Demaree et al., 1984, James et al., 1993). Results of reliability tests undertaken on the data set report a Cronbach Alpha (α) in the range of .60 to .96.

See **Chapter 4** for a summary of result of reliability tests.

3.6. Independent Variables (IV)

3.6.1. Team Personality as a Construct

Team composition variables pose a particular problem. Although individual differences are defined at the individual level, team composition reflects the combinations of individuals that compose a team (Mohammed et al., 2002), and how their individual-level differences in traits combine at the team-level. Consequently, the relationship between team members' composition variables and team performance will likely be moderated by this operationalisation (Arthur Jr et al., 2007, Bell, 2007, p599). Therefore, when relating team composition variables, such as personality traits, to team-level criteria, such as team effectiveness, both the predictor and the criterion must be measured at the team level (Prewett et al., 2009, p.275).

3.6.2. Personality Traits

Survey questions for each of the *Big Five* personality traits were provided by John and Srivastava (1999). This shortened version of the FFM was chosen as a compromise between attaining sufficient resolution and avoiding survey fatigue due to a relatively large number of variables being measured overall since the full version of the NEO-PIR contains 242 items.

The 44-item BFI scale (α = .80 - .90) measures individual traits based on the Big Five Factors of Personality (Goldberg, 1993), with each trait further sub-divided into facets of personality. All items are assessed on a five-point Likert scale. A copy of the survey questionnaire is included in **APPENDIX 13** below.

3.7. Moderators

3.7.1. Team Boundary Management

Survey questions for each of the team boundary management activities (Boundary spanning, buffering and reinforcement) were adapted from Faraj and Yan (2009), and Yan and Louis (1999). All items are assessed on a five-point Likert scale. The same procedure is followed regarding aggregation.

A copy of the survey questionnaire is included in **APPENDIX 13**.

3.7.1.1. Boundary Spanning (Boundary Loosening activities):

Four survey questions assessing the extent to which the team encourages its members to solicit critical information and resources, influence important external agents and actors, and build relational networks external to the team.

[Original Scale reliability was $\alpha_{\text{individual level}}$ = .73; $\alpha_{\alpha\text{aggregate level}}$ = .81; median r_{wg} = .87; ICC_1 = .17; ICC_2 = .50]

3.7.1.2. Boundary Buffering (Boundary tightening activities)

Four items assessing the extent to which the team and its leadership deflect or absorb external interference, competing demands and requests in order to prevent team member overload.

[Original Scale reliability was $\alpha_{\text{individual level}}$ = .79; $\alpha_{\text{aggregate level}}$ = .82; median r_{wg} = .85; ICC_1 = .06; ICC_2 = .24]

3.7.1.3. Boundary Reinforcement (Boundary tightening activities)

Four items assessing the extent to which the team proactively creates a sense of boundary awareness among its members in order to build a clear and distinctive team identity. Survey items can be seen in **APPENDIX 13** below.

[Original Scale reliability was $\alpha_{\text{individual level}}$ = .83; $\alpha_{\text{aggregate level}}$ = .84; median r_{wg} = .92; ICC_1 = .17; ICC_2 = .49]

3.7.2. Interdependence

I measured Interdependence with 9 items from Barrick et al. (2007) scale (adapted from (Campion et al., 1993, p.848-849), original Task Interdependence α=.61; Goal Interdependence α=.68; Interdependent Feedback & Reward α=.59); and Team Interdependence as a hybrid of Campion et al. (1993), and Carter et al. (2013). Items focus on the extent to which tasks performed by members are interrelated within and between teams, and whether team member goals are related to the team's objectives and success outcomes. Survey items can be seen in **APPENDIX 13** below.

[Original Scale reliability was α = .80 at the individual level and α = .95 at the team level, and checks for aggregating team interdependence were acceptable ($F_{93, 506}$ = 2.49, p = .01; ICC[1] = .21; ICC[2] = .60; r_{wg} = .94)].

3.8. Dependent Variables (DV)

3.8.1. Team Effectiveness

3.8.1.1. Performance

I used two questionnaires, taken from Gibson et al. (2009: p.68) and Vinokur-Kaplan (1995: p.312), using four-items of a 7-point Likert scale ranging from 1 (very inaccurate) to 7 (very accurate). Original scale reliability Cronbach α=.86. and .83 respectively. These performance measures capture how effective the team is rather than whether specific goals had been achieved and is therefore conceptually distinct from the measure of goal accomplishment, although both measures were also empirically distinct. Performance data was analysed according to the approach originally proposed by Heslin (1964: p.249) whereby the evaluation of the final product is provided by an agency outside the group. In this case, the Team Leader.

Team performance was measured on two occasions at a period of three months apart to accommodate the temporal nature of performance. However, only Performance data collected at Time Interval 2 was used in analysis of results. Results are assessed for interrater agreement after James et al. (1993). See **APPENDIX 13** for details of questionnaire to be used.

3.8.1.2. Team Cohesion

Team cohesion is measured using an 8-item scale modified from Hackman (1987), by Sundstrom et al. (1990) – Original scale reliability Cronbach $\alpha_{\text{aggregate group level Cohesiveness}}$ = .89 (from Dobbins and Zaccaro, 1986). See **APPENDIX 13** for details.

3.8.1.3. Team Viability

Henderson and Lee (1992: p.769) define team viability as the extent to which a team was able to increase its ability to perform as an intact unit over time. The questionnaire used three items developed from (Marrone et al., 2007) following Hackman (1987), Sundstrom et al. (1990) referent-shift consensus model. Using a five-point Likert scale, team members rate the extent to which the team provided a satisfying and developmental experience enabling it to continue to work productively over time. See **APPENDIX 13** for details.

[Original Scale reliability was α=.81, median r_{wg} = .78, ICC_1 = .59, and ICC_2 = .74; single factor, (Chan, 1998)]

3.9. Control Variables (Covariance)

A number of control variables were selected based upon the studies evaluated in the literature review. These include *Team Size* (Team Size squared for quadratic analysis) which is knowns to negatively influence Team Effectiveness, and *Collaboration* as a secondary measure of Interdependence. See **APPENDIX 13.**

3.9.1. Demographic Data

This study collected various data on demographic variables including: age (Bedeian et al., 1992, Cohen, 1993, Zenger and Lawrence, 1989), sex (Bray et al., 1978), Nationality (Kirkman et al., 2013), level of education , English first language, etc.

3.9.2. Tenure

This study collected various data for tenure (see Stewart, 2006: p.33).

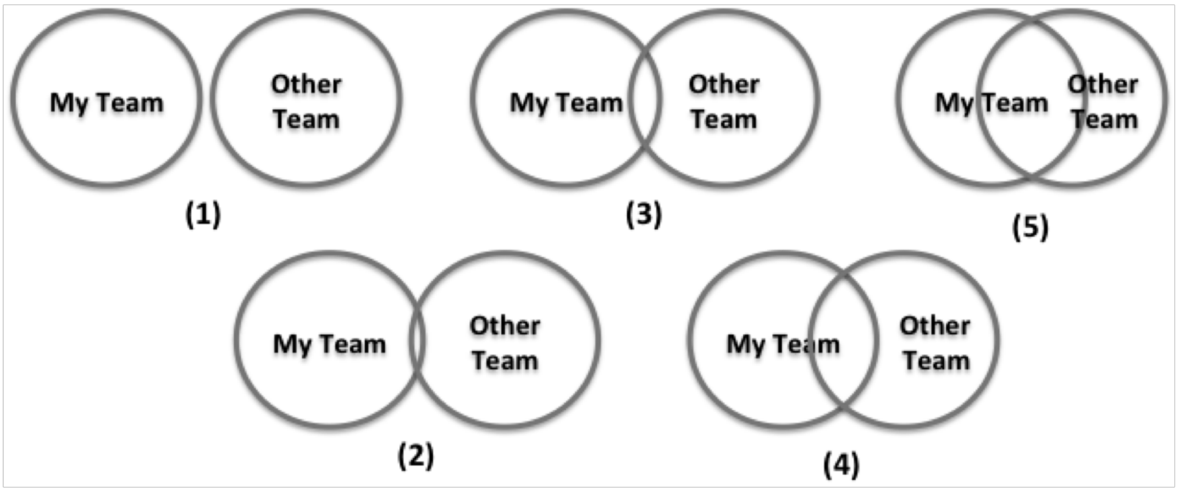
3.9.3. Team size

Research relating to team size is equivocal. Some studies finding that large teams suffer coordination and process loss, while others report that large teams are more effective due to availability of more resources (Marrone et al., 2007: p.1430). This study collected data on team size and controlled for Team size and Team Size squared during analysis.

3.9.4. Collaboration

Collaboration was assessed by asking respondents to think about the teams their team had to collaborate with the most and choose an image that best represented the degree of collaboration as illustrated in **Figure 3.1** below.

Figure 3.1: Extent to which teams collaborate with each other



3.10. Ethical Considerations

Aston Business School (ABS) Ethical Guidelines and Economic and Social Research Council (ERSC) guidelines form the basis for all ethical considerations in this research along with supervision provided by more experienced researchers (project supervisors). The objective of this research is to develop and extend current understanding of inputs, such as team personality and composition, and supporting processes as they relate to team performance in complex organisational contexts, such as boundary spanning. The work contributes to theory, methodology and practice by developing a shared model of team composition and social behavioural processes in complex environments, and, in so doing, helps to bridge the gap reported to exist between theory and practice. Various theoretical groundings are helpful to this work but the main theoretical basis for this assignment is Trait Theory, Trait Activation Theory (TAT), with further reference to Similarity Attraction Theory, Attraction-Selection-Attrition Theory, and Interdependence theory.

All of the details relating to the formal requirements of this research are contained in **APPENDIX 15.**

3.11. Analysis

Analysis was undertaken using IBM SPSS v25 and covering both descriptive and inferential statistics. Much of the statistical calculation effort was automated using SPSS v25 syntax in combination v3 of Hayes PROCESS for IBM SPSS tool (explained in detail in Hayes, 2018).

The number of Bootstrap samples for percentile Bootstrap Confidence intervals was 5,000.

3.11.1. Moderation

Differentiating between the often-confused functions of third variables (Baron and Kenny, 1986) provided an early clarification as prior to this these terms were used interchangeably (e.g. Harkins et al., 1980). Since this early work there has been extensive development of this literature subject (Aiken and West, 1991, Baron and Kenny, 1986, Edwards and Lambert, 2007, Frazier et al., 2004, Gibson et al., 2011, James and Brett, 1984, Judd and Kenny, 1981, Kenny et al., 1998, Kraemer et al., 2002, MacKinnon et al., 2007, MacKinnon et al., 2002, Muller et al., 2005, Preacher et al., 2007), and the analytic strategies underlying the assessment of each are thought to be well understood. This view is not shared by Hayes (2009), who cites criticism of the Baron and Kenny's Causal Step approach on the basis that it provides the lowest power and it is not based on a quantification of the very thing it is attempting to test--the intervening effect (p.410).

A term sometimes confused with mediation, moderation describes a situation in which X's effect on Y varies as a function of some third variable M, the moderator variable (Hayes, 2009, p.415). A Moderator is a qualitative or quantitative variable that affects the direction and/or strength of the relationship between an independent (or predictor) variable and a dependent (or criterion) variable (Baron and Kenny, 1986: p.1174).

Bootstrapping generates an empirical representation of the sampling distribution of the indirect effect by treating the obtained sample of size *n* as a representation of the population in miniature, one that is repeatedly resampled during analysis as a means of mimicking the original sampling process; and is one of the more valid and powerful methods for testing intervening variable effects (p.412). Andrew Hayes progresses this, both in his books on the subject, and with the provision of the PROCESS tool aimed at assisting otherwise laborious statistical analysis (Hayes, 2018).

The number of Bootstrap samples for percentile Bootstrap Confidence intervals was 5,000.

3.11.2. Analytic Strategy

Data was evaluated in context of both time intervals for outcome variables, T1 and T2, and covering PROCESS model types 1 (moderation). All results were manually evaluated. Statistically significant results of interactions were recorded for explanatory purposes, whether or not these related directly to hypotheses. Interactions were further examined with Simples Slopes analysis, including: 2-Way, 3-Way and Quadratic variants (Dawson, 2003, Dawson, 2014, Dawson and Richter, 2006).

3.11.3. Aggregation

All variables were aggregated at the team level and mean-centered.

A selection of aggregation methods was developed supporting each type of aggregation discussed in the literature review in **CHAPTER 2** above, i.e. Mean, Minimum, Maximum, Variance and Quadratic.

Outcome variables were operationalized using the ratings of team leaders at time two. According to multilevel theory (Klein and Kozlowski, 2000b: p.41), these are *"shared unit-level constructs*," meaning that individual level data is used to assess team-level characteristics capable of differentiating between teams. Interrater agreement score (r_{WG}) has been calculated for each variable after James et al. (1993), with studies suggesting .60 as an acceptable cutoff criterion (Glick, 1985).

3.11.4. Fit, Reliability and Normality

Reliability statistics can be viewed in **CHAPTER 4**.

Item and scale reliability will be assessed with Cronbach Alpha (α) which, according to Arbuckle (2011), is a common test of reliability. The option to check descriptives if item is deleted was deployed for the best possible combination of alpha score. The measure of RWGJ were all above the required cut-off point.

Multicollinearity was assessed by iterative regression of subscale items in IBM SPSS v25, checking tolerance and VIF on each pass. Dependent variables (DVs) were assessed for normality (skew) applying the *'rule of one'* and multiples of Standard Error (SE) as thresholds, after Field (2012: p.674).

3.12. Summary

This chapter outlines the methodological, analytical, and ethical considerations under which the research has been conducted. A quantitative study based on a Positivist tradition, data was collected by survey online questionnaires, from sufficient number of participants to meet the demands of statistical power, validity and reliability. Following the Input-Process-Output (IPO) model, variables included existing validated scales for personality traits, Boundary Management, a variety of team outcomes, moderating variables, demographic variables and covariates. Fifty-seven (57) teams were approached, and forty-eight (48) teams participated and provided their data by completing online questionnaires, with three-hundred and twenty-five (325) participants in total.

Data was analysed using IBM SPSS v25 in combination with the proprietary SPSS Add-In application, PROCESS, develop by Hayes (2018). All calculations were recorded with log files, and output files either stored as SPSS Output files, or exported to Microsoft Excel for further analysis.

Data collection has been conducted in accordance with the Aston Business School (ABS) Ethical Guidelines and Economic and Social Research Council (ERSC), with supervision provided by multiple experienced academic researchers (project supervisors).

CHAPTER 4: RESULTS - DESCRIPTIVE STATISTICS

4.1. Results of Reliability Tests

Table 4.1: Individual Level Descriptive Statistics

	N	Mean		Std. Deviation	Cronbach ∝
		Statistic	Std. Error	Statistic	
Control variables					
Team Size	--	--	--	--	
Collaboration	--	--	--	--	
Independent Variables					
Mean Neuroticism	241	2.529	0.040	0.623	0.722
Mean Extraversion	241	3.552	0.041	0.632	0.796
Mean Openness	241	3.488	0.030	0.463	0.742
Mean Agreeableness	241	3.929	0.027	0.425	0.727
Mean Conscientiousness	241	3.993	0.029	0.448	0.743
Moderating Variables					
Boundary Spanning	241	3.736	0.041	3.736	0.737
Boundary Buffering	241	3.278	0.047	3.278	0.782
Boundary Reinforcement	241	3.739	0.043	3.739	0.795
Dependent Variables*					
Performance	241	3.759	0.024	3.759	0.637
Team Cohesion	241	3.838	0.029	3.838	0.780
Team Viability	241	3.765	0.024	3.765	0.606

N=241 team members in 48 teams (*based on responses from 48 team leaders)

Table 4.2: Individual-Level Correlation Matrix

		1	2	3	4	5	6	7	8	9	10
1	Mean Neuroticism										
2	Mean Extraversion	-0.413**									
3	Mean Openness	-0.253**	0.232**								
4	Mean Agreeableness	-0.446**	0.275**	0.190**							
5	Mean Conscientiousness	-0.401**	0.226**	0.154*	0.457**						
6	Boundary Spanning	-0.173**	0.184**	0.194**	0.103	0.042					
7	Boundary Buffering	-0.252**	0.131*	0.004	0.213**	0.203**	0.233**				
8	Boundary Reinforcement	-0.209**	0.200**	0.064	0.177*	0.214**	0.319**	0.463**			
9	Performance	-0.020	0.036	-0.033	0.038	0.008	0.041	0.132*	0.169**		
10	Team Cohesion	-0.146*	-0.103	-0.010	0.080	0.048	0.106	0.219**	0.140*	0.167**	
11	Team Viability	-0.024	-0.077	-0.085	0.034	0.018	0.044	0.243**	0.162*	0.428**	0.596**

*N=241 team members in 48 teams † p < .10; * p < .05; ** p < .01*

Table 4.3: Team Level Descriptive Statistics

	N	Mean		Std. Deviation	
		Statistic	Std. Error	Statistic	Rwg
Control variables					
Team Size	48	6.438	0.360	2.492	
Collaboration	48	3.579	0.091	0.633	
Independent Variables					
Mean Neuroticism	48	2.556	0.052	0.359	.9307
Mean Extraversion	48	3.545	0.045	0.310	.9410
Mean Openness	48	3.499	0.036	0.253	.9615
Mean Agreeableness	48	3.912	0.033	0.229	.9680
Mean Conscientiousness	48	3.963	0.038	0.263	.9662
Moderating Variables					
Boundary Spanning	48	3.766	0.049	0.343	.9154
Boundary Buffering	48	3.251	0.075	0.519	.9050
Boundary Reinforcement	48	3.711	0.062	0.433	.9029
Dependent Variables					
Performance	48	3.750	0.058	0.405	
Team Cohesion	48	3.823	0.071	0.489	
Team Viability	48	3.764	0.054	0.376	

N=48 teams

Table 4.4: Team-Level Correlation Matrix

		1	2	3	4	5	6	7	8	9	10	11	12
1	Team Size												
2	Collaboration	0.116											
3	Mean Neuroticism	-0.105	-0.344*										
4	Mean Extraversion	-0.002	0.271†	-0.335*									
5	Mean Openness	-0.020	-0.254†	-0.046	0.046								
6	Mean Agreeableness	0.191	0.279†	-0.615**	0.335*	0.197							
7	Mean Conscientiousness	0.184	0.413**	-0.446**	0.251†	-0.042	0.495**						
8	Boundary Spanning	-0.098	0.306*	-0.102	0.116	0.155	-0.003	-0.019					
9	Boundary Buffering	0.137	0.344*	-0.396**	0.050	0.052	0.291*	0.278†	0.277†				
10	Boundary Reinforcement	0.209	0.426**	-0.300*	0.075	-0.206	0.275†	0.205	0.265†	0.655**			
11	Performance	0.170	0.067	0.034	0.085	-0.115	0.070	0.082	0.017	0.106	0.058		
12	Team Cohesion	0.135	-0.068	-0.257†	-0.295*	0.037	0.262†	0.095	0.130	0.245†	0.153	0.123	
13	Team Viability	0.037	-0.087	-0.110	-0.226	-0.066	0.155	0.070	0.054	0.278†	0.162	0.358*	0.649**

*N=241 team members in 48 teams † $p < .10$; * $p < .05$; ** $p < .01$*

CHAPTER 5: TRAIT TEAM NEUROTICISM

5.1. Introduction

Following the literature review, the premise of the theoretical model and hypotheses (as set out in **Chapter 2**), is that Team Boundary Management processes, comprising Spanning, Buffering and Reinforcement, moderate, the relationship between Five Factor model personality traits and Team Effectiveness. The following sections examine the results.

5.2. Overview of Hypotheses

H1.1: Mean Team Neuroticism will have a CONVEX curvilinear relationship with Performance.	***Supported***
H1.2: Deviation in Team Neuroticism will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Performance (as set out in **H1.1**)	*Rejected*
H1.3: Mean Team Neuroticism will have a CONVEX curvilinear relationship with Team Cohesion.	*Rejected*
H1.4: Deviation in Team Neuroticism will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Cohesion (as set out in **H1.3)**	*Rejected*
H1.5: Mean Team Neuroticism will have a CONVEX curvilinear relationship with Team Viability.	*Rejected*
H1.6: Deviation in Team Neuroticism will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Viability (as set out in **H1.5**)	*Rejected*
H1.7: Team Boundary Spanning will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Performance.	*Rejected*
H1.8: Team Boundary Buffering will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Performance.	*Rejected*
H1.9: Team Boundary Reinforcement will moderate the CONCAVE moderate the curvilinear association between Mean Team Neuroticism and Performance	*Rejected*
H1.10: Team Boundary Spanning will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Cohesion.	***Supported***
H1.11: Team Boundary Buffering will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Cohesion.	*Rejected*
H1.12: Team Boundary Reinforcement will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Cohesion	*Rejected*
H1.13: Team Boundary Spanning will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Viability.	*Rejected*
H1.14: Team Boundary Buffering will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Viability.	*Rejected*
H1.15: Team Boundary Reinforcement will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Viability	*Rejected*

5.3. Moderation Analysis

I found support for a variety of other relationships, including the moderating role of Team Boundary Management in the relationship between Team Neuroticism and Team Outcomes. The overall analytic approach taken is outlined in the following four steps:

Step 1 : Review of main and interaction effects of Team Neuroticism on Team Outcomes.

Step 2 : Review of conditional effects of Team Neuroticism on Team Outcomes as MODERATED by Team Boundary Management and Team Functional variables.

The following sections will examine each of the Team Neuroticism and provide an overview of the relationships found in the analysis.

5.4. Main and Interaction Effects: Team Neuroticism on Team Outcomes

5.4.1. Neuroticism on Performance

The analysis presented in **Table 5.1** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

Table 5.1 shows there was a quadratic effect of Neuroticism on Performance (B = 0.928, p = .005) ***lending support to Hypothesis H1.1***. No interaction effects were found (B = -0.742, p = .785), ***accordingly Hypothesis H1.2 was rejected***.

Table 5.1: Main and interaction effects of Neuroticism on Performance

			H1.1				H1.2	
	B	*p*	B	*p*	B	*p*	B	*p*
Cl	0.017	0.868	0.037	0.698	-0.058	0.603	-0.004	0.972
Ts	0.013	0.622	0.021	0.400	0.013	0.595	0.021	0.388
Ts^2	0.009	0.161	0.010	0.070	0.009	0.132	0.010	0.072
N^m	0.041	0.819	-0.066	0.698	0.078	0.679	0.008	0.962
N^{m2}			**0.928**	**0.005**			0.817	0.043
N^{sd}					-0.452	0.081	-0.271	0.334
N^m * N^{sd}					1.665	0.115	1.821	0.067
N^{m2} * N^{sd}							-0.742	0.785
R^2	0.080		0.242		0.191		0.332	

Key: Cl Collaboration; Ts Team size; Ts^2 Team size squared; N^m Neuroticism (mean); N^{sd} Neuroticism (deviation)

5.4.2. Neuroticism on Team Cohesion

The analysis presented in **Table 5.2** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

Table 5.2 shows there was no main quadratic (B = 0.059, p = .875) or interaction effects (B = 5.235, p = .121) of Neuroticism on Team Cohesion, accordingly ***hypotheses H1.3 and H1.4 were rejected***.

However, there was an unhypothesised, significant negative main (linear) effect of Neuroticism on Team Cohesion (B -0.519, p = .011).

Table 5.2: Main and interaction effects of Neuroticism on Team Cohesion

			H1.3				H1.4	
	B	*p*	B	*p*	B	*p*	B	*p*
CI	-0.211	0.067	-0.209	0.072	-0.281	0.033	-0.319	0.019
Ts	-0.006	0.826	-0.006	0.842	-0.004	0.881	-0.011	0.711
Ts^2	0.018	0.009	0.018	0.009	0.019	0.008	0.020	0.005
N^m	**-0.519**	**0.011**	-0.526	0.013	-0.607	0.007	-0.617	0.007
N^{m2}			0.059	0.875			0.420	0.384
N^{sd}					-0.312	0.287	-0.585	0.092
$N^m * N^{sd}$					-0.700	0.558	-0.641	0.590
$N^{m2} * N^{sd}$							5.235	0.121
R^2	0.243		0.243		0.270		0.315	

Key: CI Collaboration; Ts Team size; Ts^2 Team size squared; N^m Neuroticism (mean); N^{sd} Neuroticism (deviation)

5.4.3. Neuroticism on Team Viability

The analysis presented in **Table 5.3** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

Table 5.3 shows there were no main (B = 0.093, p = .758) or interaction effects of Neuroticism on Team Viability (B = -1.374, p = .608), accordingly hypotheses H1.5 and H1.6 were both rejected.

Table 5.3: Main and interaction effects of Neuroticism on Team Viability

			H1.5				H1.6	
	B	*p*	B	*p*	B	*p*	B	*p*
CI	-0.138	0.131	-0.136	0.142	-0.176	0.085	-0.163	0.127
Ts	-0.019	0.410	-0.018	0.437	-0.019	0.398	-0.017	0.465
Ts^2	0.015	0.009	0.015	0.009	0.015	0.007	0.014	0.011
N^m	-0.242	0.133	-0.252	0.129	-0.189	0.265	-0.190	0.278
N^{m2}			0.093	0.758			-0.065	0.867
N^{sd}					-0.256	0.265	-0.177	0.519
$N^m * N^{sd}$					1.462	0.123	1.455	0.134
$N^{m2} * N^{sd}$							-1.374	0.608
R^2	0.177		0.179		0.244		0.250	

Key: CI Collaboration; Ts Team size; Ts^2 Team size squared; N^m Neuroticism (mean); N^{sd} Neuroticism (deviation)

5.5. Conditional Effects: Team Neuroticism and Team Boundary Management on Performance

The analysis presented in **Table 5.4** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

5.5.1. Neuroticism and Boundary Spanning on Performance

Table 5.4 shows there were no two-way quadratic interaction effects between Neuroticism and Boundary Spanning on Performance (B = -0.243, p = .883) so ***Hypothesis H1.7 was rejected***.

An unhypothesised quadratic main effect between Team Neuroticism and Performance was noted (B = 0.977, p = .005) – see **Table 5.4.**

Table 5.4: Main and interaction effects of Neuroticism and Boundary Management on Performance

	Boundary Spanning ***H1.7***				***Boundary Buffering*** ***H1.8***				***Boundary Reinforcement*** ***H1.9***			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
CI	0.014	0.896	0.058	0.576	0.057	0.540	0.054	0.579	0.095	0.351	0.079	0.448
Tm	0.012	0.665	0.016	0.543	0.010	0.674	0.012	0.621	0.015	0.536	0.017	0.494
Tm^2	0.010	0.146	0.012	0.067	0.012	0.042	0.011	0.062	0.009	0.139	0.011	0.087
N^m	0.003	0.987	-0.090	0.624	-0.132	0.459	-0.128	0.529	-0.045	0.790	-0.036	0.840
N^{m2}			**0.977**	**0.005**			0.193	0.720			0.560	0.183
BS^m	-0.147	0.533	-0.186	0.437								
BB^m					-0.006	0.960	0.019	0.895				
BR^m									0.060	0.686	-0.023	0.915
N^m * BS^m	0.450	0.528	0.248	0.765								
N^{m2} * BS^m			-0.243	0.883								
N^m * BB^m					**-0.943**	**0.001**	-0.800	0.067				
N^{m2} * BB^m							-0.043	0.937				
N^m * BR^m									**-0.774**	**0.002**	-0.769	0.103
N^{m2} * BR^m											0.429	0.499
R^2	0.092		0.260		0.317		0.320		0.272		0.308	

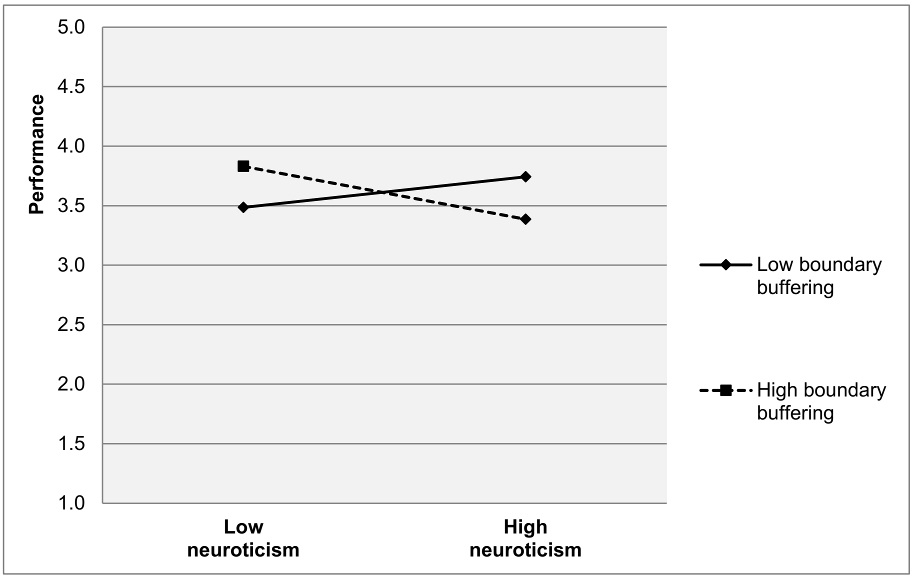
Key: *CI Collaboration; Ts Team size; Ts^2 Team size squared; N^m Neuroticism (mean); N^{sd} Neuroticism (deviation); BS^m Boundary Spanning (mean); BB^m Boundary Buffering (mean); BR^m Boundary Reinforcement (mean); n=48*

5.5.2. Neuroticism and Boundary Buffering on Performance

Table 5.4 shows there was no two-way quadratic interaction between Neuroticism and Boundary Buffering on Performance (B = -0.43, *p* = .937) so ***Hypothesis H1.8 was rejected.*** However, an unhypothesised negative two-way interaction between Neuroticism and Boundary Buffering on Performance was found (B = -0.943, *p* = .001).

Figure 5.1 shows that where Boundary Buffering is LOW, an increase in Neuroticism is associated with a marginally significant increase in Performance (simple slope: t = 1.925, *p* = .061); conversely where Boundary Buffering is HIGH, an increase in Neuroticism is associated with a significant decrease in Performance (simple slope: t = -2.488, *p* = .017).

Figure 5.1: Interaction between Neuroticism and Boundary Buffering on Performance

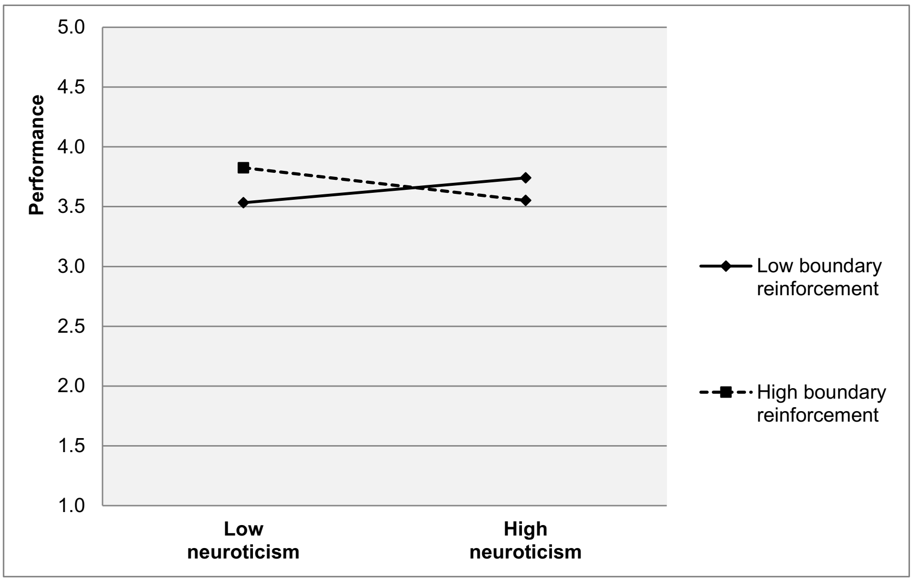


5.5.3. Neuroticism and Boundary Reinforcement on Performance

Table 5.4 shows there was no significant two-way quadratic interaction between Neuroticism and Boundary Reinforcement on Performance (B = 0.429, *p* = .499) so ***Hypothesis H1.9 was rejected***. However, an unhypothesised negative two-way interaction between Neuroticism and Boundary Reinforcement on Performance was found (B = -0.774, *p* = .002***).***

Figure 5.2 shows that where Boundary Reinforcement is LOW, an increase in Neuroticism is associated with a non-significant increase in Performance (simple slope: t = 1.572 *p* = .127); conversely where Boundary Reinforcement is HIGH, an increase in Neuroticism is associated with a marginally significant decrease in Performance (simple slope: t = -1.815, *p* = .077).

Figure 5.2: Interaction between Neuroticism and Boundary Reinforcement on Performance



5.6. Conditional Effects: Team Neuroticism and Team Boundary Management on Team Cohesion

The analysis presented in ***Table 5.5*** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

Table 5.5: Main and interaction effects of Neuroticism and Boundary Management on Team Cohesion

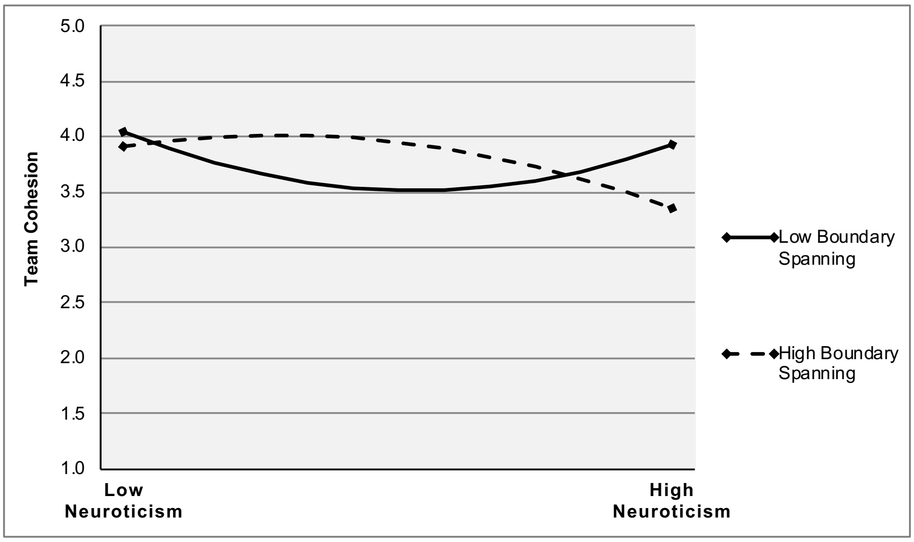
	Boundary Spanning H1.10				***Boundary Buffering H1.11***				***Boundary Reinforcement H1.12***			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
CI	-0.178	0.120	-0.139	0.214	-0.228	0.058	-0.232	0.062	-0.193	0.119	-0.176	0.170
Tm	-0.009	0.760	0.007	0.793	-0.007	0.819	-0.006	0.841	-0.007	0.822	-0.009	0.765
Tm^2	0.016	0.022	0.012	0.098	0.017	0.017	0.018	0.022	0.017	0.014	0.017	0.029
N^m	**-0.380**	**0.059**	-0.318	0.110	**-0.468**	**0.041**	-0.437	0.094	**-0.539**	**0.011**	-0.517	0.022
N^{m2}			0.281	0.430			0.164	0.809			-0.338	0.510
BS^m	**0.412**	**0.093**	0.633	0.016								
BB^m					0.129	0.384	0.118	0.526				
BR^m									0.116	0.518	0.075	0.779
$N^m * BS^m$	**-1.769**	**0.019**	-0.613	0.490								
$N^{m2} * BS^m$			**-3.981**	**0.028**								
$N^m * BB^m$					-0.072	0.821	-0.021	0.968				
$N^{m2} * BB^m$							0.160	0.816				
$N^m * BR^m$									-0.363	0.209	-0.585	0.308
$N^{m2} * BR^m$											0.101	0.896
R^2	0.342		0.422		0.259		0.260		0.275		0.284	

Key: CI Collaboration; Ts Team size; Ts^2 Team size squared; N^m Neuroticism (mean); N^{sd} Neuroticism (deviation); BS^m Boundary Spanning (mean); BB^m Boundary Buffering (mean); BR^m Boundary Reinforcement (mean); n=48

5.6.1. Neuroticism and Boundary Spanning on Team Cohesion

Table 5.5 shows there was a significant concave two-way quadratic interaction between Neuroticism and Boundary Spanning on Team Cohesion (B = -3.981, p = .028), where Team Cohesion decreases when Neuroticism and Boundary Spanning are HIGH; conversely Team Cohesion reduces, to a point, and then increases as Neuroticism increases when Boundary Spanning is LOW, see **Figure 5.3** providing ***support for Hypothesis H1.10***.

Figure 5.3: Quadratic Interaction between Neuroticism and Boundary Spanning on Team Cohesion



5.6.2. Neuroticism and Boundary Buffering on Team Cohesion

Table 5.5 shows no quadratic interaction effects between Neuroticism, Boundary Buffering on Team Cohesion (B = 0.160, p = .816) so ***Hypothesis H1.11 was rejected.***

5.6.3. Neuroticism and Boundary Reinforcement on Team Cohesion

Table 5.5 shows there were no two-way or quadratic interaction effects between Neuroticism and Boundary Reinforcement on Team Cohesion (B = 0.101, p = .896) so ***Hypothesis H1.12 was rejected***.

5.7. Conditional Effects: Team Neuroticism and Team Boundary Management on Team Viability

The analysis presented in **Table 5.6** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

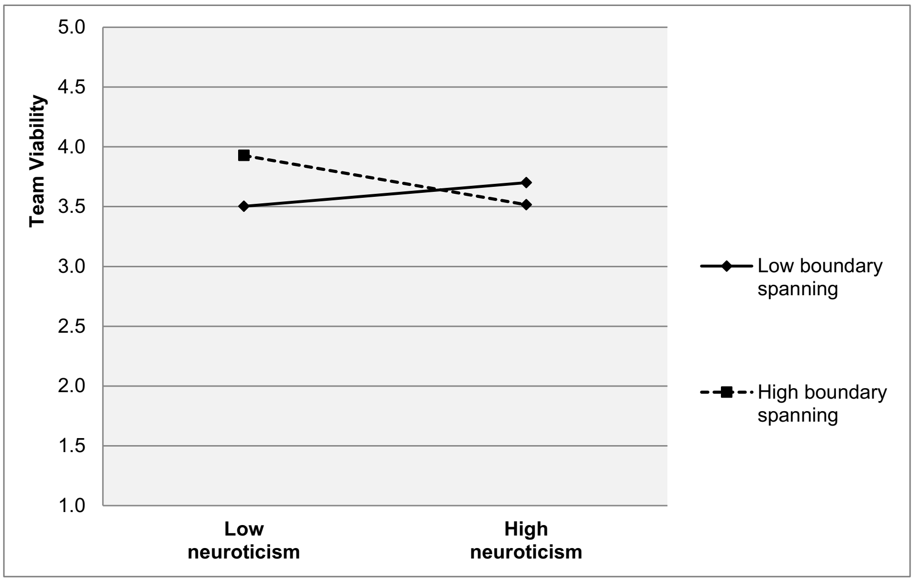
5.7.1. Neuroticism and Boundary Spanning on Team Viability

Table 5.6 shows there was no quadratic two-way interaction between Neuroticism and Boundary Spanning on Team Viability (B = -1.350, p = .374) and therefore ***Hypothesis H1.13 was rejected***.

However, there was a significant negative, unhypothesised, two-way interaction between Neuroticism and Boundary Spanning on Team Viability (B = -1.240, p = .043)*.

Figure 5.4 shows that where Boundary Spanning is LOW, Team Viability remains largely unchanged regardless of the levels of Neuroticism (simple slope: t = .940 p = .353); conversely where Boundary Reinforcement is HIGH, an increase in Neuroticism is associated with a significant decrease in Team Viability (simple slope: t = -2.610, p = .013).

Figure 5.4: Interaction between Neuroticism and Boundary Spanning on Team Viability



* This unhypothesised two-way interaction becomes insignificant when the other personality variables are included as covariance in the regression analysis (B -.954, p =.174).

Table 5.6: Main and interaction effects of Neuroticism and Boundary Management on Team Viability

	Boundary Spanning H1.13				***Boundary Buffering H1.14***				***Boundary Reinforcement H1.15***			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
Cl	-0.100	0.281	-0.080	0.399	-0.159	0.089	-0.165	0.089	-0.134	0.171	-0.124	0.225
Tm	-0.025	0.289	-0.019	0.438	-0.020	0.389	-0.020	0.398	-0.020	0.388	-0.021	0.366
Tm^2	0.014	0.013	0.013	0.030	0.014	0.017	0.014	0.018	0.014	0.016	0.014	0.028
N^m	-0.151	0.352	-0.145	0.391	-0.181	0.303	-0.131	0.512	-0.246	0.136	-0.227	0.194
N^{m2}			0.243	0.427			0.155	0.770			-0.173	0.671
BS^m	0.175	0.375	0.243	0.269								
BB^m					0.177	0.131	0.143	0.329				
BR^m									0.155	0.280	0.110	0.606
$N^m * BS^m$	**-1.240**	**0.043***	-0.890	0.246								
$N^{m2} * BS^m$			-1.350	0.374								
$N^m * BB^m$					-0.152	0.542	-0.157	0.708				
$N^{m2} * BB^m$							0.297	0.581				
$N^m * BR^m$									-0.317	0.168	-0.489	0.285
$N^{m2} * BR^m$											0.148	0.811
R^2	0.257		0.280		0.234		0.240		0.228		0.233	

Key: Cl Collaboration; Ts Team size; Ts^2 Team size squared; N^m Neuroticism (mean); N^{sd} Neuroticism (deviation); BS^m Boundary Spanning (mean); BB^m Boundary Buffering (mean); BR^m Boundary Reinforcement (mean); n=48

5.7.2. Neuroticism and Boundary Buffering on Team Viability

Table 5.6 shows there was no quadratic two-way interaction between Neuroticism and Boundary Buffering on Team Viability (B = 0.297, p = .581) and therefore, ***Hypothesis H1.14 was rejected***.

5.7.3. Neuroticism and Boundary Reinforcement on Team Viability

Table 5.6 shows there was no quadratic two-way interaction between Neuroticism and Boundary Buffering on Team Viability (B = 0.148, p = .811) and therefore, ***Hypothesis H1.15 was rejected***.

5.8. Summary

5.8.1. Overview of Relationships with Neuroticism

As the summary in **Section 5.2** above shows, support was found for only two of the hypothesised relationships, namely: **H1.1** that Mean Team Neuroticism will have a CONVEX curvilinear relationship with Performance (p = .005). A hypothesised conditional effect was also found, H1.10, where Team Boundary Spanning will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Cohesion (p = .028). In this case, Team Cohesion was found to decreases when Neuroticism and Boundary Spanning are HIGH, but Team Cohesion reduces, to a point, and then increases again as Neuroticism increases when Boundary Spanning is LOW.

Other, significant, unhypothesised relationships were also found. For example: a NEGATIVE main effect was found between Mean Team Neuroticism and Team Cohesion (p = .011). Conditional effects were also found. For example: Team Boundary Buffering and Team Boundary Reinforcement both moderated the NEGATIVE relationship between Team Neuroticism and Performance, in that where Boundary Buffering is LOW, an increase in Neuroticism is associated with a marginally significant increase in Performance; conversely where Boundary Buffering is HIGH, an increase in Neuroticism is associated with a significant decrease in Performance. A similar pattern was noted for Boundary Reinforcement. Finally, Team Boundary Spanning moderated the NEGATIVE relationship between Team Neuroticism and Team Viability. where Boundary Spanning is LOW, Team Viability remains largely unchanged regardless of the levels of Neuroticism; conversely where Boundary Reinforcement is HIGH, an increase in Neuroticism is associated with a significant decrease in Team Viability. The remaining hypotheses were all rejected.

CHAPTER 6: RESULTS: TRAIT EXTRAVERSION

6.1. Introduction

Following the literature review, the premise of the theoretical model and hypotheses (as set out in **Chapter 2**), is that Team Boundary Management processes, comprising Spanning, Buffering and Reinforcement, moderate, the relationship between Five Factor model personality traits and Team Effectiveness. The following sections examine the results.

6.2. Overview of Hypotheses

H2.1: Mean Team Extraversion will have a CONCAVE curvilinear relationship with Performance.	*Rejected*
H2.2: Deviation in Team Extraversion will moderate the CONVEX curvilinear association between Mean Team Neuroticism and Performance (as set out in **H2.1**)	*Rejected*
H2.3: Mean Team Extraversion will have a CONCAVE curvilinear relationship with Team Cohesion.	***Supported***
H2.4: Deviation in Team Extraversion will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Cohesion (as set out in H2.3)	*Rejected*
H2.5: Mean Team Extraversion will have a CONCAVE curvilinear relationship with Team Viability.	*Rejected*
H2.6: Deviation in Team Extraversion will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Viability (as set out in H2.5)	*Rejected*
H2.7: Team Boundary Spanning will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Performance.	*Rejected*
H2.8: Team Boundary Buffering will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Performance.	*Rejected*
H2.9: Team Boundary Reinforcement will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Performance	*Rejected*
H2.10: Team Boundary Spanning will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Cohesion.	***Supported***
H2.11: Team Boundary Buffering will moderate the CONVEX curvilinear association between Mean Team Neuroticism and Team Cohesion.	*Rejected*
H2.12: Team Boundary Reinforcement will moderate the CONVEX curvilinear association between Mean Team Neuroticism and Team Cohesion	***Supported***
H2.13: Team Boundary Spanning will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Viability.	***Supported***
H2.14: Team Boundary Buffering will moderate the CONVEX curvilinear association between Mean Team Neuroticism and Team Viability.	***Supported***
H2.15: Team Boundary Reinforcement will moderate the CONVEX curvilinear association between Mean Team Neuroticism and Team Viability	*Rejected*

6.3. Moderation Analysis

I found support for a variety of other relationships, including the moderating role of Team Boundary Management in the relationship between Team Extraversion and Team Outcomes. The overall analytic approach taken is outlined in the following four steps:

Step 1 : Review of main and interaction effects of Team Extraversion on Team Outcomes.

Step 2 : Review of conditional effects of Team Extraversion on Team Outcomes as MODERATED by Team Boundary Management and Team Functional variables.

The next section will examine each of the Team Extraversion and provide an overview of the relationships found in the analysis.

6.4. Main and Interaction Effects: Team Extraversion on Team Outcomes

6.4.1. Extraversion on Performance

The analysis presented in **Table 6.1** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

Table 6.1 shows no significant (quadratic) main (B = 0.274, p = .578) or interaction effects (B = 4.000, p = .156) were found between Extraversion and Performance so ***Hypotheses H2.1 and H2.2 were rejected***.

Table 6.1: Main and interaction effects of Extraversion on Performance

			H2.1				**H2.2**	
	B	*p*	B	*p*	B	*p*	B	*p*
CI	-0.024	0.812	-0.013	0.901	-0.008	0.940	-0.009	0.929
Ts	0.010	0.697	0.008	0.767	0.006	0.833	0.010	0.717
Ts^2	0.011	0.089	0.011	0.093	0.013	0.055	0.014	0.043
E^m	0.207	0.320	0.154	0.502	0.199	0.345	0.092	0.692
E^{m2}			0.274	0.578			0.508	0.320
E^{sd}					0.135	0.628	-0.162	0.650
$E^m * E^{sd}$					-1.013	0.336	-2.354	0.093
$E^{m2} * E^{sd}$							4.000	0.156
R^2	0.100		0.107		0.126		0.180	

Key: CI Collaboration; Ts Team size; Ts^2 Team size squared; E^m Extraversion (mean); E^{sd} Extraversion (deviation)

6.4.2. Extraversion on Team Cohesion

The analysis presented in **Table 6.2** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

Table 6.2 shows there was a significant concave quadratic effect between Extraversion on Team Cohesion (B = -1.269, *p* = .023) ***lending support to Hypotheses H2.3***. However, no two-way curvilinear interaction was found (B = -4.283, *p* = .160) so ***Hypothesis 2.4 was rejected***.

An (unhypothesised) negative marginally significant linear interaction was found between Neuroticism and Neuroticism Deviation (B = -2.127, *p* = .079). **Figure 6.1** shows that where variance in Extraversion is high, increases in Extraversion is associated with a significant decrease in Team Cohesion (simple slope: t = -2.298, *p* = .027); conversely where variance in Extraversion is low, Team Cohesion largely remains unchanged as Extraversion increases (simple slope: t = .341, *p* = .735).

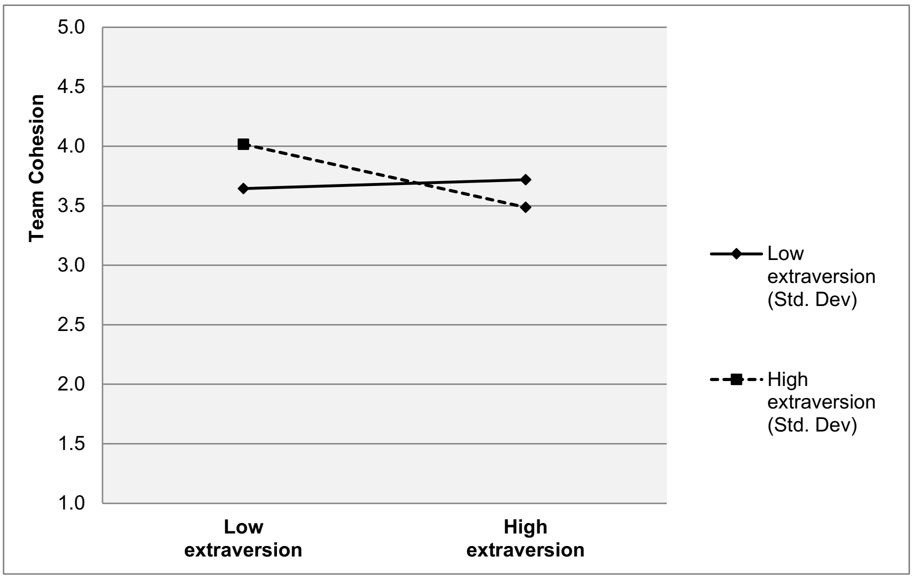
* This unhypothesised two-way interaction becomes insignificant when the other personality variables are included as covariance in the regression analysis (B -1.054, p = .404).

Table 6.2: Main and interaction effects of Extraversion on Team Cohesion

			H2.3		H2.4			
	B	*p*	B	*p*	B	*p*	B	*p*
Cl	-0.050	0.672	-0.101	0.375	-0.025	0.829	-0.061	0.595
Ts	0.007	0.810	0.018	0.542	0.000	0.989	0.004	0.901
Ts^2	0.012	0.101	0.012	0.081	0.016	0.037	0.015	0.041
E^m	-0.346	0.156	-0.102	0.686	-0.369	0.127	-0.099	0.693
E^{m2}			**-1.269**	**0.023**			-1.356	0.017
E^{sd}					0.153	0.628	0.419	0.279
$E^m * E^{sd}$					**-2.127**	**0.079***	-0.567	0.703
$E^{m2} * E^{sd}$							-4.283	0.160
R^2	0.160		0.258		0.227		0.345	

Key: Cl Collaboration; Ts Team size; Ts^2 Team size squared; E^m Extraversion (mean); E^{sd} Extraversion (deviation)

Figure 6.1: Interaction between Extraversion (mean and variance) on Team Cohesion



6.4.3. Extraversion on Team Viability

The analysis presented in **Table 6.3** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

Table 6.3 shows no quadratic main (B = -0.109, *p* = .808) or interaction effects (B = -1.230, *p* = .600) were found, therefore ***Hypotheses H2.5 and H2.6 were rejected***.

Table 6.3: Main and interaction effects of Extraversion on Team Viability

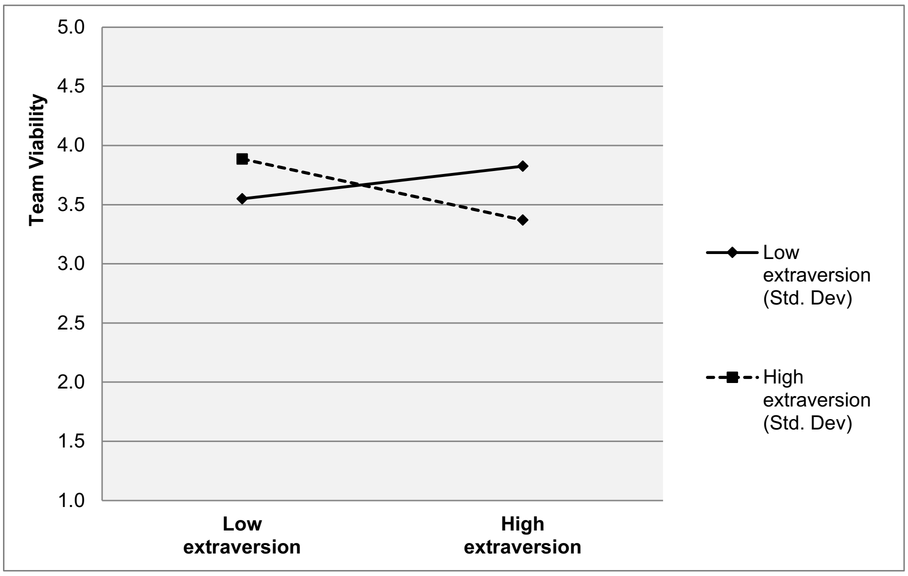
			H2.5				H2.6	
	B	*p*	B	*p*	B	*p*	B	*p*
CI	-0.065	0.473	-0.070	0.457	-0.058	0.495	-0.054	0.545
Ts	-0.013	0.582	-0.012	0.617	-0.015	0.477	-0.018	0.449
Ts^2	0.012	0.038	0.012	0.040	0.015	0.007	0.015	0.009
E^m	-0.147	0.434	-0.126	0.545	-0.194	0.260	-0.175	0.370
E^{m2}			-0.109	0.808			-0.085	0.842
E^{sd}					-0.130	0.569	-0.034	0.910
$E^m * E^{sd}$					**-2.788**	**0.002**	-2.387	0.044
$E^{m2} * E^{sd}$							-1.230	0.600
R^2	0.144		0.145		0.325		0.330	

Key: CI Collaboration; Ts Team size; Ts^2 Team size squared; E^m Extraversion (mean); E^{sd} Extraversion (deviation)

However, Table 6.3 shows there was an (unhypothesised) significant two-way interaction between the mean and deviation of Extraversion on Team Viability (B = -2.788, *p* = .002).

Figure 6.2 shows that where variance in Extraversion is HIGH, increases in Extraversion is associated with a significant decrease in Team Viability (simple slope: t = -3.107, *p* = .003); conversely where variance in Extraversion is LOW, increases in Extraversion is associated with an increase in Team Viability (simple slope: t = 1.786, *p* = .082).

Figure 6.2: Interaction between Extraversion (mean and variance) on Team Viability



6.5. Conditional Effects: Team Extraversion and Team Boundary Management on Performance

The analysis presented in **Table 6.4** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

6.5.1. Extraversion and Boundary Spanning on Performance

Table 6.4 shows there were no two-way quadratic interaction effects between Extraversion and Boundary Spanning on Performance (B = 1.857, p = .333) therefore ***Hypothesis H2.7 was rejected***.

Table 6.4: Main and interaction effects of Extraversion and Boundary Management on Performance

	Boundary Spanning ***H2.7***				***Boundary Buffering*** ***H2.8***				***Boundary Reinforcement*** ***H2.9***			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
CI	-0.012	0.913	0.009	0.932	-0.022	0.837	-0.019	0.861	0.025	0.821	0.030	0.793
Tm	0.006	0.817	0.008	0.774	0.010	0.690	0.009	0.746	0.011	0.667	0.011	0.692
Tm^2	0.012	0.098	0.009	0.250	0.011	0.084	0.012	0.089	0.013	0.053	0.012	0.060
E^m	0.222	0.303	0.035	0.897	0.267	0.235	0.233	0.379	0.287	0.178	0.255	0.293
E^{m2}			0.450	0.429			0.166	0.794	0.119	0.512	0.131	0.818
BS	-0.099	0.620	-0.272	0.289								
BB					0.063	0.623	0.119	0.456				
BR									0.899	0.109	0.154	0.456
E^m * BS	0.000	1.000	-0.793	0.405	0.308	0.425						
E^{m2} * BS			1.857	0.333								
E^m * BB							0.264	0.507				
E^{m2} * BB							-0.405	0.677				
E^m * BR											0.738	0.339
E^{m2} * BR											-0.526	0.782
R^2	0.106		0.137		0.116		0.128		0.157		0.162	

Key: CI Collaboration; Ts Team size; Ts^2 Team size squared; E^m Extraversion (mean); E^{sd} Extraversion (deviation); BS^m Boundary Spanning (mean); BB^m Boundary Buffering (mean); BR^m Boundary Reinforcement (mean); n=48

6.5.2. Extraversion and Boundary Buffering on Performance

Table 6.4 shows there were no significant two-way quadratic interaction effects between Extraversion and Boundary Buffering on Performance (B = -0.405, p = .677), consequently ***Hypothesis H2.8 was rejected***.

6.5.3. Extraversion and Boundary Reinforcement on Performance

Table 6.4 shows there was no significant two-way curvilinear interaction between Extraversion and Boundary Reinforcement on Performance (B = -0.526, p = .782), therefore ***Hypothesis H2.9 was rejected***.

6.6. Conditional Effects: Team Extraversion and Team Boundary Management on Team Cohesion

The analysis presented in **Table 6.5** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

Table 6.5: Main and interaction effects of Extraversion and Boundary Management on Team Cohesion

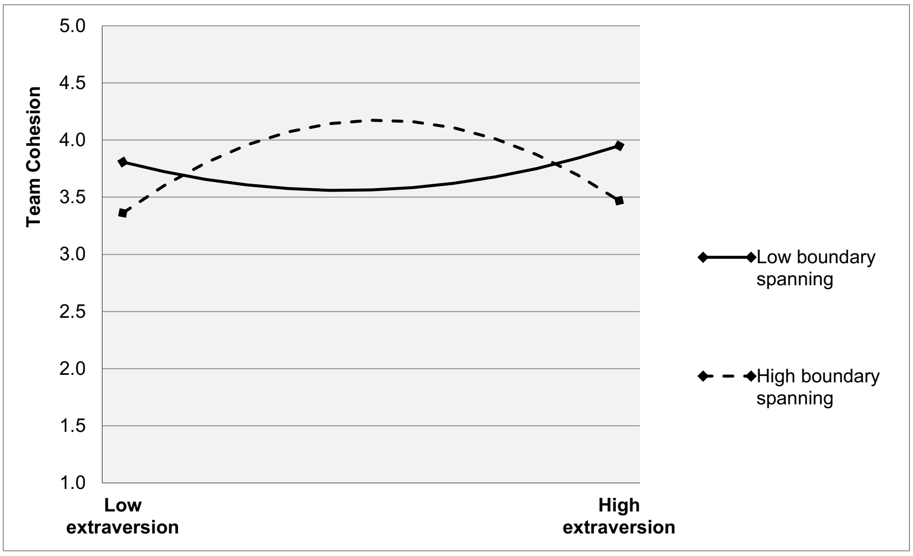
	Boundary Spanning ***H2.10***				***Boundary Buffering*** ***H2.11***				***Boundary Reinforcement*** ***H2.12***			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
CI	-0.089	0.428	-0.137	0.200	-0.089	0.459	-0.105	0.369	-0.098	0.454	-0.107	0.355
Tm	0.027	0.368	0.021	0.446	0.006	0.829	0.015	0.602	0.004	0.888	0.035	0.219
Tm^2	0.004	0.617	0.011	0.126	0.012	0.094	0.012	0.090	0.011	0.158	0.013	0.063
E^m	-0.325	0.157	0.135	0.601	-0.231	0.354	-0.040	0.884	-0.359	0.158	-0.034	0.890
E^{m2}			-1.026	0.068			-0.918	0.174			-1.977	0.001
BS	0.150	0.478	0.589	0.021								
BB					0.286	0.050	0.137	0.416				
BR									0.146	0.502	0.330	0.120
E^m * BS	**-2.002**	**0.007**	-0.033	0.971								
E^{m2} * BS			**-4.798**	**0.013**								
E^m * BB					0.587	0.174	0.724	0.088				
E^{m2} * BB							0.775	0.449				
E^m * BR									-0.124	0.850	-1.614	0.044
E^{m2} * BR											**-5.833**	**0.004**
R^2	0.310		0.444		0.250		0.337		0.178		0.403	

Key: *CI Collaboration; Ts Team size; Ts^2 Team size squared; E^m Extraversion (mean); E^{sd} Extraversion (deviation); BS^m Boundary Spanning (mean); BB^m Boundary Buffering (mean); BR^m Boundary Reinforcement (mean); n=48*

6.6.1. Extraversion and Boundary Spanning on Team Cohesion

Table 6.5 shows there was a significant concave two-way quadratic interaction between Extraversion and Boundary Spanning on Team Cohesion (B = -4.798, *p* = .013), ***lending support to Hypothesis H2.10***. **Figure 6.3** shows that Team Cohesion increases, to a point, and then decreases again as Extraversion increases when Boundary Spanning is HIGH.

Figure 6.3: Quadratic interaction between Extraversion and Boundary Spanning on Team Cohesion



6.6.2. Extraversion and Boundary Buffering on Team Cohesion

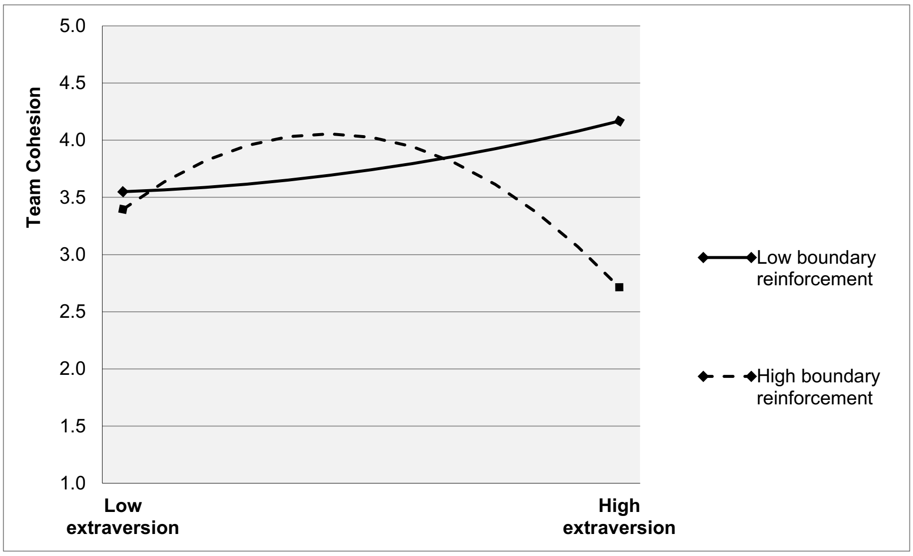
Table 6.5 shows there was no significant two-way curvilinear interaction between Extraversion and Boundary Buffering on Team Cohesion (B = 0.775, *p* = .449) and therefore ***Hypothesis H2.11 was rejected***.

6.6.3. Extraversion and Boundary Reinforcement on Team Cohesion

Table 6.5 shows there was a very significant concave quadratic interaction effect between Extraversion and Boundary Reinforcement on Team Cohesion (B = -5.833, *p* = .004) ***lending support to Hypothesis H2.12***.

Figure 6.4 shows that Team Cohesion increases, to a point, and then decreases again as Extraversion increases AND Boundary Reinforcement is HIGH; conversely, Team Cohesion increase with Extraversion when Boundary Reinforcement is LOW.

Figure 6.4: Quadratic interaction between Extraversion and Boundary Reinforcement on Team Cohesion



6.7. Conditional Effects: Team Extraversion and Team Boundary Management on Team Viability

The analysis presented in **Table 6.6** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

Table 6.6: *Main and interaction effects of Extraversion and Boundary Management on Team Viability*

	Boundary Spanning H2.13				***Boundary Buffering H2.14***				***Boundary Reinforcement H2.15***			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
Cl	-0.073	0.432	-0.070	0.436	-0.094	0.288	-0.082	0.336	-0.094	0.356	-0.090	0.381
Tm	-0.007	0.780	-0.018	0.458	-0.013	0.538	-0.019	0.380	-0.015	0.513	-0.010	0.678
Tm^2	0.009	0.156	0.014	0.033	0.013	0.019	0.010	0.048	0.011	0.055	0.012	0.054
E^m	-0.122	0.517	0.082	0.711	0.003	0.988	-0.131	0.517	-0.123	0.527	-0.098	0.654
E^{m2}			0.145	0.758			0.633	0.199			-0.216	0.678
BS	-0.024	0.890	0.266	0.211								
BB					0.283	0.009	0.145	0.242				
BR									0.209	0.213	0.275	0.147
E^m * BS	**-1.021**	**0.086**	-0.001	0.999								
E^{m2} * BS			**-3.839**	**0.019**								
E^m * BB					**0.769**	**0.017**	0.833	0.009				
E^{m2} * BB							**1.652**	**0.031**				
E^m * BR									0.296	0.560	-0.119	0.865
E^{m2} * BR											-1.526	0.380
R^2	0.204		0.316		0.325		0.402		0.177		0.193	

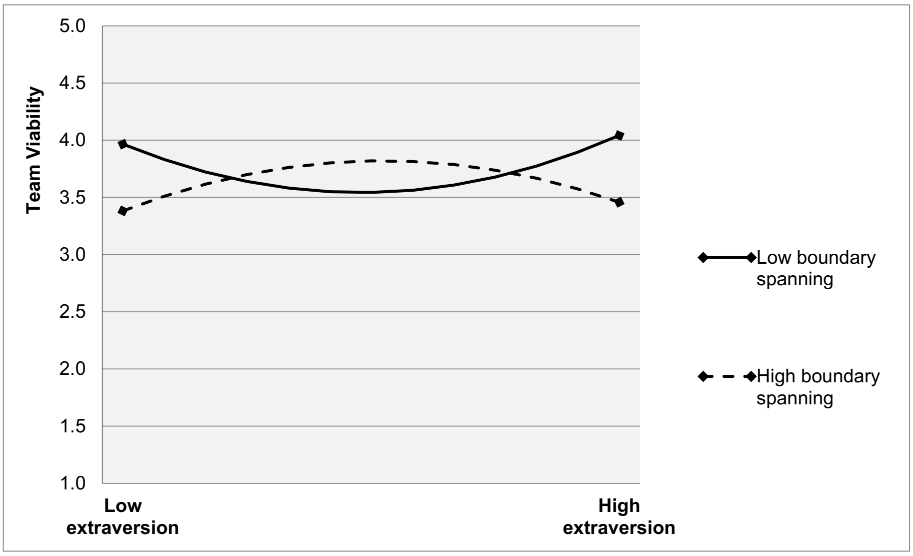
Key: *Cl Collaboration; Ts Team size; Ts^2 Team size squared; E^m Extraversion (mean); E^{sd} Extraversion (deviation); BS^m Boundary Spanning (mean); BB^m Boundary Buffering (mean); BR^m Boundary Reinforcement (mean); n=48*

6.7.1. Extraversion and Boundary Spanning on Team Viability

Table 6.6 shows there was a significant concave quadratic interaction between Extraversion and Boundary Spanning on Team Viability (B = -3.839, *p* = .019) ***lending support to Hypothesis H2.13***.

Figure 6.5 shows that Team Viability decreases, to a point, and then increases again as Extraversion increases when Boundary Spanning is LOW.

Figure 6.5: Quadratic interaction between Extraversion and Boundary Spanning on Team Viability

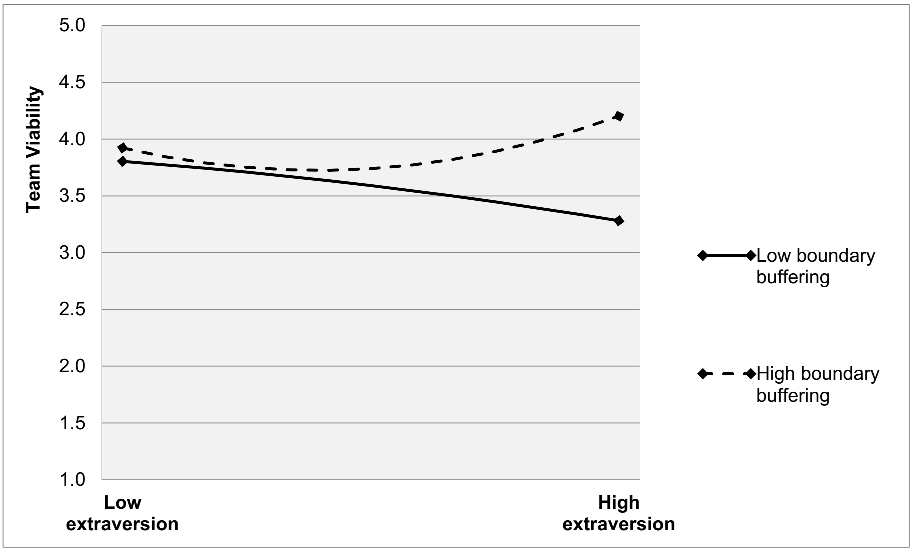


6.7.2. Extraversion and Boundary Buffering on Team Viability

Table 6.6 shows a significant convex quadratic interaction between Extraversion and Boundary Buffering on Team Viability, (B = 1.652, *p* = .031) ***lending support to Hypothesis H2.14***.

Figure 6.6 shows that Team Viability decreases, to a point, and then increases again as Extraversion increases when Boundary Buffering is LOW.

Figure 6.6: Quadratic interaction between Extraversion and Boundary Buffering on Team Viability



6.7.3. Extraversion and Boundary Reinforcement on Team Viability

Table 6.6 shows there were no significant two-way quadratic interaction effects between Extraversion and Boundary Reinforcement on Team Viability (B = -1.526, *p* = .380) therefore ***Hypothesis H2.15 was rejected***.

6.8. Summary

6.8.1. Overview of Relationships with Extraversion

A variety of hypothesised and unhypothesised main and conditional relationships were found for Extraversion. For example, support was found for **Hypothesis H2.3** – that Mean Team Extraversion will have a CONCAVE curvilinear relationship with Team Cohesion (*p* = .023).

A significant (unhypothesised) NEGATIVE interaction effect was also reported between Mean and Deviation Extraversion on Team Viability (*p* = .002), marginally significant on Team Cohesion (*p* = .079). Results indicated that where VARIANCE in Team Extraversion is HIGH, increases in Extraversion are associated with significant decreases in Team Viability (and Team Cohesion); conversely where variance in Team Extraversion is LOW, an increase in Extraversion is associated with an increase in Team Viability (and Team Cohesion). Although this is consistent with previous reports (Prewett et al., 2016), it is an important finding since, as Prewett notes, the majority of literature tends to report that variance in (Extraversion when Team Extraversion is HIGH) is beneficial to team outcomes, rather than being detrimental, as this result seems to suggest.

The only conditional relationship found between Extraversion and Performance was during post-hoc analysis (unhypothesised) examining for possible three-way interactions with Interdependence. This revealed a significant three-way interaction between Extraversion, Boundary Buffering and Task interdependence on Performance (p = .009), where it was seen that Performance decreases as Extraversion increases when both Boundary Buffering AND Task Interdependence are both LOW.

Extraversion is known to be a pro-social trait, and, in this study, it was found to predict Team Cohesion and Team Viability when moderated by each of the Team Boundary Management activities (Boundary Spanning, Buffering and Reinforcement). For example: Support was found for **Hypothesis H2.10** - that Team Boundary Spanning will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Cohesion (p = .013). In this case, Team Cohesion was found to increase, to a point, and then decreases again as Extraversion increases when Boundary Spanning is HIGH.

Support was also found for **Hypothesis H2.12** - that Team Boundary Reinforcement will moderate the CONVEX curvilinear association between Mean Team Neuroticism and Team Cohesion (p = .004). In this case, Team Cohesion increases, to a point, and then decreases again as Extraversion increases AND when Boundary Reinforcement is HIGH; conversely, Team Cohesion increase with Extraversion when Boundary Reinforcement is LOW.

Support was also found for **Hypothesis H2.13** – that Team Boundary Spanning will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Viability (p = .019). In this case, Team Viability increases, to a point, and then decreases again as Extraversion increases AND when Boundary Spanning is HIGH; conversely, Team Viability increase with Extraversion when Boundary Spanning is LOW.

Support was also found for **Hypothesis H2.14** – that Team Boundary Buffering will moderate the CONVEX curvilinear association between Mean Team Neuroticism and Team Viability (p = .031). In this case, Team Viability decreases, to a point, and then increases again as Extraversion increases AND when Boundary Buffering is HIGH; conversely, Team Viability decreases when Extraversion is HIGH, and Boundary Buffering is LOW. The remaining hypotheses were all rejected.

CHAPTER 7: RESULTS: TRAIT OPENNESS

7.1. Introduction

Following the literature review, the premise of the theoretical model and hypotheses (as set out in **Chapter 2**), is that Team Boundary Management processes, comprising Spanning, Buffering and Reinforcement, moderate, the relationship between Five Factor model personality traits and Team Effectiveness. The following sections examine the results.

7.2. Overview of Hypotheses

H3.1: MEAN Team Openness will POSITIVELY predict Performance.	*Rejected*
H3.2: Variability in Team Openness will POSITIVELY moderate the association between Mean Team Neuroticism and Performance (as set out in H3.1)	*Rejected*
H3.3: Moderated by Boundary Spanning, Mean Team Openness will be POSITIVELY associated with Performance.	*Rejected*
H3.4: Moderated by Boundary Buffering, Mean Team Openness will be NEGATIVELY associated with Performance.	***Supported***
H3.5: Moderated by Boundary Reinforcement, Mean Team Openness will be NEGATIVELY associated with Performance.	*Rejected*

7.3. Moderation Analysis

I found support for a variety of other relationships, including the moderating role of Team Boundary Management in the relationship between Team Openness and Team Outcomes.

The overall analytic approach taken is outlined in the following four steps:

Step 1 : Review of main and interaction effects of Team Openness on Team Outcomes.

Step 2 : Review of conditional effects of Team Openness on Team Outcomes as MODERATED by Team Boundary Management and Team Functional variables.

The next section will examine each of the Team Openness and provide an overview of the relationships found in the analysis.

7.4. Main and Interaction Effects: Team Openness on Team Outcomes

7.4.1. Openness on Performance

The analysis presented in **Table 7.1** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

Table 7.1 shows there were no main (B = -0.178, *p* = .465) or interaction effects (B = -0.714, *p* = .725) so ***Hypotheses H3.1 and H3.2 were both rejected***.

Table 7.1: Main and interaction effects of Openness on Performance

	H3.1					**H3.2**		
	B	*p*	B	*p*	B	*p*	B	*p*
Cl	-0.010	0.921	-0.009	0.928	-0.003	0.972	0.000	1.000
Ts	0.012	0.639	0.013	0.634	0.004	0.884	0.007	0.812
Ts^2	0.009	0.136	0.009	0.142	0.010	0.100	0.010	0.112
O^m	-0.178	0.465	-0.190	0.484	-0.201	0.416	-0.190	0.588
O^{m2}			0.057	0.914			0.355	0.611
O^{sd}					0.369	0.298	0.426	0.282
$O^m * O^{sd}$					-0.714	0.725	-1.069	0.699
$O^{m2} * O^{sd}$							-2.440	0.698
R^2	0.090		0.091		0.118		0.126	

Key: Cl Collaboration; Ts Team size; Ts^2 Team size squared; O^m Openness *(mean); O^{sd}* Openness *(deviation)*

7.5. Conditional Effects: Team Openness and Team Boundary Management on Performance

The analysis presented in **Table 7.2** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found.

Table 7.2: *Main and interaction effects of Openness and Boundary Management on Performance*

	Boundary Spanning H3.3				***Boundary Buffering H3.4***				***Boundary Reinforcement H3.5***			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
CI	-0.012	0.909	-0.013	0.910	-0.044	0.670	-0.028	0.780	0.004	0.973	0.003	0.977
Tm	0.010	0.719	0.012	0.671	0.008	0.763	0.020	0.436	0.012	0.641	0.012	0.674
Tm^2	0.010	0.142	0.010	0.152	0.009	0.114	0.010	0.089	0.010	0.123	0.010	0.138
O^m	-0.158	0.538	-0.218	0.474	-0.027	0.914	-0.165	0.524	-0.246	0.351	-0.232	0.472
O^{m2}			0.233	0.704			-0.003	0.997			-0.075	0.908
BS	-0.012	0.953	-0.021	0.937								
BB					0.099	0.421	-0.056	0.709				
BR									-0.023	0.891	-0.023	0.914
O^m * BS	-0.341	0.484	-0.504	0.598								
O^{m2} * BS			0.148	0.929								
O^m * BB					**-0.808**	**0.033**	-1.618	0.007				
O^{m2} * BB							1.745	0.151				
O^m * BR									-0.408	0.487	-0.436	0.504
O^{m2} * BR											0.018	0.994
R^2	0.102		0.106		0.190		0.258		0.103		0.104	

Key: *CI Collaboration; Ts Team size; Ts^2 Team size squared; O^m Openness (mean); O^{sd} Openness (deviation); BS^m Boundary Spanning (mean); BB^m Boundary Buffering (mean); BR^m Boundary Reinforcement (mean); n=48*

7.5.1. Openness and Boundary Spanning on Performance

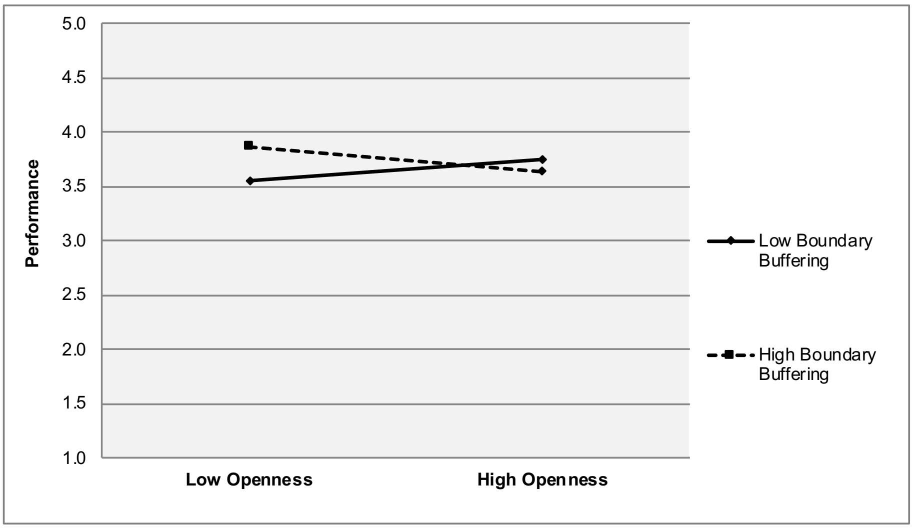
Table 7.2 shows there were no two-way interaction effect between Openness and Boundary Spanning on Performance (B = -0.341, *p* = .484) so ***Hypothesis H3.3 was rejected***.

7.5.2. Openness and Boundary Buffering on Performance

Table 7.2 shows there was a significant negative two-way interaction between Openness and Boundary Buffering on Performance (B = -0.808, *p* = .033) ***lending support to Hypothesis H3.4***.

Figure 7.1 shows that Performance will decline as Openness increases where Boundary Buffering is HIGH (simple slope: t = -.1.702, *p* = .096); conversely that Performance will increase as Openness increases where Boundary Buffering is LOW (simple slope: t = 1.105, *p* = .276).

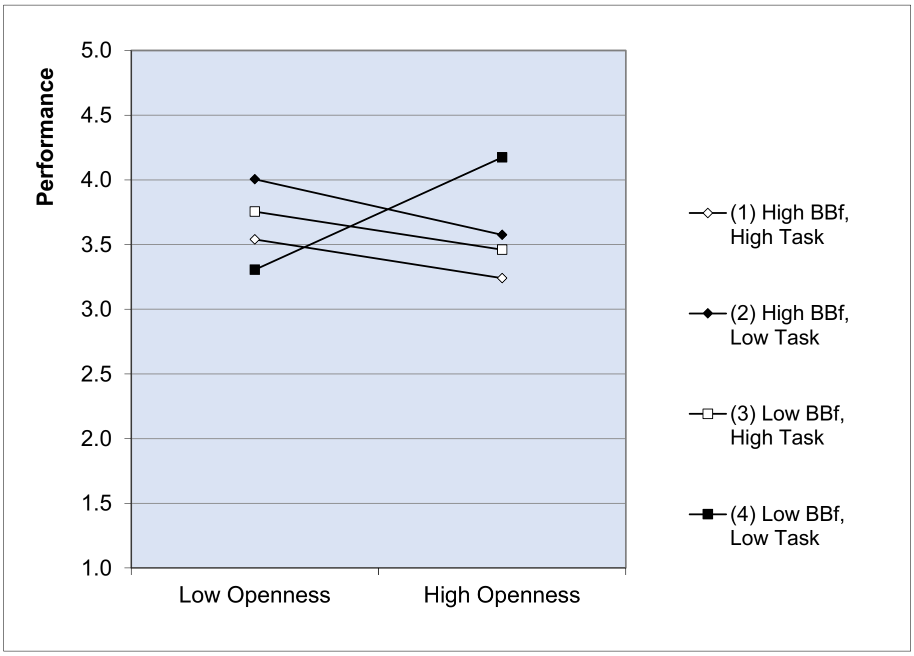
Figure 7.1: Two-way interaction between Openness and Boundary Buffering on Performance



Additional (unhypothesised) post-hoc analysis was conducted to examine for possible three-way interaction with Interdependence – see **APPENDIX 5**.

Figure 7.2 shows a significant three-way interaction between Openness, Boundary Buffering and Task Interdependence on Performance, (B = 2.859, *p* = .003). Results from the Slope Difference Test indicate the slope 4 is significantly different from slope 1 (t = -3.016, *p* = .005); slope 2 (t = -3.668, *p* = .001); and slope (t = -2.363, *p* = .023); whereby Performance will increase as Openness increases but only where Boundary Buffering AND Task Interdependence are LOW, otherwise Performance declines with each of the other combinations.

Figure 7.2: Three-way interaction between Openness, Boundary Buffering and Task Independence on Performance



7.5.3. Openness and Boundary Reinforcement on Performance

Table 7.2 shows there were no two-way interaction effect between Openness and Boundary Reinforcement on Performance (B = -0.341, p = .484), therefore ***Hypothesis H3.5 was rejected***.

7.6. Summary

7.6.1. Overview of Relationships with Openness

No main or interaction effects were found between Team Openness and any of the Team outcomes included in this study. This was consistent with findings in previous studies that have noted a weak and generally inconclusive relationship between this trait and a variety of team outcomes.

Support was found for the hypothesised conditional effect noted in **Hypothesis H3.4** – that moderated by Boundary Buffering, Mean Team Openness will be NEGATIVELY associated with Performance (p = .033). The remaining hypotheses were all rejected.

CHAPTER 8: RESULTS: TEAM AGREEABLENESS

8.1. Introduction

Following the literature review, the premise of the theoretical model and hypotheses (as set out in **Chapter 2**), is that Team Boundary Management processes, comprising Spanning, Buffering and Reinforcement, moderate, the relationship between Five Factor model personality traits and Team Effectiveness. The following sections examine the results.

8.2. Overview of Hypotheses

H4.1: Mean Team Agreeableness will have a CONCAVE curvilinear relationship with Performance.	*Rejected*
H4.2: Deviation in Team Agreeableness will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Performance (as set out in H4.1)	***Supported***
H4.3: Mean Team Agreeableness will have a CONVEX curvilinear relationship with Team Cohesion.	*Rejected*
H4.4: Deviation in Team Agreeableness will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Cohesion (as set out in H4.3)	***Supported***
H4.5: Mean Team Agreeableness will have a CONVEX curvilinear relationship with Team Viability.	*Rejected*
H4.6: Deviation in Team Agreeableness will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Viability (as set out in H4.5)	*Rejected*
H4.7: Team Boundary Spanning will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Performance.	*Rejected*
H4.8: Team Boundary Buffering will moderate the CONCAVE curvilinear association between Mean Team Agreeableness and Performance.	***Supported***
H4.9: Team Boundary Reinforcement will moderate the CONCAVE curvilinear association between Mean Team Agreeableness and Performance	***Supported***
H4.10: Team Boundary Spanning will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Team Cohesion.	*Rejected*
H4.11: Team Boundary Buffering will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Team Cohesion.	***Supported***
H4.12: Team Boundary Reinforcement will moderate the CONCAVE curvilinear association between Mean Team Agreeableness and Team Cohesion.	*Rejected*
H4.13: Team Boundary Spanning will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Team Viability.	*Rejected*
H4.14: Team Boundary Buffering will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Team Viability.	***Supported***
H4.15: Team Boundary Reinforcement will moderate the CONCAVE curvilinear association between Mean Team Agreeableness and Team Viability.	*Rejected*

8.3. Moderation Analysis

I found support for a variety of other relationships, including the moderating role of Team Boundary Management in the relationship between Team Agreeableness and Team Outcomes.

The overall analytic approach taken is outlined in the following four steps:

Step 1 : Review of main and interaction effects of Team Agreeableness on Team Outcomes.

Step 2 : Review of conditional effects of Team Agreeableness on Team Outcomes as MODERATED by Team Boundary Management and Team Functional variables.

The next section will examine each of the Team Agreeableness and provide an overview of the relationships found in the analysis.

8.4. Main and Interaction Effects: Team Agreeableness on Team Outcomes

8.4.1. Agreeableness on Performance

The analysis presented in **Table 8.1** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

Table 8.1 shows there was no main quadratic effect between Agreeableness and Performance (B = 0.514, p = .541), consequently ***Hypothesis H4.1 was rejected***. However, there was a significant concave curvilinear interaction between mean-squared and deviation Agreeableness on Performance (B = -12.231, p = .044) ***lending support to Hypothesis H4.2***.

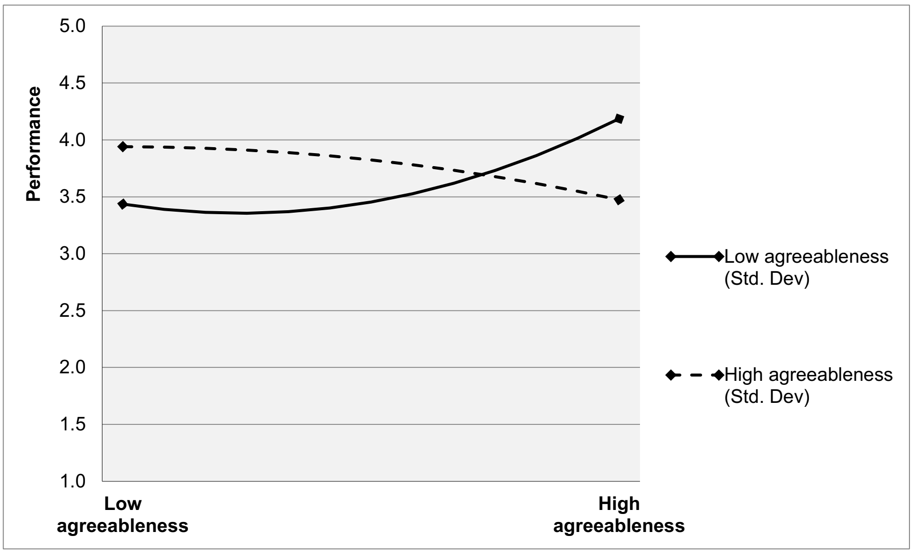
Table 8.1: Main and interaction effects of Agreeableness on Performance

			H4.1			H4.2		
	B	*p*	B	*p*	B	*p*	B	*p*
Cl	0.002	0.985	-0.014	0.890	-0.079	0.491	-0.076	0.494
Ts	0.011	0.676	0.011	0.674	0.002	0.941	-0.002	0.940
Ts^2	0.009	0.140	0.009	0.129	0.011	0.075	0.012	0.049
A^m	0.068	0.803	0.215	0.558	0.344	0.315	0.207	0.576
A^{m2}			0.514	0.541			1.019	0.373
A^{sd}					0.471	0.283	1.127	0.039
$A^m * A^{sd}$					-0.990	0.449	-5.397	0.044
$A^{m2} * A^{sd}$							**-12.231**	**0.044**
R^2	0.080		0.088		0.126		0.213	

Key: Cl Collaboration; Ts Team size; Ts^2 Team size squared; A^m Agreeableness *(mean); A^{sd}* Agreeableness *(deviation)*

Figure 8.1 shows that Performance increases as Agreeableness increases when variance in Agreeableness is LOW; conversely, Performance decreases as Agreeableness increases when variance in Agreeableness is HIGH.

Figure 8.1: Quadratic interaction between Agreeableness (mean and variation) on Performance



8.4.2. Agreeableness on Team Cohesion

The analysis presented in **Table 8.2** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

Table 8.2: Main and interaction effects of Agreeableness on Team Cohesion

			H4.3				**H4.4**	
	B	*p*	B	*p*	B	*p*	B	*p*
CI	-0.166	0.142	-0.159	0.180	-0.033	0.789	-0.027	0.814
Ts	-0.007	0.817	-0.007	0.817	0.012	0.686	0.008	0.767
Ts^2	0.016	0.024	0.016	0.028	0.011	0.104	0.012	0.056
A^m	**0.647**	**0.041**	0.580	0.165	0.226	0.538	0.171	0.658
A^{m2}			-0.238	0.801			2.132	0.079
A^{sd}					**-1.043**	**0.031**	-0.241	0.664
$A^m * A^{sd}$					0.812	0.564	-4.119	0.137
$A^{m2} * A^{sd}$							**-15.710**	**0.015**
R^2	0.202		0.203		0.304		0.410	

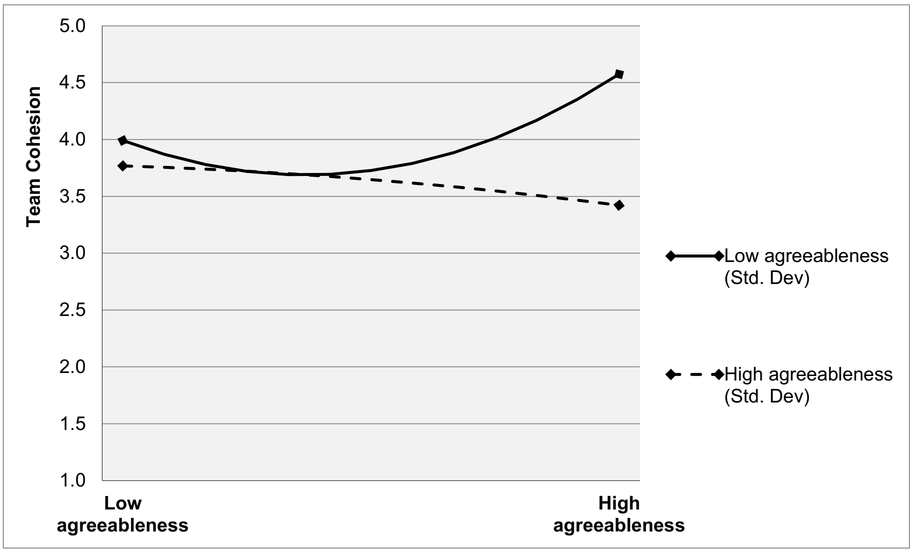
Key: CI Collaboration; Ts Team size; Ts^2 Team size squared; A^m Agreeableness *(mean); A^{sd}* Agreeableness *(deviation)*

Table 8.2 shows there was no main quadratic effect between Agreeableness and Team Cohesion (B = -0.238, *p* = .801) so ***Hypothesis H4.3 was rejected***.

An unhypothesised main effect between Mean Agreeableness and Team Cohesion was found (B = 0.647, *p* = .041). Furthermore, there was a significant concave curvilinear interaction between mean-squared and deviation Agreeableness on Team Cohesion (B = -15.710, *p* = .015) ***lending support to Hypothesis H4.4***.

Figure 8.2 shows Team Cohesion declines, to a point, and then increases as Agreeableness increases and when variance in Agreeableness is LOW; conversely, Team cohesion decreases as Agreeableness increases and when variance in Agreeableness is HIGH.

Figure 8.2: Quadratic interaction between Agreeableness (mean and variation) on Team Cohesion



8.4.3. Agreeableness on Team Viability

The analysis presented in **Table 8.3** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

Table 8.3 shows there were no significant quadratic main (B = 0.387, p - .602) or interaction effects (B = -5.895, *p* = .254) for Agreeableness on Team Viability, consequently ***Hypotheses H4.5 and H4.6 were both rejected***.

Table 8.3: Main and interaction effects of Agreeableness on Team Viability

			H4.5				H4.6	
	B	*p*	B	*p*	B	*p*	B	*p*
Cl	-0.122	0.170	-0.134	0.149	-0.031	0.754	-0.026	0.788
Ts	-0.020	0.392	-0.020	0.399	-0.008	0.722	-0.008	0.744
Ts^2	0.014	0.013	0.014	0.013	0.011	0.054	0.011	0.038
A^m	0.344	0.161	0.454	0.164	0.047	0.873	0.201	0.530
A^{m2}			0.387	0.602			1.982	0.050
A^{sd}					-0.628	0.101	-0.384	0.405
$A^m * A^{sd}$					0.804	0.476	0.002	0.999
$A^{m2} * A^{sd}$							-5.895	0.254
R^2	0.171		0.176		0.243		0.316	

Key: Cl Collaboration; Ts Team size; Ts^2 Team size squared; A^m Agreeableness *(mean); A^{sd}* Agreeableness *(deviation)*

8.5. Conditional Effects: Team Agreeableness and Team Boundary Management on Performance

The analysis presented in **Table 8.4** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

8.5.1. Agreeableness and Boundary Spanning on Performance

Table 8.4 shows there were no significant two-way quadratic interaction effect between Agreeableness and Boundary Spanning on Performance (B = 1.077, p = .747), so ***Hypothesis 4.7 was rejected***.

Table 8.4: Main and interaction effects of Agreeableness and Boundary Management on Performance

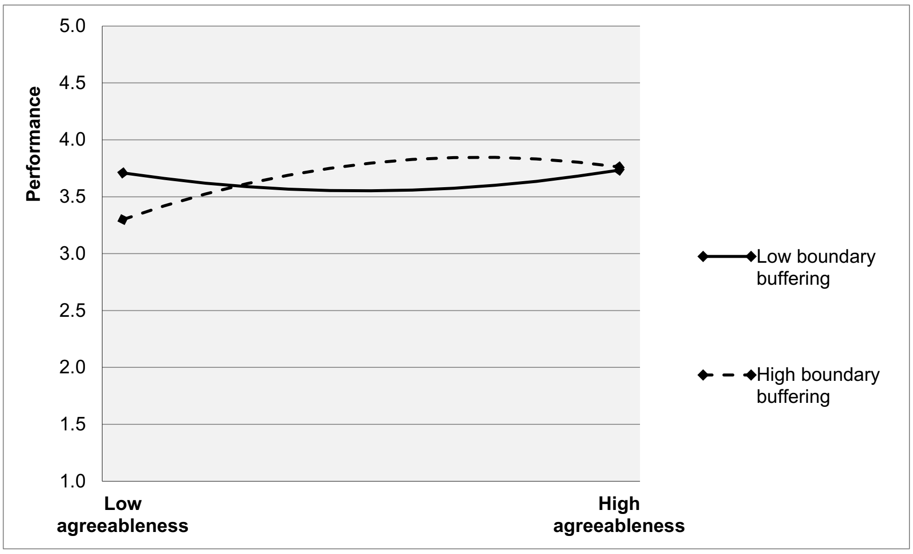
	Boundary Spanning ***H4.7***				***Boundary Buffering*** ***H4.8***				***Boundary Reinforcement*** ***H4.9***			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
CI	0.006	0.955	-0.012	0.917	-0.007	0.939	0.006	0.955	0.062	0.556	0.067	0.532
Tm	0.008	0.767	0.007	0.798	0.008	0.732	0.008	0.734	0.015	0.569	0.015	0.542
Tm^2	0.010	0.130	0.011	0.118	0.007	0.196	0.007	0.196	0.006	0.336	0.007	0.274
A^m	0.098	0.738	0.259	0.513	0.252	0.358	0.354	0.309	0.063	0.816	0.272	0.449
A^{m2}			0.401	0.695			-0.402	0.623			0.732	0.383
BS	-0.075	0.707	-0.145	0.585								
BB					0.116	0.347	0.235	0.093				
BR									0.059	0.715	0.297	0.145
A^m * BS	-0.321	0.673	0.078	0.943								
A^{m2} * BS			1.077	0.747								
A^m * BB					**1.425**	**0.007**	0.615	0.380				
A^{m2} * BB							**-3.554**	**0.077**				
A^m * BR									**1.184**	**0.031**	-0.438	0.652
A^{m2} * BR											**-5.135**	**0.055**
R^2	0.087		0.096		0.232		0.293		0.181		0.162	

Key: *CI Collaboration; Ts Team size; Ts^2 Team size squared; A^m Agreeableness (mean); A^{sd} Agreeableness (deviation); BS^m Boundary Spanning (mean); BB^m Boundary Buffering (mean); BR^m Boundary Reinforcement (mean); n=48*

8.5.2. Agreeableness and Boundary Buffering on Performance

Table 8.4 shows a marginally significant concave curvilinear interaction between Agreeableness and Boundary Buffering on Performance (B = -3.554, *p* = .077) ***lending partial support to Hypothesis H4.8***.

Figure 8.3: Quadratic interaction between Agreeableness and Boundary Buffering on Performance



An unhypothesised positive linear two-way interaction was found between Team Agreeableness, and Boundary Buffering on Performance (B = 1.425, *p* = .007).

Figure 8.4: Interaction between Agreeableness and Boundary Buffering on Performance

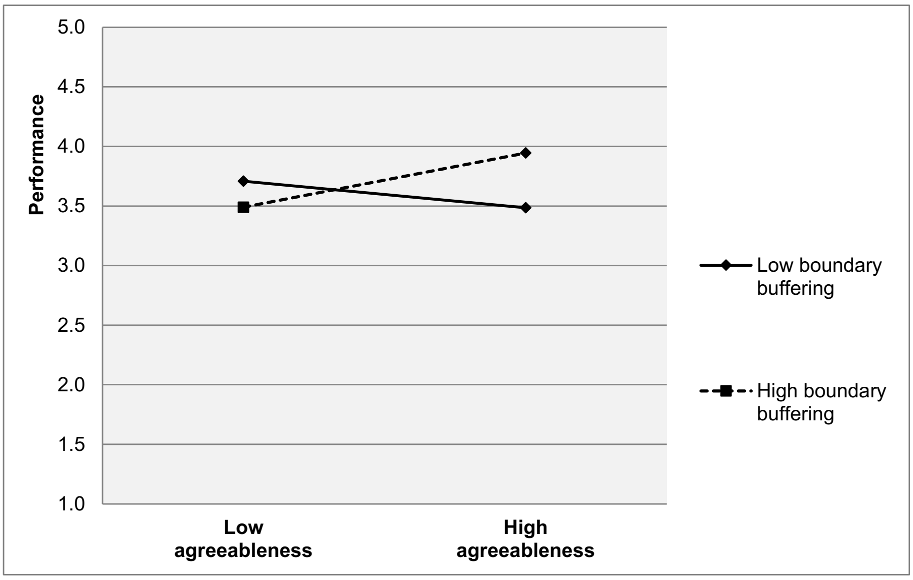


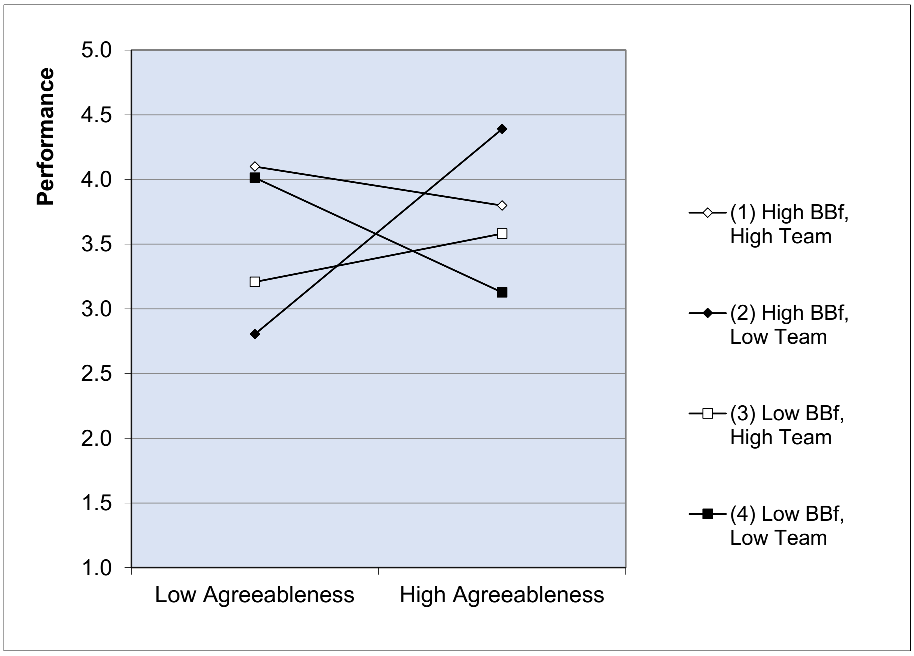
Figure 8.4 shows that when Boundary Buffering was HIGH, then an increase in Agreeableness results in an increase in Performance (simple slope: t = 2.352, *p* = .024); conversely when Boundary Buffering was LOW, then an increase in Agreeableness results in a slight increase in Performance (simple slope: t = -1.510, *p* = .140).

Additional (unhypothesised) post-hoc analysis was conducted to examine for possible three-way interaction with Interdependence – see **APPENDIX 6**.

There was a significant three-way interaction effect between Agreeableness, Boundary Buffering and Team Interdependence on Performance (B = -6.148; p = .043). **Figure 8.5** helps to qualify **Figure 8.4** and shows that where Boundary Buffering is HIGH there is an increase in Performance as Agreeableness increases, but only when Team Interdependence is LOW (e.g. slope 2). Where Team Independence is HIGH (e.g. slope 1) there is a slight decrease in Performance as Agreeableness increases. Results from the simple slopes test would indicate that slope 2 is significantly different from slope 1 (t = -2.202, p = .034); slope 3 (t = 2.451, p = .019) and slope 4 (t = 2.740, p = .009). For full detail see **APPENDIX 6.**

It therefore appears that the interaction in **Figure 8.4** occurs when Team Independence is LOW (lines 2 and 4) and not HIGH (lines 1 and 3).

Figure 8.5: Three-way interaction between Agreeableness, Boundary Buffering and Team Interdependence on Performance



8.5.3. Agreeableness and Boundary Reinforcement on Performance

Table 8.4 shows there was a marginally significant concave curvilinear interaction between Agreeableness and Boundary Reinforcement on Performance (B = -5.135, p = .055) ***lending partial support to Hypothesis H4.9***. See **Figure 8.6**.

An unhypothesised positive linear two-way interaction was also noted between Agreeableness and Boundary Reinforcement on Performance (B = 1.184, p = .031) see **Figure 8.7.**

Figure 8.7 shows that when Boundary Reinforcement was HIGH, then an increase in Agreeableness results in a slight (non-significant) increase in Performance (simple slope: t = 1.654, p = .106); conversely when Boundary Reinforcement was LOW, then an increase in Agreeableness results in a slight (non-significant) decrease in Performance (simple slope: t = -1.255, p = .217).

Figure 8.6: Quadratic interaction between Agreeableness and Boundary Reinforcement on Performance

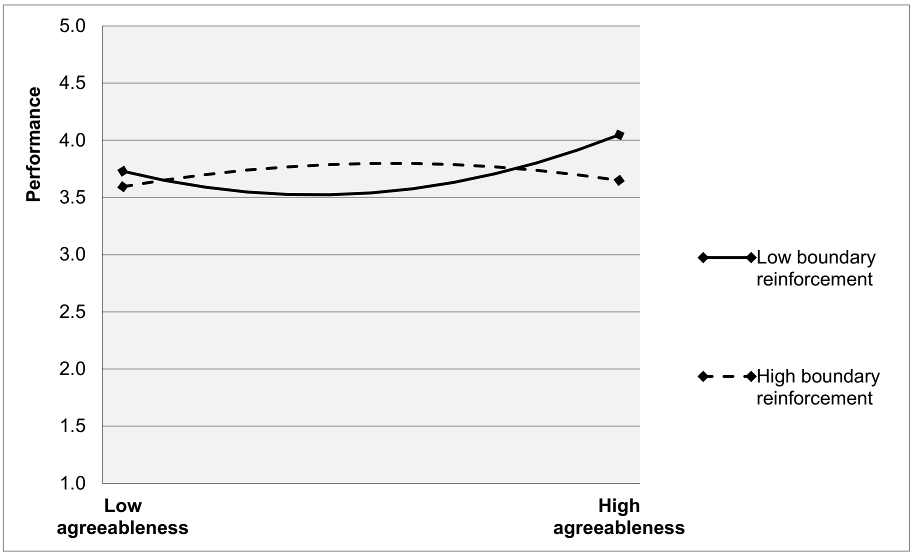
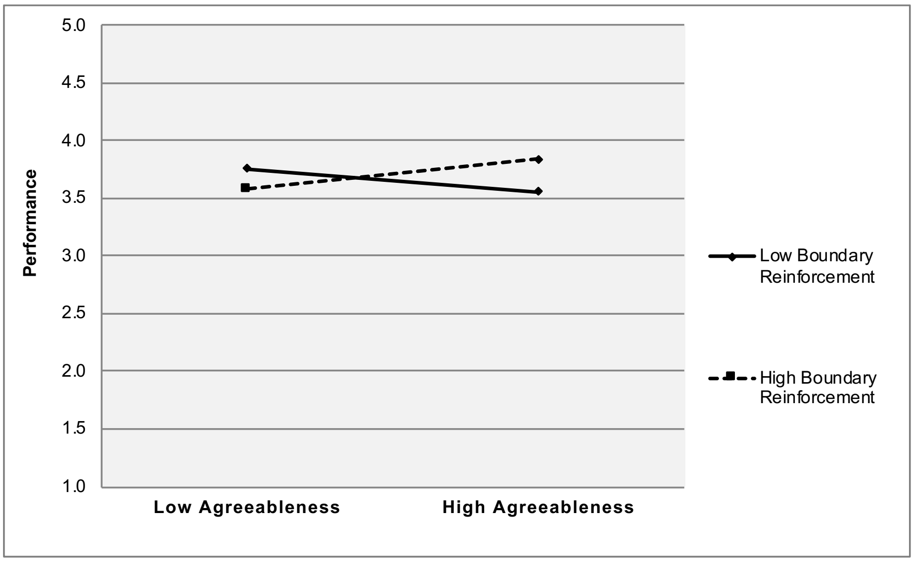


Figure 8.7: Two-way interaction between Agreeableness and Boundary Reinforcement on Performance



8.6. Conditional Effects: Team Agreeableness and Team Boundary Management on Team Cohesion

The analysis presented in **Table 8.5** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

Table 8.5: Main and interaction effects of Agreeableness and Boundary Management on Team Cohesion

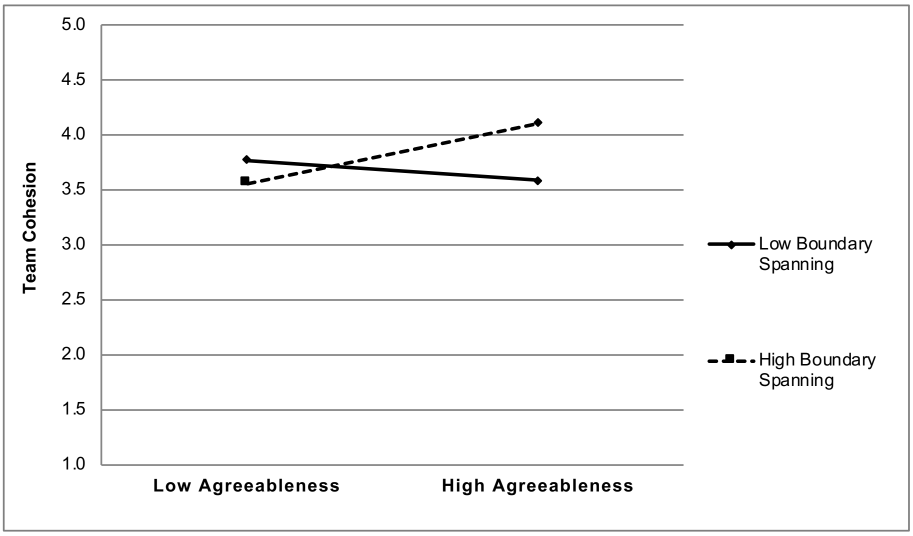
	Boundary Spanning ***H4.10***				***Boundary Buffering*** ***H4.11***				***Boundary Reinforcement*** ***H4.12***			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
CI	-0.147	0.182	-0.141	0.220	-0.205	0.082	-0.216	0.071	-0.165	0.186	-0.157	0.227
Tm	0.002	0.931	0.004	0.894	-0.007	0.819	-0.007	0.817	-0.007	0.826	-0.007	0.817
Tm^2	0.012	0.080	0.011	0.099	0.015	0.035	0.015	0.033	0.013	0.070	0.012	0.096
A^m	0.404	0.180	0.508	0.204	0.511	0.124	0.319	0.437	0.607	0.060	0.399	0.360
A^{m2}			1.102	0.285			0.348	0.720			-0.722	0.478
BS	0.225	0.269	0.336	0.211								
BB					0.166	0.262	0.003	0.983				
BR									0.162	0.392	0.033	0.894
A^m * BS	**2.325**	**0.004**	2.076	0.060								
A^{m2} * BS			-2.682	0.423								
A^m * BB					-0.357	0.557	0.791	0.341				
A^{m2} * BB							**4.867**	**0.042**				
A^m * BR									0.635	0.314	1.593	0.180
A^{m2} * BR											2.933	0.357
R^2	0.357		0.379		0.240		0.318		0.228		0.249	

Key: *CI Collaboration; Ts Team size; Ts^2 Team size squared; A^m Agreeableness (mean); A^{sd} Agreeableness (deviation); BS^m Boundary Spanning (mean); BB^m Boundary Buffering (mean); BR^m Boundary Reinforcement (mean); n=48*

8.6.1. Agreeableness and Boundary Spanning on Team Cohesion

Table 8.5 shows there was no significant quadratic interaction between Agreeableness and Boundary Spanning on Team Cohesion (B = -2.682, p = .423) so ***Hypothesis H4.10 was rejected***. However, an unhypothesised positive linear two-way interaction was found between Agreeableness and Boundary Spanning on Team Cohesion was found (B = 2.325, p = .004) – see **Figure 8.8**. This shows that Team Cohesion increases when Boundary Spanning and Agreeableness are both HIGH.

Figure 8.8: Two-way Interaction between Agreeableness and Boundary Spanning on Team Cohesion

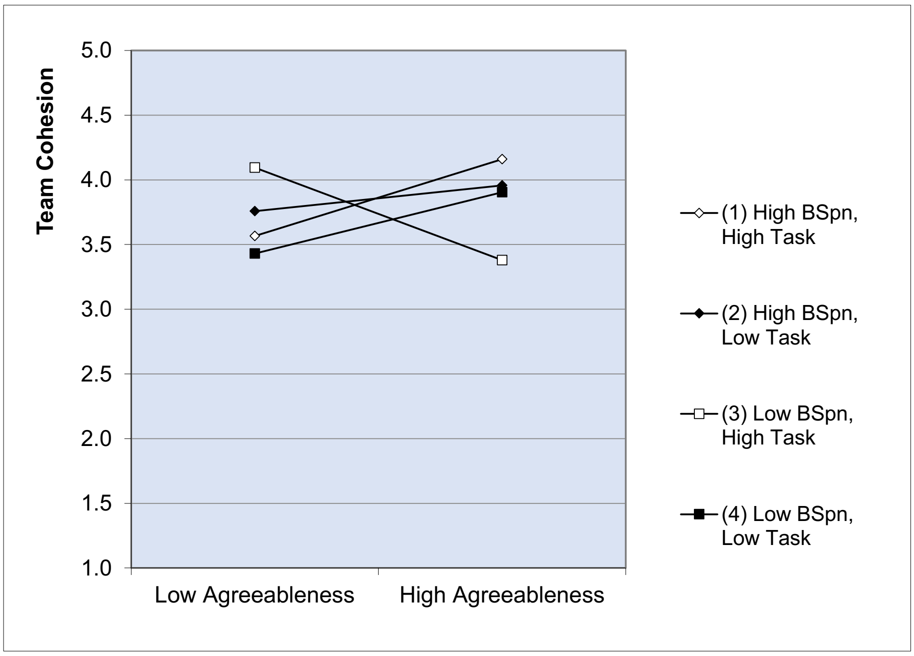


Additional (unhypothesised) post-hoc analysis was conducted to examine for possible three-way interaction with Interdependence – see **APPENDIX 6**.

This shows there was a significant three-way interaction effect between Agreeableness, Boundary Spanning and Task Interdependence on Team Cohesion (B = 5.850; p = .024).

Figure 8.9 shows that where Boundary Spanning is LOW and where Task Interdependence is HIGH (e.g. slope 3), there is a decrease in Team Cohesion as Agreeableness increases. Results from the simple slopes test would indicate that slope 3 is significantly different from slope 1 (t = 3.728, p = .001); slope 2 (t = 1.855, p = .072) and slope 4 (t = -1.797, p = .081). For full detail see **APPENDIX 6**.

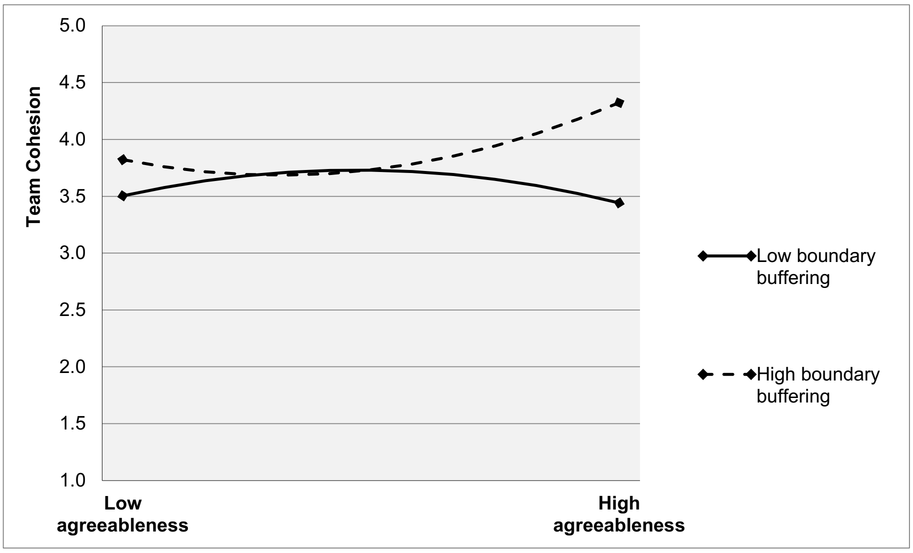
Figure 8.9: Three-way Interaction between Agreeableness, Boundary Spanning and Task Interdependence on Team Cohesion



8.6.2. Agreeableness and Boundary Buffering on Team Cohesion

Table 8.5 shows there was a significant convex quadratic interaction between Agreeableness and Boundary Buffering on Team Cohesion (B = 4.867, p = .042) ***lending support to hypothesis H4.11***, whereby Team Cohesion increases as Agreeableness increases when Boundary Buffering is HIGH – se**e Figure 8.10**.

Figure 8.10: Quadratic interaction between Agreeableness and Boundary Buffering on Team Cohesion



8.6.3. Agreeableness and Boundary Reinforcement on Team Cohesion

Table 8.5 shows there were no two-way quadratic interaction effect between Agreeableness and Boundary Reinforcement on Team Cohesion (B = 2.933, *p* = .357) so ***Hypothesis H4.12 was rejected***.

8.7. Conditional Effects: Team Agreeableness and Team Boundary Management on Team Viability

The analysis presented in **Table 8.6** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

8.7.1. Agreeableness and Boundary Spanning on Team Viability

Table 8.6 shows there was no significant quadratic interaction between Agreeableness and Boundary Spanning on Team Viability (B = -3.678, *p* = .183) so ***Hypothesis H4.13 was rejected***.

8.7.2. Agreeableness and Boundary Buffering on Team Viability

Table 8.6 shows there was a significant convex quadratic interaction effect between Agreeableness and Boundary Buffering on Team Viability (B = 4.554, *p* = .012) ***lending support to Hypothesis H4.14.***

Figure 8.11 shows that Team Viability increases when Agreeableness and Boundary Buffering are both HIGH.

Figure 8.11: Quadratic interaction between Agreeableness and Boundary Buffering on Team Viability

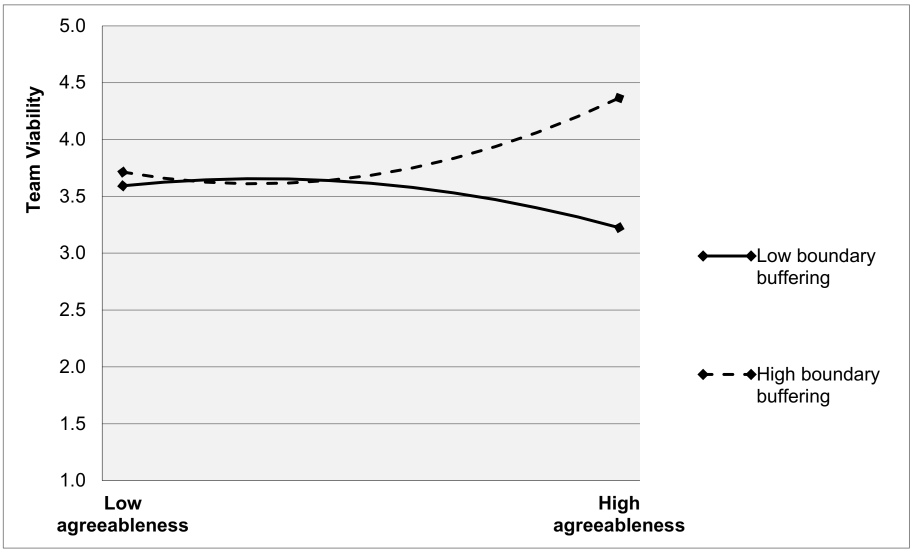


Table 8.6: Main and interaction effects of Agreeableness and Boundary Management on Team Viability

	Boundary Spanning ***H4.13***				***Boundary Buffering*** ***H4.14***				***Boundary Reinforcement*** ***H4.15***			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
CI	-0.098	0.287	-0.090	0.339	-0.164	0.070	-0.185	0.039	-0.126	0.193	-0.138	0.174
Tm	-0.019	0.435	-0.017	0.475	-0.021	0.351	-0.021	0.330	-0.020	0.391	-0.020	0.392
Tm^2	0.013	0.028	0.012	0.035	0.012	0.028	0.012	0.020	0.011	0.053	0.011	0.059
A^m	0.219	0.385	0.354	0.280	0.309	0.221	0.207	0.497	0.297	0.229	0.293	0.386
A^{m2}			1.473	0.085			0.629	0.385			-0.017	0.983
BS	0.018	0.915	0.171	0.436								
BB					0.222	0.054	0.069	0.570				
BR									0.181	0.218	0.069	0.714
A^m * BS	**1.111**	**0.093***	0.756	0.396								
A^{m2} * BS			-3.678	0.183								
A^m * BB					0.415	0.375	1.431	0.024				
A^{m2} * BB							**4.554**	**0.012**				
A^m * BR									0.618	0.207	1.296	0.160
A^{m2} * BR											2.249	0.363
R^2	0.227		0.294		0.247		0.364		0.219		0.193	

Key: *CI Collaboration; Ts Team size; Ts^2 Team size squared; A^m Agreeableness (mean); A^{sd} Agreeableness (deviation); BS^m Boundary Spanning (mean); BB^m Boundary Buffering (mean); BR^m Boundary Reinforcement (mean); n=48*

8.7.3. Agreeableness and Boundary Reinforcement on Team Viability

Table 8.6 shows there were no two-way quadratic interaction effect between Agreeableness and Boundary Reinforcement on Team Viability (B = 2.249, p = .363) so ***Hypothesis H4.15 was rejected***.

8.8. Summary

8.8.1. Overview of Relationships with Agreeableness

Like Extraversion, Trait Agreeableness is known to be strongly associated with pro-social behaviours. Consequently, a variety of hypothesised and unhypothesised main and interaction effects were found by this study. For example, although no curvilinear main effects were found, significant CONCVE curvilinear interaction effects were found between Mean and Deviation Team Agreeableness on Performance (p = .044) providing support for **Hypothesis H4.2** – that Deviation in Team Agreeableness will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Performance (p = .015), providing support for **Hypothesis H4.4** – that Deviation in Team Agreeableness will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Cohesion.

A POSITIVE (unhypothesised) linear main effect was also noted with Team Agreeableness and Team Cohesion (*p* = .041).

A variety of significant hypothesised and unhypothesised condition effects were also found between Team Agreeableness, Team Boundary Management and Team Effectiveness Outcomes. For example: a concave curvilinear interaction between Agreeableness and Boundary Buffering on Performance (*p* = .077) lending partial support to **Hypothesis H4.8** – that Team Boundary Buffering will moderate the CONCAVE curvilinear association between Mean Team Agreeableness and Performance. This is further clarified by a more significant (*p* = .007) (unhypothesised) POSITIVE linear relationship indicating that when Boundary Buffering was HIGH, an increase in Agreeableness results in an increase in Performance, conversely when Boundary Buffering was LOW, an increase in Agreeableness results in a slight increase in Performance. Additional (unhypothesised) post-hoc analysis of the three-way interactions further explains the nature of this relationships in that the two-way interaction occurs when Team Independence is LOW and not HIGH.

A similarly CONCAVE curvilinear interaction was found between Agreeableness and Boundary Reinforcement on Performance (*p* = .055) lending partial support to **Hypothesis**

H4.9 – that Team Boundary Reinforcement will moderate the CONCAVE curvilinear association between Mean Team Agreeableness and Performance. In this case the results indicated that that when Boundary Reinforcement was HIGH, an increase in Agreeableness resulted in a slight (non-significant) increase in Performance (simple slope: p = .106); conversely when Boundary Reinforcement was LOW, then an increase in Agreeableness results in a slight (non-significant) decrease in Performance. A more significant (p = .031) unhypothesised, CONVEX curvilinear effect was found between Mean Team Agreeableness and Team Boundary Reinforcement with a broadly similar effect.

Although **Hypothesis H4.10** - Team Boundary Spanning will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Team Cohesion was rejected (p = .423), a significant (unhypothesised) two-way conditional linear effect was found (p = .004), between Agreeableness and Boundary Spanning on Team. This shows that Team Cohesion increases when Boundary Spanning and Agreeableness are both HIGH. This was also further illumined by a post-hoc analysis finding a (unhypothesised) three-way interaction between Agreeableness, Boundary Spanning and Task Interdependence on Team Cohesion (p = .024). In this case, where Boundary Spanning is LOW and where Task Interdependence is HIGH, there is a decrease in Team Cohesion as Agreeableness increases.

A significant POSITIVE quadratic interaction between Agreeableness and Boundary Buffering on Team Cohesion (p = .042) lending support to **Hypothesis H4.11** – that Team Boundary Buffering will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Team Cohesion. In this case Team Cohesion increases as Agreeableness increases when Boundary Buffering is HIGH.

Finally, a significant POSITIVE two-way quadratic interaction effect was found between Agreeableness and Boundary Buffering on Team Viability (p = .012) lending support to **Hypothesis H4.14** – that Team Boundary Buffering will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Team Viability. In this case in was indicated that Team Viability increases when Agreeableness and Boundary Buffering are both HIGH. The remaining hypotheses were all rejected.

CHAPTER 9: RESULTS: TRAIT CONSCIENTIOUSNESS

9.1. Introduction

Following the literature review, the premise of the theoretical model and hypotheses (as set out in **Chapter 2**), is that Team Boundary Management processes, comprising Spanning, Buffering and Reinforcement, moderate, the relationship between Five Factor model personality traits and Team Effectiveness. The following sections examine the results.

9.2. Overview of Hypotheses

H5.1: Mean Team Conscientiousness will have a CONVEX curvilinear relationship with Performance.	***Supported***
H5.2: Deviation in Team Conscientiousness will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Performance (as set out in H5.1).	***Supported***
H5.3: Mean Team Conscientiousness will have a CONCAVE curvilinear relationship with Team Cohesion.	*Rejected*
H5.4: Deviation in Team Conscientiousness will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Cohesion (as set out in H5.3).	*Rejected*
H5.5: Mean Team Conscientiousness will have a CONCAVE curvilinear relationship with Team Viability.	*Rejected*
H5.6: Deviation in Team Conscientiousness will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Viability (as set out in H5.5).	*Rejected*
H5.7: Team Boundary Buffering will moderate the CONCAVE curvilinear association between Mean Team *Conscientiousness* and Performance.	*Rejected*
H5.8: Team Boundary Reinforcement will moderate the CONCAVE curvilinear association between Mean Team *Conscientiousness* and Performance.	***Supported***
H5.9: Team Boundary Spanning will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Team Cohesion.	*Rejected*
H5.10: Team Boundary Buffering will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Team Cohesion.	*Rejected*
H5.11: Team Boundary Spanning will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Team Viability.	*Rejected*
H5.12: Team Boundary Buffering will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Team Viability.	*Rejected*

9.3. Moderation Analysis

I found was support for a variety of other relationships, including the moderating role of Team Boundary Management in the relationship between Team Neuroticism and Team Outcomes.

The overall analytic approach taken is outlined in the following four steps:

Step 1 : Review of main and interaction effects of Team Conscientiousness on Team Outcomes.

Step 2 : Review of conditional effects of Team Conscientiousness on Team Outcomes as MODERATED by Team Boundary Management and Team Functional variables.

The next section will examine each of the Team Conscientiousness and provide an overview of the relationships found in the analysis.

9.4. Main and Interaction Effects: Team Conscientiousness on Team Outcomes

9.4.1. Conscientiousness on Performance

The analysis presented in **Table 9.1** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

Table 9.1 shows there was a significant convex main effect between Team Conscientiousness and Performance (B = 1.374, p = .022) ***lending support to Hypothesis H5.1***. There was also a significant concave quadratic two-way interaction between Mean Squared and Deviation Conscientiousness on Performance (B = -9.190, p = .003) ***lending support to Hypothesis H5.2***.

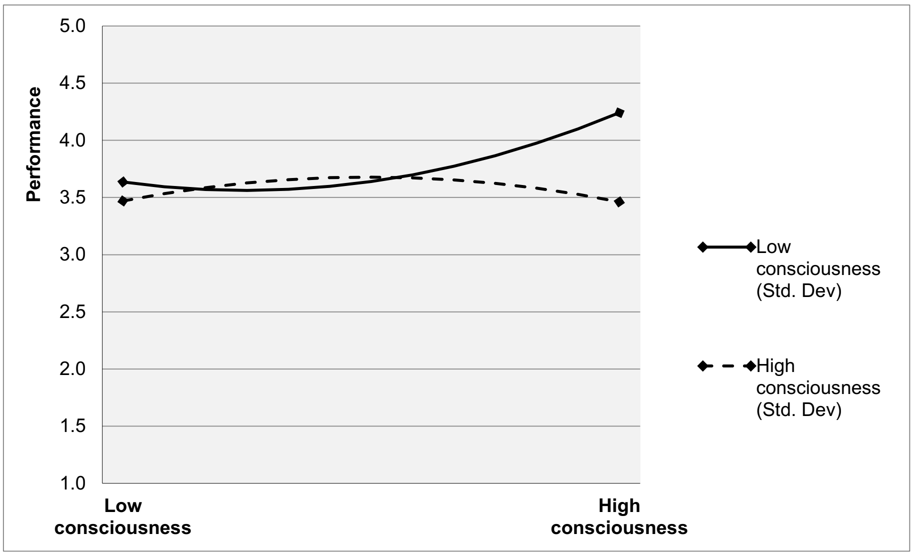
Table 9.1: Main and interaction effects of Conscientiousness on Performance

			H5.1		H5.2			
	B	*p*	B	*p*	B	*p*	B	*p*
Cl	-0.029	0.788	-0.032	0.755	-0.032	0.765	-0.013	0.883
Ts	0.007	0.804	0.033	0.244	0.020	0.475	0.050	0.060
Ts^2	0.010	0.102	0.008	0.207	0.010	0.135	0.004	0.483
C^m	0.203	0.445	0.309	0.231	0.182	0.524	0.379	0.137
C^{m2}			**1.374**	**0.022**			0.278	0.700
C^{sd}					-0.588	0.129	0.109	0.778
$C^m * C^{sd}$					-0.419	0.727	-2.182	0.060
$C^{m2} * C^{sd}$							**-9.190**	**0.003**
R^2	0.091		0.199		0.144		0.407	

Key: Cl Collaboration; Ts Team size; Ts^2 Team size squared; C^m Conscientiousness *(mean); C^{sd}* Conscientiousness *(deviation)*

Figure 9.1 shows that Performance decreases, to a point, and then increases again as Conscientiousness increases, and when variance in Conscientiousness is LOW; conversely, Performance increases, to a point, and then decreases as Conscientiousness increases when variance in Conscientiousness is HIGH.

Figure 9.1: Quadratic interaction between Conscientiousness (mean and variance) on Performance



9.4.2. Conscientiousness on Team Cohesion

The analysis presented in **Table 9.2** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

Table 9.2 shows there were no main (B = -.0.67, p = .925) or interaction effects (B = -1.591, p = .669) between conscientiousness and Team Cohesion so ***Hypotheses H5.3 and H5.4 were rejected***.

Table 9.2: Main and interaction effects of Conscientiousness on Team Cohesion

			H5.3				H5.4	
	B	p	B	p	B	p	B	p
CI	-0.195	0.120	-0.195	0.124	-0.201	0.087	-0.197	0.095
Ts	-0.010	0.756	-0.011	0.749	0.011	0.721	-0.006	0.856
Ts^2	0.019	0.012	0.019	0.014	0.018	0.010	0.020	0.006
C^m	0.495	0.110	0.489	0.123	0.682	0.032	0.715	0.029
C^{m2}			-0.067	0.925			-1.247	0.176
C^{sd}					**-0.746**	**0.076**	-0.666	0.179
C^m * C^{sd}					1.682	0.200	2.395	0.102
C^{m2} * C^{sd}							-1.591	0.669
R^2	0.171		0.171		0.311		0.346	

Key: CI Collaboration; Ts Team size; Ts^2 Team size squared; C^m Conscientiousness *(mean); C^{sd}* Conscientiousness *(deviation)*

9.4.3. Conscientiousness on Team Viability

The analysis presented in **Table 9.3** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

Table 9.3 shows there were no main (B = 0.286, p = .599) or interaction effects (B = -1.202, p = .696) between conscientiousness and Team Viability so ***Hypotheses H5.5 and H5.6 were rejected***.

Table 9.3: Main and interaction effects of Conscientiousness on Team Viability

			H5.5				H5.6	
	B	*p*	B	*p*	B	*p*	B	*p*
Cl	-0.162	0.091	-0.162	0.093	-0.165	0.083	-0.162	0.097
Ts	-0.025	0.290	-0.020	0.448	-0.015	0.545	-0.015	0.576
Ts^2	0.016	0.005	0.016	0.008	0.016	0.006	0.016	0.010
C^m	**0.396**	**0.093**	0.418	0.084	0.471	0.065	0.497	0.066
C^{m2}			0.286	0.599			-0.215	0.776
C^{sd}					-0.386	0.252	-0.303	0.457
$C^m * C^{sd}$					0.638	0.544	0.605	0.612
$C^{m2} * C^{sd}$							-1.202	0.696
R^2	0.188		0.193		0.239		0.242	

Key: Cl Collaboration; Ts Team size; Ts^2 Team size squared; C^m Conscientiousness *(mean); C^{sd}* Conscientiousness *(deviation)*

9.5. Conditional Effects: Team Conscientiousness and Team Boundary Management on Performance

The analysis presented in **Table 9.4** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

Table 9.4: Main and interaction effects of Consciousness and Boundary Management on Performance

	Boundary Spanning				***Boundary Buffering*** ***H5.7***				***Boundary Reinforcement*** ***H5.8***			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
Cl	-0.058	0.627	-0.035	0.763	0.022	0.836	0.036	0.736	0.006	0.957	-0.018	0.817
Tm	0.012	0.673	0.037	0.213	0.006	0.828	0.022	0.449	0.000	0.997	0.075	0.002
Tm^2	0.010	0.160	0.007	0.329	0.012	0.054	0.008	0.209	0.012	0.068	-0.007	0.178
C^m	0.282	0.320	0.263	0.364	0.223	0.389	0.458	0.107	0.303	0.260	0.387	0.041
C^{m2}			1.534	0.019			1.108	0.145			1.641	0.002
BS	-0.028	0.889	0.083	0.710								
BB					0.013	0.913	0.148	0.297				
BR									0.065	0.696	0.568	0.000
C^m * BS	-1.176	0.339	-1.101	0.359								
C^{m2} * BS			-4.644	0.307								
C^m * BB					**0.953**	**0.015**	0.097	0.866				
C^{m2} * BB							-1.800	0.103				
C^m * BR									**0.710**	**0.083**	-2.562	0.000
C^{m2} * BR											**-5.865**	**0.000**
R^2	0.114		0.233		0.215		0.287		0.158		0.622	

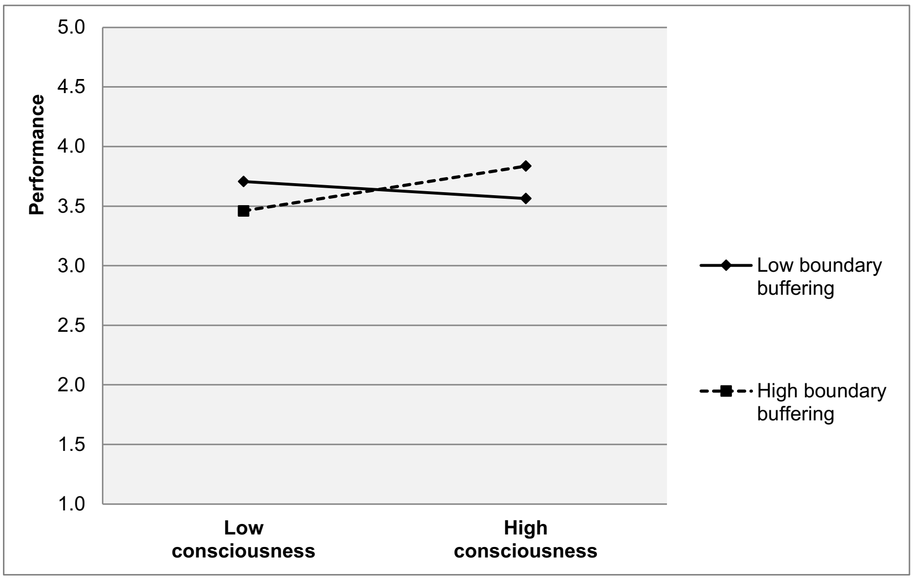
Key: *Cl Collaboration; Ts Team size; Ts^2 Team size squared; C^m Consciousness (mean); C^{sd} Consciousness (deviation); BS^m Boundary Spanning (mean); BB^m Boundary Buffering (mean); BR^m Boundary Reinforcement (mean); n=48*

9.5.1. Conscientiousness and Boundary Buffering on Performance

Table 9.4 shows there was no significant quadratic interaction between Conscientiousness and Boundary Buffering on Performance (B = -1.800, *p* = .103) so ***Hypothesis H5.7 was rejected***. However, there was an unhypothesised significant positive linear two-way interaction between Conscientiousness and Boundary Buffering on Performance (B = 0.953, *p* = .015).

Figure 9.2 shows that when Boundary Buffering was HIGH, an increase in Conscientiousness results in an increase in Performance (simple slope: t = -.865, *p* = .393); conversely when Boundary Buffering was LOW, then an increase in Conscientiousness results in a slight decrease in Performance (simple slope: t = 2.187, *p* = .035).

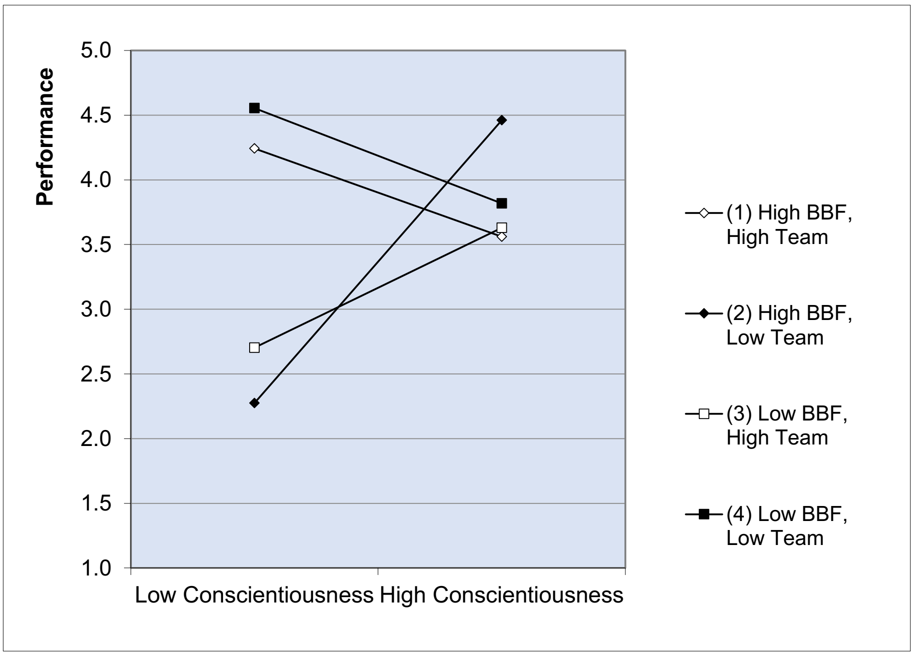
Figure 9.2: Two-interaction between Conscientiousness and Boundary Buffering on Performance



Additional post-hoc analysis was conducted to examine for possible three-way interaction with Interdependence – see **APPENDIX 7**.

Figure 9.3 shows a significant Three-way interaction between Conscientiousness, Boundary Buffering and Team Interdependence on Performance, (B = -17.708, *p* = .001).

Figure 9.3: Three-way interaction between Conscientiousness, Boundary Buffering and Team Interdependence on Performance



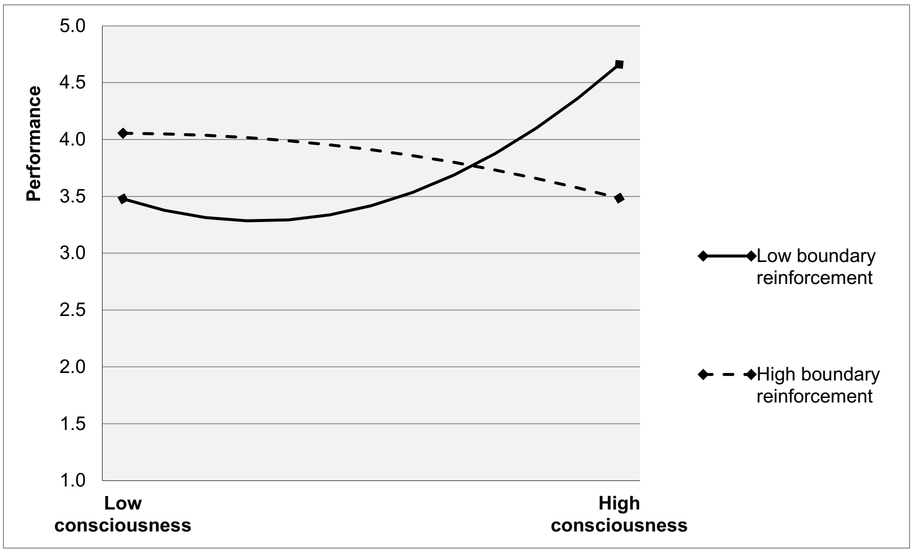
Results from the Simple Slopes Test indicate that Slope 2 is significantly different to Slope 1 (t = -4.067, *p* = .000); Slope 3 (t = 3.909, *p* = .000); and Slope 4 (t = 4.549, *p* = .000), whereby Performance increases as Conscientiousness increases when Boundary Buffering is HIGH, and Team Interdependence is LOW (i.e. slope 2); Conversely, Performance decreases when Conscientiousness, Boundary Buffering AND Team Interdependence are all HIGH, or when Conscientiousness is HIGH but Boundary Buffering and Team Interdependence are LOW. Slope 3 was also significantly different to Slope 4 (t = 4.549, *p* = .000); and Slope 1 (t = -2.649, *p* = .012). whereby Performance increases as Conscientiousness increases when Boundary Buffering is LOW, and Team Interdependence is HIGH. For full detail see **APPENDIX 7**.

9.5.2. Conscientiousness and Boundary Reinforcement on Performance

Table 9.4 shows there was a very significant concave quadratic interaction between Conscientiousness and Boundary Reinforcement on Performance, (B = -5.865, p = .000) ***lending support to Hypothesis H5.8***.

Figure 9.4 indicates that Performance declines, to a point, and then increases again as Conscientiousness increases when Boundary Reinforcement is LOW (slope test t = -.016, p = .987); conversely, that Performance decreases as Conscientiousness increases when Boundary Reinforcement is HIGH (slope test t = 1.771, p = .084).

Figure 9.4: Quadratic interaction between Conscientiousness and Boundary Reinforcement on Performance



9.6. Conditional Effects: Team Conscientiousness and Team Boundary Management on Team Cohesion

The analysis presented in **Table 9.5** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found unless otherwise stated.

Table 9.5: Main and interaction effects of Consciousness and Boundary Management on Team Cohesion

	Boundary Spanning				***Boundary Buffering***				***Boundary Reinforcement***			
	H5.9				***H5.10***							
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
Cl	-0.110	0.401	-0.115	0.396	-0.237	0.072	-0.214	0.118	-0.211	0.115	-0.199	0.150
Tm	-0.026	0.413	-0.024	0.483	-0.009	0.764	-0.007	0.855	-0.018	0.577	-0.038	0.330
Tm^2	0.021	0.006	0.021	0.008	0.017	0.028	0.015	0.065	0.019	0.015	0.023	0.012
C^m	0.273	0.373	0.314	0.351	0.405	0.197	0.549	0.123	0.552	0.082	0.529	0.101
C^{m2}			0.057	0.938			0.342	0.716			-0.578	0.511
BS	0.061	0.777	0.021	0.934								
BB					0.203	0.167	0.299	0.097				
BR									0.232	0.237	0.119	0.612
C^m * BS	**3.280**	**0.017**	3.383	0.019								
C^{m2} * BS			1.549	0.768								
C^m * BB					-0.104	0.821	-0.548	0.449				
C^{m2} * BB							-1.327	0.333				
C^m * BR									0.559	0.238	1.332	0.165
C^{m2} * BR											1.253	0.425
R^2	0.289		0.291		0.210		0.229		0.211		0.230	

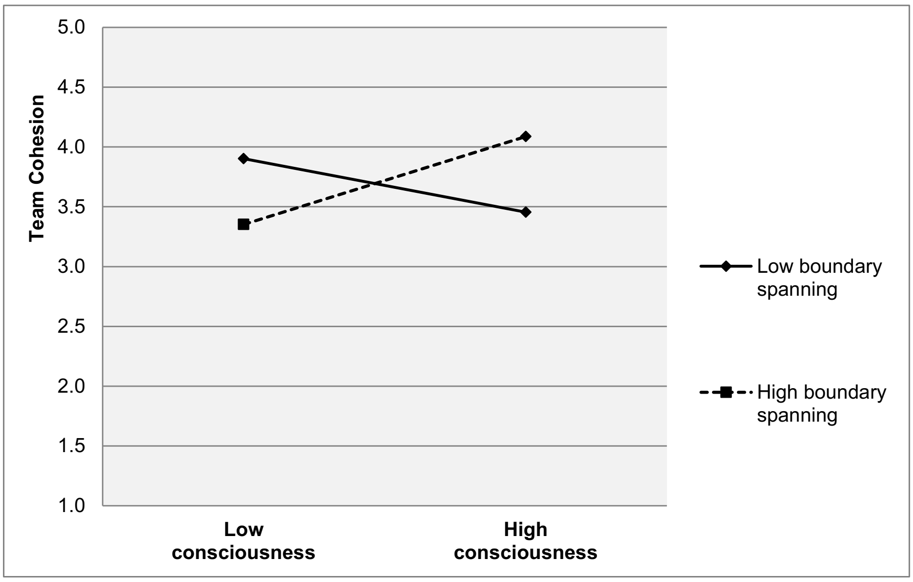
Key: *Cl Collaboration; Ts Team size; Ts^2 Team size squared; C^m Consciousness (mean); C^{sd} Consciousness (deviation); BS^m Boundary Spanning (mean); BB^m Boundary Buffering (mean); BR^m Boundary Reinforcement (mean); n=48*

9.6.1. Conscientiousness and Boundary Spanning on Team Cohesion

Table 9.5 shows there was no significant quadratic interaction between Conscientiousness and Boundary Spanning on Team Cohesion (B = 1.549, *p* = .768) so ***Hypothesis H5.9 was rejected***. However, an unhypothesised significant positive linear two-way interaction was noted between Conscientiousness and Boundary Spanning on Team Cohesion (B = 3.280, *p* = .017).

Figure 9.5 shows that when Boundary Spanning is HIGH, Team Cohesion will increase as Conscientiousness increases (t = 3.046, *p* = .004); conversely, when Boundary Spanning is LOW, Team Cohesion will decrease as Conscientiousness increases (t = -1.384, *p* = .174).

Figure 9.5: Two-way between Conscientiousness and Boundary Spanning on Team Cohesion



9.6.2. Conscientiousness and Boundary Buffering on Team Cohesion

Table 9.5 shows there were no two-way quadratic interaction effect between Conscientiousness and Boundary Buffering on Team Cohesion (B = -1.327, *p* = .333) so ***Hypothesis H5.10 was rejected***.

9.7. Conditional Effects: Team Conscientiousness and Team Boundary Management on Team Viability

The analysis presented in **Table 9.6** was repeated with the four other personality variables included as covariance in the regression analysis and a similar pattern of results was found.

9.7.1. Conscientiousness and Boundary Spanning on Team Viability

Table 9.6 shows there is no significant quadratic interaction between Conscientiousness and Boundary Spanning on Team Viability (B = -0.393, p = .922) so ***Hypothesis H5.11 was rejected***. However, an unhypothesised positive linear two-way interaction between Conscientiousness and Boundary Spanning on Team Viability was found (B = 2.325, p = .028).

Figure 9.6 below shows that Team Viability increases as Conscientiousness increases and when Boundary Spanning is HIGH (t = 2.893, p = .006); conversely, Team Viability decreases as Conscientiousness increases when Boundary Spanning is LOW (t = -1.189, p = .241).

Figure 9.6: Two-interaction between Conscientiousness and Boundary Spanning on Team Viability

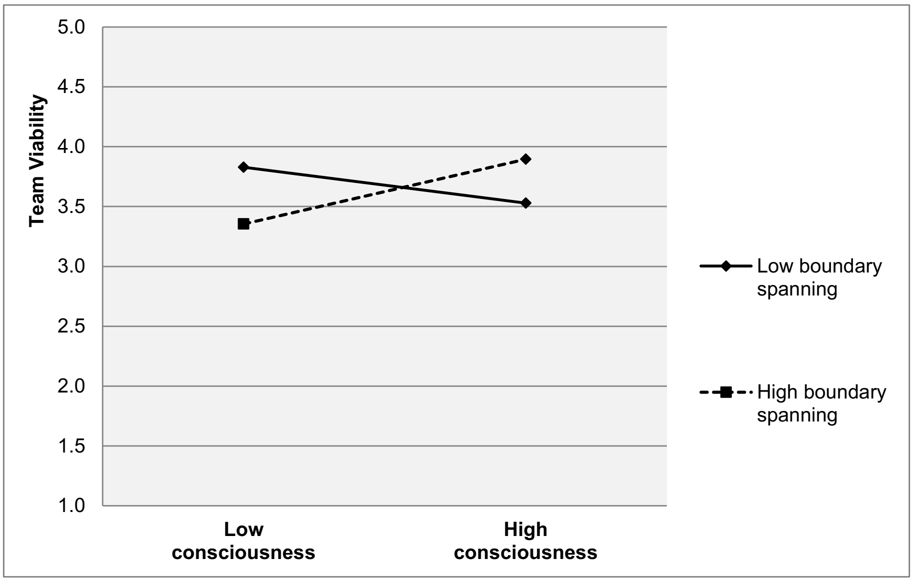


Table 9.6: Main and interaction effects of Consciousness and Boundary Management on Team Viability

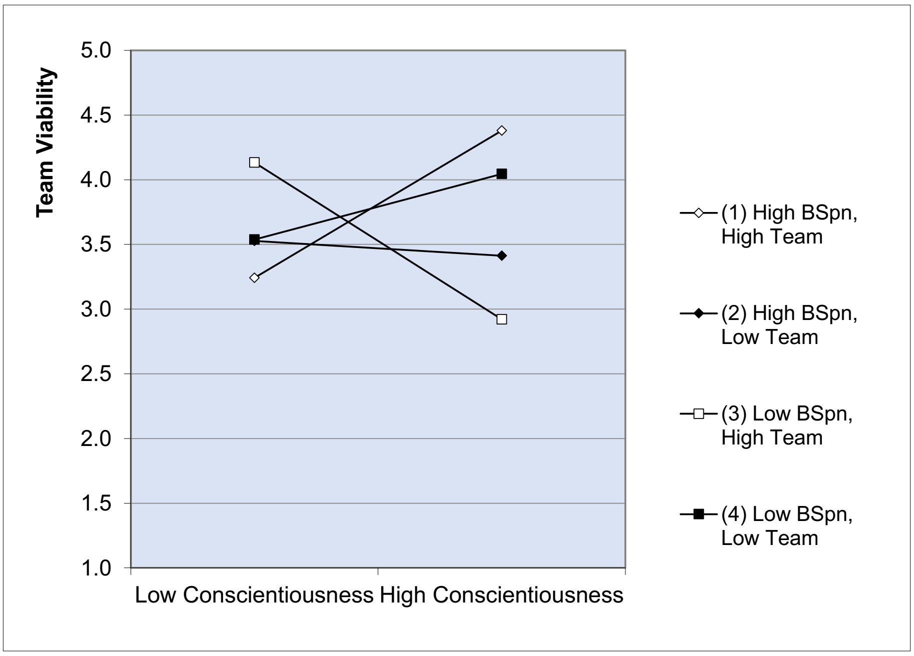
	Boundary Spanning H5.11				***Boundary Buffering H5.12***				***Boundary Reinforcement***			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
Cl	-0.082	0.419	-0.078	0.453	-0.177	0.071	-0.162	0.114	-0.182	0.075	-0.187	0.078
Tm	-0.041	0.100	-0.033	0.217	-0.025	0.274	-0.025	0.353	-0.031	0.195	-0.021	0.484
Tm^2	0.019	0.002	0.018	0.004	0.015	0.009	0.014	0.021	0.016	0.007	0.013	0.056
C^m	0.230	0.331	0.248	0.337	0.324	0.165	0.403	0.129	0.433	0.073	0.445	0.072
C^{m2}			0.445	0.431			0.131	0.852			0.266	0.692
BS	-0.078	0.640	-0.071	0.722								
BB					0.190	0.083	0.245	0.069				
BR									0.203	0.174	0.262	0.151
C^m * BS	**2.325**	**0.028**	2.403	0.029								
C^{m2} * BS			-0.393	0.922								
C^m * BB					0.340	0.320	0.109	0.839				
C^{m2} * BB							-0.767	0.452				
C^m * BR									0.397	0.269	-0.003	0.997
C^{m2} * BR											-0.671	0.575
R^2	0.279		0.291		0.264		0.274		0.231		0.240	

Key: *Cl Collaboration; Ts Team size; Ts^2 Team size squared; C^m Consciousness (mean); C^{sd} Consciousness (deviation); BS^m Boundary Spanning (mean); BB^m Boundary Buffering (mean); BR^m Boundary Reinforcement (mean); n=48*

Additional (unhypothesised) post-hoc analysis was conducted to examine for possible three-way interaction with Interdependence – for full detail see **APPENDIX 7**.

Figure 9.7 shows a Three-way interaction between Conscientiousness, Boundary Spanning and Team Interdependence on Team Viability, (B = 7.648, p = .059).

Figure 9.7: Three-way interaction between Conscientiousness, Boundary Spanning and Team Interdependence on Team Viability



Results from the Simple Slopes Test would indicate that slope 3 is significantly different from slope 1 (t = 2.770, p = .009); and slope 2 (t = 2.494, p = .017); such that when Boundary Spanning is LOW, Team Viability will decrease as Conscientiousness increases, but only where Team Interdependence is HIGH (e.g. slope 3); conversely, Team Viability will increase as Conscientiousness increases when Boundary Spanning and Team interdependence are both HIGH (slope 1). **Figure 9.7** extends **Figure 9.6** in that Team Viability increases when there is HIGH Team Interdependence (lines 1 and 3) but not when there is LOW Team Interdependence (lines 2 and 4 – where the effect is opposite). For full detail see **APPENDIX 7**.

9.7.2. Conscientiousness and Boundary Buffering on Team Viability

Table 9.6 shows there were no significant two-way quadratic interaction between Conscientiousness and Boundary Buffering on Team Viability (B = -0.767, p = .452) so ***Hypothesis H5.12 was rejected***.

9.8. Summary

9.8.1. Overview of Relationships with Conscientiousness

Results reported a significant CONVEX quadratic main effect between Team Conscientiousness and Performance (p = .022) lending support to **Hypothesis H5.1** – that Mean Team Conscientiousness will have a CONVEX curvilinear relationship with Performance. There was also a significant CONCAVE quadratic two-way interaction between Mean Squared and Deviation Conscientiousness on Performance (p = .003) lending support to **Hypothesis H5.2** – that Deviation in Team Conscientiousness will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Performance. In this case results indicate that Performance decreases, to a point, and then increases again as Conscientiousness increases, and when variance in Conscientiousness is LOW. Conversely, that Performance increases, to a point, and then decreases as Conscientiousness increases when variance in Conscientiousness is HIGH. Results also reported a very significant CONCAVE quadratic interaction between Conscientiousness and Boundary Reinforcement on Performance (p = .000) lending support to **Hypothesis H5.8** – that Team Boundary Reinforcement will moderate the CONCAVE curvilinear association between Mean Team *Conscientiousness* and Performance`. Here, results indicated that that Performance declines, to a point, and then increases again as Conscientiousness increases when Boundary Reinforcement is LOW. Conversely, that Performance increases as Conscientiousness increases when Boundary Reinforcement is HIGH. A number of unhypothesised conditional effects were noted. For example; there was a significant POSITIVE two-way linear interaction between Team Conscientiousness and Boundary Buffering on Performance (p = .015). Results suggested that when Boundary Buffering was HIGH, an increase in Conscientiousness results in an increase in Performance. Conversely when Boundary Buffering was LOW, an increase in Conscientiousness results in a slight decrease in Performance. A significant POSITIVE two-way linear interaction was noted between Conscientiousness and Boundary Spanning on Team Cohesion (p = .017) with results indicating that when Boundary Spanning is HIGH, Team Cohesion will increase as Conscientiousness increases. Conversely, when Boundary Spanning is LOW, Team Cohesion will decrease as Conscientiousness increases. A similar pattern of results was noted with Team viability as an unhypothesised POSITIVE linear two-way interaction was found between Conscientiousness and Boundary Spanning on Team Viability (p = .028), with results indicating that Team Viability increases as Conscientiousness increases when Boundary Spanning is HIGH. Conversely, Team Viability decreases as Conscientiousness increases when Boundary Spanning is LOW.

CHAPTER 10: DISCUSSION

10.1. Summary

Emanating from career long observations, I've been concerned about the practice of composing (and managing) teams in an increasingly complex and rapidly changing organisational context. Also, by the utility of data derived from psychometric assessment of personality in context of team composition and performance development, since the evolving team context puts a premium on pro-social behaviours (George, 1991, Martin-Raugh et al., 2016). These provide compelling reasons to assess personality with the aim of composing teams that have a natural propensity for *'desirable'* social behaviours (Penner et al., 1995).

This has already stimulated a large body of literature examining the antecedents of team performance, including the personality-performance relationship, as well as collaborative processes, such as Boundary Management. However, many of these studies have reported small effect sizes and equivocal results (Driskell et al., 1987, Mount et al., 1998, Porter et al., 2003), leaving scholars to posit that, justified by Trait Activation Theory, more complex models are required beyond the dyadic relationship between personality-performance. Similarly, although researchers have previously shown that Boundary Management activities predict a range of team outcomes. However, the role of boundary management in the personality-performance relationship has not been examined and this creates a lacuna in our understanding, and resulting in calls for the consideration of deep-level compositional factors as antecedents of boundary management processes (Dey, 2017), calls that are further supported by Seibert and DeGeest (2017). This research answers these calls and accepts the conclusions of prior scholars: that *team composition* is an important *input* variable of performance; that personality traits are an important *input* to team composition; and that boundary management is an important team *process*. This led me to the central question addressed by this research: *How*, *when*, and *under what conditions*, do *Team Personality* traits influence *Team Outcomes* moderated by *Team Boundary Management*?

Collectively, these questions will help to address the gaps in our theoretical and practical understanding, the resolution of which provides significant value in understanding how to compose teams for optimal performance. Therefore, this research is important because it contributes to knowledge and practice about team composition at a time when: teams commonly operate in distributed contexts; there is an increasing tendency towards flattening organisation structures; and, increased demand for lateral interactions between distributed team members creates a requirement for pro-social behaviours.

10.2. Introduction

Teams are ubiquitous (Barrick et al., 1998, Hollenbeck et al., 2004, Sundstrom et al., 1990), a fact reflected in the immense variety of team types (Driskell and Salas, 2013). However, organisations are assimilating changes to their operating environments that significantly influence how such teams work, particularly with respect to the nature and magnitude of lateral social-interactions required between teams and team members. This has potentially negative consequences for practice, since the perceived rate of change is exceeding the ability to explain the antecedents of performance. Examples of such changes include: the increasing role of *Knowledge Work* (Drucker, 1969, 2013, Bosch-Sijtsema et al., 2011); *Globalisation* (Wageman et al., 2012a, p.301); and *De-layering* and *Flattening* of hierarchical structures (Bell and Kozlowski, 2012, Littler et al., 2003, McCann et al., 2008, Tannenbaum et al., 2012). Indeed, the prevalence of *Distributed teams* brings the recognition that they are different from traditional teams and it is increasingly rare to find <u>any</u> teams that are not virtual (Kirkman and Mathieu, 2005: p.702), or have such fluid, permeable boundaries (Bosch-Sijtsema, 2007, Goldman et al., 1995) that participants are unable to identify team membership (Mortensen, 2004). These changes may suggest that organisational bureaucracies are increasing, that collaboration is becoming counter-productive (Hamel and Zanini, 2016), and that the associated need for lateral social interactions within and between teams necessitates an improved understanding of team composition and prioritises knowledge about how we might better compose and manage such teams (Burt, 2000, Cole et al., 2002, Cummings, 2004, Kilduff and Tsai, 2003, Sparrowe et al., 2001, Murase et al., 2012).

Fisher et al. (2012) report that the interdependent nature of team work creates inherent challenges for teams due to the need to integrate individual attributes through interactions between team members in order to achieve a combined team outcome (e.g., see Guzzo and Dickson, 1996, Hackman and Morris, 1975, 1987, 1990b, 1990a, 1998). Various writers recognise the increasing importance of pro-social and *'extra-role'* behaviours (George, 1991, Martin-Raugh et al., 2016) ,often referred to as *Contextual Performance* (Borman and Motowidlo, 1993, Hogan and Holland, 2003, Hough, 1992, Hurtz and Donovan, 2000, Motowidlo and Van Scotter, 1994, Peeters et al., 2006b, Van Scotter and Motowidlo, 1996). Therefore, the spontaneous display of *extra-role, pro-social behaviours* is so essential for effective organisational function (Katz, 1964) that they are a key capability for those that operate in this team environment (Duclos and Barasch, 2014, Garcia-Banda et al., 2011, Martin-Raugh et al., 2016, Penner et al., 1995, Puffer, 1987). Even so, spontaneous displays of such behaviours rely on the presence of particular situational characteristics, personality traits, and upon consideration of Team Composition from the perspective of understanding the influence of the individual differences of team members.

10.3. Personality Traits: as a Team Composition Input

Concerned with the measurement of personality traits*, Trait Theory* posits that personality traits are stable over time, differ between individuals, and influence behaviour (Staw et al., 1986, Staw and Ross, 1985). Sackett and Lievens (2008) reported sizeable relationships between Personality and important work outcomes (p.424), and a large number of studies have investigated the personality and performance relationship (Barrick et al., 2001, Tett et al., 1991, Tett and Christiansen, 2008); indicating that personality characteristics are likely to be good predictors of: *contextual performance* (Borman and Motowidlo, 1993, Motowidlo and Van Scotter, 1994, Van Scotter and Motowidlo, 1996); *Team Cohesion* (Van Vianen and De Dreu, 2001); and *Team Viability* (Barrick et al., 1998). Yet others have found that personality traits are an important input to *Team Composition* (Anderson, 2009, Barry and Stewart, 1997, Bell, 2007, Halfhill et al., 2005, Humphrey et al., 2009, Kramer et al., 2014, Neuman et al., 1999, Prewett et al., 2016, Quigley and Gardner, 2007).

10.3.1. Team Personality Traits

Team composition variables pose a particular problem. Although individual differences are defined at the individual level, team composition reflects the combinations of individuals that compose a team (Mohammed et al., 2002), and how their individual-level differences in traits combine at the team-level. Consequently, the relationship between team members' composition variables and team performance will likely be moderated by this operationalisation (Arthur Jr et al., 2007, Bell, 2007, p599). Therefore, when relating team composition variables, such as personality traits, to team-level criteria, such as team effectiveness, both the predictor and the criterion must be measured at the team level (Prewett et al., 2009, p.275). Team personality is viewed as the aggregation of team members' personality traits. Barrick et al. (1998) identifies a number of operationalisations using various team-level indices. For example: *mean, variance, minimum,* and *maximum* (Chan, 1998, Hofmann and Jones, 2005, Stewart, 2003).

10.3.2. Trait Oriented Approaches to Trait Aggregation

Trait oriented approaches differentiate between two personality characteristics of team composition: *elevation* and *variability* of a trait within a team (Barrick et al., 1998, Mohammed and Angell, 2003, Neuman et al., 1999, O'Neill and Allen, 2011). Aimed at optimising Team Performance, trait-oriented theories propose that team membership/composition choices should be guided by *person-team fit* in respect of *Supplementary* and *Complementary* personality traits. *Person-Team* fit is theoretically consistent with *Similarity Attraction* and *Attraction-Selection-Attrition* Theories discussed above. In this context, Similarity Attraction suggests that in absence of interference from other selection and composition methods, teams will be formed of individuals with broadly similar characteristics, regardless of whether the compound motivational effect of those characteristics are compatible with achieving performance goals, although they might. Similarly, the group phenomena resulting from the compilation of Team Personality traits is theoretically consistent with *Trait Activation Theory*, briefly outlined below.

10.3.3. Trait Aggregation: Team Personality and Performance

Prewett et al. (2009) compared results of meta-analyses focussing on the influence of each of the Big Five personality traits (Costa and McCrae, 1992) on Team Performance (with the exception of Openness to Experience as the theoretical approaches to this trait are different to the other *Big Five* factors). The results are summarised in Error! Reference source not f ound. in **Section 2.10.10** above. In general, it can be seen that each aggregation method broadly results in a POSITIVE effect, with the exception of VARIANCE. The consequences of trait aggregation have important implications that are explained by *Trait Activation Theory* and outlined below.

10.3.4. Trait Elevation: Linear or Curvilinear?

Much of the literature concerning the Personality-Performance relationship assumes that the relationship between them is linear. This can lead to a conclusion that *'more is better'*. This assumption has been challenged by a number of scholars who have gone on to call for more research into the nature of the curvilinear relationship between Personality and Performance (Murphy and Dzieweczynski, 2005, Ones et al., 2007, Le et al., 2011). This study has responded to these calls since despite the obvious importance for management practice, there are few empirical studies addressing this issue (Benson and Campbell, 2007, Carter et al., 2016, Cucina and Vasilopoulos, 2005, LaHuis et al., 2005, Le et al., 2011, Pierce and Aguinis, 2013, Robbins et al., 2006, Vasilopoulos et al., 2006, Vasilopoulos et al., 2007, Whetzel et al., 2010). In prior studies, some relationships have been found to be curvilinear, where higher mean trait levels may increase performance to a point, but very high (or very low) trait elevations may be counterproductive (Christiansen and Tett, 2013), and potentially *maladaptive*, resulting in unpredictable (or undesirable) outcomes (Mullins-Sweatt and Widiger, 2010, Ro and Clark, 2009, Ro and Clark, 2013).

10.3.5. Trait Activation (and Interaction)

Trait Activation Theory (TAT) (Allport, 1966, Kenrick and Funder, 1988, Tett and Guterman, 2000, Tett and Burnett, 2003, Tett et al., 2013) explains that as traits are latent propensities for individuals to behave in certain ways, in order for personality traits to be expressed, they require *situations* that provide trait relevant *situational cues* (Kenrick and Funder, 1988, Tett and Guterman, 2000, Tett and Christiansen, 2007). *Traits* and *situations* can therefore be considered to be two sides of the same coin (Eysenck and Eysenck, 1985). This theory presents an *interactionist* view of job performance, whereby certain situations at work allow the expression of specific underlying personality traits, which facilitate job performance (Tett and Burnett, 2003).

10.3.6. Team-level Effects and Trait Activation

The presence of team-level effects on individual behaviours arising from task characteristics, and/or from the *homogeneity*, or not, of team characteristics, is well established (Forsyth, 2018). Previous research on team performance has suggested that *homogeneous* teams tend to develop stronger team *norms* than more diverse teams (Kirkman et al., 2004b). For example, team research has illustrated that the dominant opinion within a team can influence the direction and magnitude of individual member opinions (Goethals and Zanna, 1979) since group identification increases commitment to shared goals, while triggering *hostile* behaviour towards *out-groups* (e.g., (Hogg and Hains, 1996, Hogg and Turner, 1987, Hogg and Williams, 2000). Therefore team member behaviour is partially governed by the *situation strength* associated with group norms (e.g., (Gelfand et al., 2006) as high elevations of common team personality traits create *situations* that contain the relevant cues necessary for the expression of individual trait related behaviours. In contrast, modest or low elevations of team personality traits create *situations* that constrain individual trait expression since other influencing factors will be more prominent. Because team homogeneity generally corresponds to stronger norms, it's reasonable to expect that greater heterogeneity in team personality traits would enable the expression of individual traits within the team. In particular, negative traits and behaviours are often more powerful in group contexts than positive ones (Baumeister et al., 2001). This phenomenon suggests that it may be increasingly difficult for team members to express traits associated with effective teamwork if other team members are lower on these traits. Conversely, assuming equivalent levels of team personality, trait diversity may lead to weaker *norms* for behaviour, allowing greater expression of individual personality traits as trait variance decreases the social pressures that in turn reduce the expression of individual personality traits. Thus, team trait diversity presents a complex system of relationships with team personality elevation. Taking this perspective, it is apparent that the elevation and diversity of Team Personality Traits is a key driver in exerting *top-down effects* (Prewett et al., 2016) on *norms of behaviours* and team-level outcomes, including performance. This has important implications for Team Composition, and on behaviours directed towards promoting team outcomes.

10.4. Team Neuroticism (Emotional Stability)

10.4.1. Neuroticism and Team Effectiveness

Emotional Stability has been associated with a number of phenomena related to interpersonal facilitation and interaction and may, therefore, contribute positively to teamwork, by creating a relaxed team atmosphere (Barrick et al., 1998, Molleman et al., 2004) that promotes stability, coordination and cooperation (Neuman et al., 1999), and task cohesion (Van Vianen and De Dreu, 2001), by reducing conflict and disruptive behaviour, enhancing Team Performance as a result, (Barrick et al., 2001, Driskell et al., 1987, Hough, 1992, Mount et al., 1998). It can therefore be concluded that elevated levels of Emotional Stability are expected to positively predict Team Performance (Barrick et al., 1998, Haythorn, 1953, Heslin, 1964, Kichuk and Wiesner, 1998, Molleman et al., 2004, Thoms et al., 1996) by creating a team context where members interact constructively and courteously (Ashton and Lee, 2007), bolstering service orientation and team member relations, as elevation in this trait is related to team cohesion and the effective management of disagreements between team members (Bradley et al., 2014, Bradley et al., 2013a, Bradley et al., 2013b, Bradley et al., 2012). Thus, teams that are generally high on trait Emotional Stability may encourage a positive social and emotional environment that is favourable, because it serves to motivate performance, a positive team atmosphere, and team outcomes. Conversely, a low elevation of trait Emotional Stability (Neuroticism) can lead to a negative and tense team climate, leading to a loss of motivation and morale (Driskell et al., 2006). In short, while research has suggested that homogeneous teams encourage the expression of individual traits in common with the group, the expression of personality traits that are adaptive for team performance depends on the elevation and variance in trait elevation across the team. Taken together, these results suggest that negative characteristics associated with Neuroticism, such as anger, anxiety, or mistrust, are more likely to be expressed if other team members also express them. Conversely, teams with strongly supportive interpersonal environments will cue the expression of positive traits associated with Emotional Stability. Thus, Emotional Stability should relate to performance when Team Emotional Stability elevation is high.

Results of studies reporting on heterogeneity in Emotional Stability between team members have been mixed (negative effect: Mohammed and Angell, 2003, Prewett et al., 2009, Stewart, 2003, positive effect: Neuman et al., 1999, Bell, 2007 (based on study in field setting not lab setting)), although given the concerns about the negative affect of even a few neurotic individuals in a team degrading team effectiveness, Emotional Stability is expected to present as a *supplementary trait*, but in a somewhat complex manner, i.e. trait variability should be related to Team Performance in that low variance at the positive pole of Emotional Stability (team members similarly high on Emotional Stability) should yield high Performance; whereas low variance at the negative pole (team members similarly low on Emotional Stability) should yield low Performance; and high variance (team members mixed on Emotional Stability) should yield moderate Performance - see Error! Reference source n ot found. in **Section 2.10.10** above. Moderated by Task Complexity, Le et al. (2011) found support for the hypothesis that the relationship between traits Emotional Stability and Task Performance were curvilinearly related such that the relationship is initially positive but becomes weaker as trait strength increases; the relationship subsequently diminishes and disappears as Emotional Stability increase further (p.114 and 116). Le et al. (2011) also found a curvilinear relationship with Neuroticism and Performance such that the relationship is initially positive but becomes weaker as trait strength increases; the effect subsequently diminishes and disappears as Emotional Stability increases further (p.114 and 116).

10.4.2. Main and Interaction Effects: Team Neuroticism and Team Effectiveness

In combination with theories of Similarity Attraction, which explain how the homogeneity of a team's inherent characteristics result in a dominant team situation and norms of behaviour, when teams are required to work interdependently, Trait Activation theory provides that Team Neuroticism is expected to differentially influence Team Effectiveness (Performance, Team Cohesion and Team Viability) depending upon the overall team trait elevation and variance in trait elevation across the team. This is due to the: negative impact that neurotic behaviours have on social interactions; and through the negative affect of behaviours activated within a neurotic team faced with the perception of uncertainty, external threats, work pressure and/or role stress. Previous studies also report that Neuroticism is expected to be curvilinearly related to team outcomes (Le et al., 2011p.114 and 116). This led to the evaluation of a number of hypotheses, **H1.1 to H1.6** – see **Chapter 4**.

In this study, support was found for hypothesis **H1.1** - that Mean Team Neuroticism will have a CONVEX curvilinear relationship with Performance (p = .005). This finding is consistent with previous reports of curvilinearity (Le et al., 2011), which explained that the relationship was initially positive but became weaker as trait strength increased, thereafter the relationship diminishes and disappears (p.114 and 116). This is entirely consistent with the notion that, devoid of other strong situational influences, a highly neurotic team will activate neurotic traits resulting in negative affect that is inconsistent with promoting team outcomes. This is compounded by the finding that negative emotions in one individual will transmit to the wider team (Barsade, 2002), and the effects of negative emotions last longer than those of positive emotions (Rein et al., 1995). This is referred to as the *bad apple effect* (Felps et al., 2006).

The remaining hypotheses relating to the main and interaction effects between Team Neuroticism and Team Effectiveness variables were all rejected. However, a significant, (unhypothesised) NEGATIVE main effect was found between Team Neuroticism and Team Cohesion. This is also consistent with previous studies, and the earlier explanation.

10.4.3. Conditional Effects: Team Neuroticism, Team Boundary Management and Team Effectiveness

A number of Hypotheses were developed for the conditional two-way interaction effects between Team Neuroticism, Team Boundary Management and Team Effectiveness, i.e. **H1.7 to H1.15** – see **Chapter 4**.

Although various conditional effects were reported, support was only found for hypothesis **H1.10** - that Team Boundary Spanning will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Cohesion (p = .028) see **Chapter 4, Figure 5.3** Simple Slope analysis indicates that Team Cohesion decreases when Neuroticism and Boundary Spanning are HIGH, but Team Cohesion reduces, to a point, and then increases again as Neuroticism increases when Boundary Spanning is LOW. The implication of this for practice is that Team Cohesion is optimal when Team Neuroticism is LOW, regardless of whether Boundary Spanning is LOW or HIGH. In contrast, even modest increases in Team Neuroticism diminish Team Cohesion when Boundary Spanning is HIGH. The finding that that Boundary Spanning moderates the concave curvilinear association between Team Neuroticism and Team Cohesion is important, since earlier studies have reported that those who carry out Boundary Spanning, while gaining status and influence, also experience *role overload* as a result of facing simultaneous and often conflicting demands (Kahn et al., 1964, Katz and Kahn, 1978). This creates a dilemma for those concerned. Whilst teams engaged in Boundary Spanning can improve Performance by managing their external environments more effectively, in doing so, team members may experience role overload and stress response that is detrimental to the team's cohesion and viability. Addressing this paradox has important practical implications. This result suggests that the previously reported negative affect associated with Boundary Spanning is also common at the team level, and individuals that have even modest levels of Neuroticism are especially sensitive to role-stress.

The remaining hypotheses relating to the conditional effects between Team Neuroticism, Team Boundary Management and Team Effectiveness were all rejected. However, a number of unhypothesised conditional effects were noted. For example, this study found that Team Boundary Buffering, and Team Boundary Reinforcement, moderated the NEGATIVE relationship between Team Neuroticism and Performance (p = .001). Analysis of Simple Slopes indicated that when Boundary Buffering is HIGH, an increase in Neuroticism is associated with a significant decrease in Performance. A similar pattern was noted for Team Neuroticism, Boundary Reinforcement and Performance (p = .002). Since Boundary Buffering and Reinforcement are both inward looking, intra-team activities aimed at tightening the team's boundaries against external pressures, and strengthening the team's identify, it's possible that the intensive social interactions required to facilitate these team processes present challenges for teams of highly neurotic individuals, since behaviours associated with negative affect become activated, perhaps through the facets of neuroticism, like *Anxiety*, or *Vulnerability* (to stress).

Finally, Team Boundary Spanning moderated the NEGATIVE relationship between Team Neuroticism and Team Viability in a similar pattern, namely, where Boundary Spanning is HIGH, an increase in Neuroticism is associated with a significant decrease in Team Viability (p = .043). Although Boundary Spanning is an externally facing process, this relationship is similar to that with Boundary Buffering and Reinforcement in that the negative affect associated with the stress response of a highly neurotic team will not be conducive to the positive, harmonious relations required to increase team viability.

10.5. Team Extraversion

10.5.1. Extraversion and Team Effectiveness

Presenting itself as a *complementary* trait, Extraversion is important to the smooth functioning of social mechanisms within a team, and is therefore strongly linked to intra-team processes and contextual Performance (Borman and Motowidlo, 1993). Characterised as the extent to which individuals are: assertive, active, friendly, enthusiastic, energetic, upbeat, optimistic, social, talkative, high spirited and generally outgoing, (Costa and McCrae, 1992), extraverts like to be around people, they crave excitement and stimulation, and tend to have a cheerful disposition. Therefore, through a process described by *Trait Activation Theory*, a positive relationship is expected between mean levels of Team Extraversion and Team Performance, e.g. (Barrick et al., 1998, Bell, 2007). Teams high in Extraversion tend also to have higher Team Viability (Barrick et al., 1998). In contrast, individuals who have low levels of Extraversion are introverted, reserved, serious, value privacy and prefer to be alone, or in the company of a few close friends (Costa and McCrae, 1992), have lower social skills (Riggio, 1986), find it more difficult to approach and engage others in social interactions (Diener et al., 1984), attain lower status in social groups (Anderson et al., 2001), and find social situations less rewarding (Lucas et al., 2000).

Despite the benefits associated with having extraverted individuals in a team, researchers have reported that too many high extroverts may be detrimental to Team Performance. Since extroverts tend to like to working in teams merely for the social interaction it provides them (Neuman et al., 1999), it is thought to distract attention from task completion (Barry and Stewart, 1997, Mohammed and Angell, 2003). Similarly, their tendency to be talkative and assertive predisposes them to dominant behaviours (Kichuk and Wiesner, 1998), and too many dominant individuals in the same team will likely result in conflict over team issues (Mazur, 1973) such as leadership (Barry and Stewart, 1997, Mohammed and Angell, 2003). Furthermore, Extraverts tend to be more noticeable in a social group (Hogan, 1991), which can draw them into conflict, and make them a target for negative affect (Vodosek, 2003). Referred to as the *'Dark Side'* of Extraversion (Hogan and Hogan, 2001, Judge et al., 2009), the negative attributes of high extraverts, i.e. inability to listen, unreceptive to other's input, etc., degrades their status as teams interact over time. This is particularly so where high degrees of interdependent working forces interactions (Bendersky and Parikh Shah, 2013: p.389) and teams composed of individuals who are dominant can stimulate friction, and result in teams composed of many leaders and no followers (Barrick et al., 1998, Barry and Stewart, 1997).

Dissonant with much of the literature, some scholars have argued that *homogeneity* rather that heterogeneity at high elevations of Team Extraversion may positively relate to team performance (Humphrey et al., 2007). This contrasts with the majority of personality and performance research which proposes that variance in Extraversion across the team promotes performance, while trait similarity at the high pole results in unproductive competition for status and leadership influence to the detriment of other important roles and team goals (Barry and Stewart, 1997). However, empirical research has generally not supported the variance hypothesis (Bell, 2007, Prewett et al., 2009) as generally weak correlations suggest that competition for status can be constructive, perhaps by encouraging members to exert more effort toward team goal attainment. Meanwhile low variance in team Extraversion may strengthen group norms of behaviour, and encourage shared leadership, which is associated with positive outcomes (Carson et al., 2007).

Furthermore, Extraversion involves more than *dominance* and need for *power* and *influence*. It also includes *sociability* and *friendliness*, both which are characteristics that may lead to cooperation and positive affectivity when maximized at the team level (McNiel and Fleeson, 2006). From this perspective, high elevations of Team Extraversion will tend to create an environmental *situation* that *activates* the expression of Extraversion through participation in team discussions and coordinated activities, as extraverted teams will likely *activate* extraverted behaviours in their members. Conversely, extraverted members on an otherwise *introverted* team may feel inhibited in the presence of introverted team members, leading to dissatisfaction and de-motivation, a dynamic that is also supported by the *Attraction Paradigm* (Byrne et al., 1971, Byrne and Griffitt, 1969, Byrne et al., 1967, Byrne, 1971). Introversion is likely to yield poor individual performance in teams, regardless of trait elevation in the rest of the team. If these expectations are true, then the relationship between Extraversion and performance will be stronger when team-level elevation of Extraversion is high, and variance is low; and weaker when team-level Extraversion is low, or variance in trait elevation is high.

Notionally consistent with this, a curvilinear relationship has been found in previous studies of Extraversion elevation and Team Performance (Peeters et al., 2006b), where intermediate levels of Extraversion (Barry and Stewart, 1997, Bell, 2007), and heterogeneity of Extraversion elevation (Humphrey et al., 2007, 2011) have influenced Team Performance. Driskell et al. (1987) have also suggested a curvilinear relationship between *sociability* and team effectiveness, implying that high mean sociability may interfere with instrumental task activities. Similarly, a team composed of dominant individuals can stimulate friction, and result in a team composed of all leaders and no followers (Barrick et al., 1998, Barry and Stewart, 1997). Research suggests that dominant team members tend to engender less positive interpersonal relations (Driskell et al., 1993) and are less likely to attentive to the task inputs of other team members in decision making (Driskell and Salas, 1992), (Christiansen and Tett, 2013, p.748).

10.5.2. Main and Interaction Effects: Team Extraversion and Team Effectiveness

In combination with theories of Similarity Attraction, which explain how the homogeneity of a team's inherent characteristics result in a dominant team situation and group norms of behaviour, when teams are required to work interdependently, Trait Activation theory provides that Team Extraversion will differentially influence Team Effectiveness (Performance, Team Cohesion and Team Viability) depending upon team trait elevation and variance in trait elevation across the team. Theory also suggests that the relationship is expected to be curvilinear in keeping with previous findings (Le et al., 2011p.114 and 116). This led to the development and evaluation of a number of Hypotheses, **H2.1 to H2.6** – see **Chapter 5**.

No main or interaction effects were found between Team Extraversion and Performance. This is not entirely unexpected as results of previous studies have been equivocal, suggesting a complex pattern of relationships at trait and sub-trait facet level.

Support was found for **Hypothesis H2.3** – that Mean Team Extraversion will have a CONCAVE curvilinear relationship with Team Cohesion (p = .023). This directionally suggests that elevation and variance in Team Extraversion may be important to Team Cohesion, although the associated curvilinear relationship hypothesised in **H2.4** was rejected. However, a significant (unhypothesised) NEGATIVE linear interaction was noted between *Mean* and *Deviation* Extraversion on Team Viability (p = .002), similarly, a two-way interaction on Team Cohesion (p = .079). These results indicate that where VARIANCE in Team Extraversion is HIGH, increases in Extraversion are associated with significant decreases in Team Viability (and Team Cohesion); conversely where variance in Team Extraversion is LOW, an increase in Extraversion is associated with an increase in Team Viability (and Team Cohesion). Although this is consistent with some previous reports (Prewett et al., 2016), it is an important finding because, as Prewett notes, the majority of the personality-performance literature tends to report that variance in Team Extraversion is beneficial to team outcomes, rather than detrimental, as this result suggests. This is consistent with the Trait Activation paradigm in that homogeneity of Team Extraversion at the high pole will activate trait Extraversion leading to the expression of Extraverted behaviours by team members. However, this is not without constraints. While, at the facet level of Extraversion, high elevations of: *Warmth*, *Gregariousness* and/or *Positive Emotions* could each be complementary to Team Cohesion and Team Viability, high elevations of facet *Assertiveness/Social Dominance* may not. A facet level analysis was not undertaken in this study and, in any event, would not yield reliable results using the short version of the FFM. Consequently, the explanation of the results is not definitive.

10.5.3. Conditional Effects: Team Extraversion, Team Boundary Management and Team Effectiveness

Extraversion is known to be a pro-social trait, and, in this study, it was found to predict Team Cohesion and Team Viability by this study, when moderated by each of the Team Boundary Management activities (Boundary Spanning, Buffering and Reinforcement). For example: Support was found for Hypothesis **H2.10 -** that Team Boundary Spanning will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Cohesion

(p = .013). Analysis of Simple Slopes showed that Team Cohesion increased, to a point, and then decreased again as Extraversion increases when Boundary Spanning is HIGH. The Simple Slope in **Chapter 5, Section 5.5.1** illustrates the likely nature of this relationship, that when Boundary Spanning is HIGH, Team Cohesion is optimal with moderate levels of Extraversion, because the combination of high levels of Team Boundary Spanning and high elevations Team Extraversion diminish Team Cohesion. This has important implications for team composition and is consistent with the *Attraction* and *Activation* paradigms. Extraverted individuals will be attracted to extraverted teams and extraverted teams are likely to recruit extraverted team members. In turn, highly extraverted teams will activate extraverted behaviour, in particular, the *Sociability* and/or *Dominance* facets of Extraversion. The opportunity provided by Team Boundary Spanning to socialise more widely creates a strong situational cue, which may tend to disrupt Team Cohesion, either through distractions to team goal completion, or conflict associated with dominant behaviours. A broadly similar pattern was noted with the relationship between Team Extraversion, Team Boundary Reinforcement, and Team Cohesion, except the decline in Team Cohesion is more dramatic when Boundary Reinforcement and Extraversion are very high – see the Simple Slope Test shown in **Chapter 5, Section 5.5.3.** Consequently, support was found for Hypothesis **H2.12 -** that Team Boundary Reinforcement will moderate the CONVEX curvilinear association between Mean Team Neuroticism and Team Cohesion (p = .004). Analysis of Simple Slopes showed that Team Cohesion increased, to a point, and then decreased again as Extraversion increased AND when Boundary Reinforcement was HIGH; conversely, Team Cohesion increased with Extraversion when Boundary Reinforcement is LOW. This also has important implications for team composition that are consistent with the earlier explanation that highly extraverted teams will activate extraverted behaviour, in particular, the *Dominance* facet of Extraversion. An internally focussed activity, the opportunity to *socialise* afforded by Team Boundary Reinforcement, may disrupt Team Cohesion due to the increased risk of friction, unproductive conflict and disagreements about leadership roles (Bendersky and Parikh Shah, 2013: p.389).

Support was also found for Hypothesis **H2.13** – that Team Boundary Spanning will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Viability (p = .019). In this case the analysis of Simple Slopes revealed that Team Viability increases, to a point, and then decreases again as Extraversion increases AND when Boundary Spanning is HIGH; conversely, Team Viability increases with Extraversion when Boundary Spanning is LOW – see **Chapter 5, Section 5.6.1**. This nature of this relationship accords with previous explanations. Further, the scenario of high Team Boundary Spanning creates the strong situational cue leading to the likelihood that *too* *much, or too little* Extraversion is detrimental to team outcomes (e.g. Grant and Schwartz, 2011, Le et al., 2011, Vergauwe et al., 2017).

Support was also found for Hypothesis **H2.14** – that Team Boundary Buffering will moderate the CONVEX curvilinear association between Mean Team Neuroticism and Team Viability (p = .031). In this case, Team Viability decreases, to a point, and then increases again as Extraversion increases AND when Boundary Buffering is HIGH; conversely, Team Viability decreases when Extraversion is HIGH, and Boundary Buffering is LOW. The analysis of Simple Slopes shown in **Chapter 5, Section 5.6.2** suggests that Team Viability may be optimal when Boundary Buffering and Extraversion are both HIGH, indicating that the combination of HIGH Team Extraversion and HIGH Team Buffering are beneficial. The explanation of this relationship is consistent with the Activation paradigm and previous explanations.

10.6. Team Openness to Experience

10.6.1. Trait Expression: Openness

10.6.2. Openness and Team Effectiveness

This lack of criterion-related validity is puzzling, since it seems reasonable to suggest that individuals who are inquisitive when faced with novel situations, adapt to change, and are creative problem solvers, would be amongst the highest of performers (Griffin and Hesketh, 2004: p.243). McCrae (1996) reports that, compared with the other four factors, Openness may have a key central influence on interpersonal and social phenomena as individuals who are curious and open-minded must have an interest in getting to know others both inside and outside of their social network. However, results of previous studies are equivocal (positive: Bell, 2007, Neuman et al., 1999, Stewart, 2003, negative: Van Vianen and De Dreu, 2001 (student sample)). Openness is suggested to be a better predictor when situations are novel or complex (Griffin and Hesketh, 2004), where there is increased likelihood of task-conflict (Antonioni, 1998), where its ability to predict Performance is contingent upon the outcome studied, (Barrick et al., 2005). Openness to experience may be associated with Performance to the extent that individuals high on this trait are more adaptable and responsive to the changes required to continue in a dynamic team environment, (LePine, 2003), and may perform at a higher level than their less-open team mates over the long term (Minbashian et al., 2013). Despite this, a team that is high in Openness to Experience might experience greater conflict, and low task-cohesion since the attraction of something new would distract focus from task Performance (Van Vianen and

De Dreu, 2001). High elevations of Team Openness should facilitate member adaptability and help members resolve unique or complex challenges. For example, some studies have found that teams with greater openness were more successful in adapting to changing contexts in decision-making (LePine et al., 2000), likely explained because member adaptability is predicted by individual-level Openness to Experience. This is particularly appropriate to project teams. However, it's also appropriate to argue that team member adaptability is enabled by the flexibility of other team members. That is, individual flexibility and imagination may be constrained if other team members fail to reciprocate. Therefore, supported by *Trait Activation*, it is expected that high elevation of Team Openness will positively relate to Team Performance since team elevation on Openness should enable the expression of member flexibility across the team. Conversely, members who are otherwise flexible may hesitate to express flexibility if other members behave inflexibly, since behaving flexibly when others are not should violate norms for reciprocity and perceptions of fairness (Blau, 1964), thus discouraging flexibility in future work interactions. There is little empirical evidence of the impact of variability in Openness in research studies although one can intuitively conclude that individuals at the polar extremes are unlikely to have satisfactory and productive relationships. Openness is thought to function as a *complementary trait*, as teams composed only of team members who are highly creative or intellectually oriented may never get past the point of exploring options (Humphrey et al., 2007). Thus, heterogeneity in team member Openness may lead to higher Team Performance, especially when task conditions are uncertain and dynamic.

10.6.3. Main and Interaction Effects: Team Openness and Team Effectiveness

The Similarity paradigm provides that the homogeneity of a team's inherent characteristics results in a dominant team situation and strong group norms of behaviour. When teams are required to work interdependently, Trait Activation suggests that Team Openness will differentially influence Team Effectiveness (Performance, Team Cohesion and Team Viability) depending upon team trait elevation and variance in trait elevation across the team. Consequently, a number of hypotheses were developed, i.e. see **H3.1** to **H3.2** in **Chapter 6**. However, no main or interaction effects were found between Team Openness and any of the Team outcomes included in this study. This was consistent with findings in previous studies that have noted weak and generally inconclusive relationships between Openness and a variety of team outcomes. The reasons for the absence of effects in this study are not entirely clear except to suggest that the underlying facets of openness may not be conceptually consistent Team Effectiveness, a concern voiced by previous researchers (Prewett et al., 2016).

10.6.4. Conditional Effects: Team Openness, Team Boundary Management and Team Effectiveness

Support was found for the hypothesised linear two-way interaction suggested by hypothesis **H3.4** – that moderated by Boundary Buffering, Mean Team Openness will be NEGATIVELY associated with Performance (p = .033). Analysis of Simple Slopes indicates that Performance declined as Openness increased when Boundary Buffering was HIGH; conversely, Performance increased as Openness increased when Boundary Buffering is LOW. This suggests that the characteristics associated with high Team Openness are not complementary to Team Boundary Buffering activities. Additional (unhypothesised) post-hoc analysis examined for possible three-way interactions with Interdependence. Error! Reference source not found.**Figure 7.2** in **Chapter 6, Section 6.4.2** shows a significant three-way interaction between Openness, Boundary Buffering and Task Interdependence on Performance (p = .003). Results from the Slope Difference Test indicate that Performance will increase as Openness increases but only where Boundary Buffering AND Task Interdependence are LOW, otherwise Performance declines. So, Openness is only accretive to Performance when Boundary Buffering and Task Interdependence are minimal. Given the absence of a main effect between Team Openness and Performance, this result is a little confusing. Perhaps the *Values* facet of Openness activates in the presence of low levels of Team Boundary Buffering when Task Interdependence is low. Otherwise, increasing Task Interdependence might provide a strong situation resulting in other Openness facets being activated, i.e. *Actions* and *Ideas*, perhaps resulting in a pursuit of novelty, or other activities that are detrimental to performance.

10.7. Team Agreeableness

10.7.1. Trait Expression: Agreeableness

Individuals high in Agreeableness can be characterised as being: courteous, friendly, tolerant, cooperative, considerate, modest, trustworthy, helpful, altruistic, empathetic, and caring (Costa and McCrae, 1992); they are non-competitive (Graziano et al., 1997) and conflict averse in their social interactions (Graziano, 1994). Therefore, Agreeableness is expected to manifest itself through its positive affect in team social processes and contextual performance (Peeters et al., 2006a). Of all of the Big Five traits, Agreeableness may be the trait that is most concerned with interpersonal relationships (Graziano et al., 1996). It is therefore expected to have high predictive validity for tasks requiring collaboration, positive social-relations (Barrick et al., 2001), and pro-social behaviours (Stewart et al., 2005, Mumford et al., 2008). Agreeableness predicts social-role behaviours

(Stewart et al., 2005, Mumford et al., 2008), consequently, agreeable team members tend to adopt social-based roles (Prewett et al., 2009), and they excel at interpersonal facilitation (Hurtz and Donovan, 2000, Mount et al., 1998, Neuman et al., 1999, Van Scotter and Motowidlo, 1996), cooperation (Barrick et al., 1998, Mohammed et al., 2002, Neuman and Wright, 1999, Taggar, 2002), conflict resolution (Barrick et al., 1998, Neuman and Wright, 1999, Taggar, 2002), open communication (Neuman and Wright, 1999), information seeking (Taggar, 2002), compliance with team goals, and alignment (Klimoski and Mohammed, 1994, Van Vianen and De Dreu, 2001). In contrast, individuals who are low in Agreeableness tend to be direct, uncaring, intolerant, unsympathetic, critical, sceptical, hard-headed and competitive (Costa Jr and McCrae, 1992), and consequently are rated (by others) as less socially desirability (Graziano et al., 1996).

10.7.2. Agreeableness and Team Effectiveness

Prewett et al. (2009) found that mean team member agreeableness predicted team performance on complex tasks requiring intensive collaboration, but not on simple tasks requiring simple pooled contributions (Christiansen and Tett, 2013, p.764). However, research on the relationship between Agreeableness and team outcomes is equivocal (Rothstein and Goffin, 2006). Empirical studies generally confirm that higher levels of Agreeableness tend to lead to higher Team Performance (Barrick et al., 1998, Graziano et al., 1997, Kozlowski and Ilgen, 2006, Neuman et al., 1999, Neuman and Wright, 1999, Van Vianen and De Dreu, 2001) and create a context where members are expected to interact constructively and courteously (Ashton and Lee, 2007), which should bolster service orientation and positive team member relations. Elevation in this trait is related to Team Cohesion and the effective management of disagreements between team members (Bradley et al., 2014, Bradley et al., 2013a, Bradley et al., 2013b, Bradley et al., 2012). Thus, teams that are generally high on this trait may encourage a positive social environment that serves to motivate member performance and positive team outcomes. Given the social nature of the inter and intra-team interactions that lie at the heart of Boundary Management, it is reasonable to expect that this trait is especially salient to Team Boundary Management activities, such as Boundary Spanning, Buffering and Reinforcement, each of which relies on the types of characteristics associated with this trait.

However, previous studies have found that having just a single team member that is low in Agreeableness may be disruptive and negatively impact Performance (Barrick et al., 1998, Bell, 2007). Referred to as the *bad apple effect* (Felps et al., 2006), low elevation in this trait can lead to a negative and tense team climate, eroding individual motivation and morale (Driskell et al., 2006). Empirical studies have indicated that negative emotions in one individual are readily adopted by others (Barsade, 2002), and the physiological effects of negative emotions tend to be longer lasting than those of positive emotions (Rein, McCraty, & Atkinson, 1995). Consistent with *Trait Activation*, these reports suggest that the negative characteristics associated with low trait Agreeableness are more likely to be expressed if other team members also express them; whereas teams with strongly supportive interpersonal environments will tend to express positive traits associated with Agreeableness. Thus, Team Agreeableness should relate to positive team outcomes when elevation of Team Agreeableness is high. Consequently, Trait Agreeableness is expected to function as a *supplemental* trait where the presence of several disagreeable team members, can disrupt Team Performance. In contrast, low variance of high trait Agreeableness will yield high Performance, while low variance of low trait Agreeableness will yield lower Performance (Mohammed and Angell, 2003, Bradley, 2008, Felps et al., 2006). Finally, a number of studies have demonstrated a curvilinear relationship between personality traits and problematic outcomes, indicating that both low and high trait elevations can be associated with decreased performance (Benson and Campbell, 2007, Carter et al., 2014, Carter et al., 2016, Cho et al., 2017, Cucina and Vasilopoulos, 2005, Grant and Schwartz, 2011, LaHuis et al., 2005, Le et al., 2011, Murphy and Dzieweczynski, 2005, Ones et al., 2007, Pierce and Aguinis, 2013, Robbins et al., 2006, Vasilopoulos et al., 2006, Vasilopoulos et al., 2007, Vergauwe et al., 2017, Whetzel et al., 2010).

10.7.3. Main and Interaction Effects: Team Agreeableness and Team Effectiveness

The *Similarity* paradigm provides that the homogeneity of a team's inherent characteristics results in a dominant team situation and strong group norms of behaviour. When teams are required to work interdependently, Trait Activation suggests that Team Agreeableness will differentially influence Team Effectiveness (Performance, Team Cohesion and Team Viability) depending upon team trait elevation and variance in trait elevation across the team. Consequently, a number of hypotheses were developed, i.e. see **H4.1** to **H4.6** in **Chapter 7**. As with Extraversion, Trait Agreeableness is strongly associated with pro-social behaviours and a variety of hypothesised, and unhypothesised, main and interaction effects were found by this study. For example, although no curvilinear main effects were found, a significant two-way CONCAVE curvilinear interaction was found between Mean-squared and Deviation Team Agreeableness on Performance (p = .044) providing support for Hypothesis **H4.2** – that Deviation in Team Agreeableness will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Performance. It seems intuitively obvious that variance in Team Agreeableness, or the underlying facets of the trait, like *Straightforwardness*, or *Compliance*, would yield lower performance, perhaps through disagreements and unproductive conflict.

A similar relationship was noted with Team Cohesion, providing support for Hypothesis **H4.4** – that Deviation in Team Agreeableness will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Team Cohesion (p = .015). The nature of both relationships followed a similar pattern. In the case of **H4.2**, Performance was found to increase as Team Agreeableness increased when VARIANCE in Team Agreeableness was LOW; conversely, Performance decreased as Agreeableness increased when VARIANCE in Team Agreeableness was HIGH. In the case **H4.4**, Team Cohesion declined, to a point, and then increased again as Agreeableness increased and when VARIANCE in Agreeableness was LOW. Conversely, Team Cohesion decreased as Agreeableness increased when variance in Agreeableness was HIGH. This result is consistent with previous reports and supported by *Trait Activation,* whereby variance in Team Agreeableness weakens the *situation* resulting in less agreeable behaviours being expressed by some team members.

10.7.4. Conditional Effects: Team Trait Agreeableness, Team Boundary Management and Team Effectiveness

A variety of significant hypothesised (**H4.7** to **H4.15**) and unhypothesised conditional effects were found between Team Agreeableness, Team Boundary Management and Team Effectiveness Outcomes. For example: a concave curvilinear two-way interaction between Agreeableness and Boundary Buffering on Performance (p = .077) provided partial support for Hypothesis **H4.8** – that Team Boundary Buffering will moderate the CONCAVE curvilinear association between Mean Team Agreeableness and Performance. However, the inconclusive nature of the relationship was clarified by further analysis that revealed a significant (p = .007) unhypothesised, POSITIVE linear relationship. Analysis of Simple Slopes indicated that when Boundary Buffering was HIGH, an increase in Agreeableness resulted in an increase in Performance, conversely when Boundary Buffering was LOW, an increase in Agreeableness resulted in a slight increase in Performance. This is theoretically consistent with Trait Activation since a highly agreeable team undertaking a mutually rewarding Boundary Buffering activity that provides team members with scope for agreeable behaviour will likely result in higher performance. Further post-hoc analysis revealed an (unhypothesised) three-way interaction further elaborating this relationship. Analysis of Simple Slopes revealed that when Boundary Buffering is HIGH there is an increase in Performance as Agreeableness increases, but only when Team Interdependence is LOW, as Team Interdependence NEGATIVELY moderates the Team Agreeableness, Boundary Buffering and Performance relationship. The consequence for team composition is that, considering the inclusion of *Collaboration* as a covariate, Team Interdependence presents a stronger *situation* (motivational influence) than do the behavioural norms associated with a highly Agreeable team. Perhaps the characteristics associated with the underlying facets of this trait, like *Altruism*, are particularly susceptible to being expressed in the face of external demands for assistance, making agreeable team members an obvious target for other Boundary Spanning teams to the detriment of the performance contribution they may make to their own team. This creates a dilemma for highly Agreeable teams – finding an appropriate balance between promoting their own performance and being good *Corporate Citizens*.

A CONCAVE curvilinear interaction was found between Agreeableness and Boundary Reinforcement on Performance (p = .055) lending partial support to Hypothesis **H4.9** – that Team Boundary Reinforcement will moderate the CONCAVE curvilinear association between Mean Team Agreeableness and Performance. However, a more significant (p = .031) (unhypothesised) POSITIVE linear conditional effect was found between Team Agreeableness and Team Boundary Reinforcement with a broadly similar pattern of effects to the previous example, i.e. HIGH Team Agreeableness and HIGH Boundary Reinforcement will increase Performance. In this case, the activities involved in Boundary Reinforcement, developing the team's sense of identity around a shared sense of purpose is particularly appropriate to highly agreeable teams.

Although **Hypothesis H4.10** – that Team Boundary Spanning will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Team Cohesion was rejected (p = .423), a significant (unhypothesised) POSITIVE two-way linear effect was found (p = .004). Analysis of Simple Slopes shows that Team Cohesion increases when Boundary Spanning and Agreeableness are both HIGH. This relationship is explained by Trait Activation in that a highly Agreeable team would create strong situation, activating agreeable traits that manifest as agreeable behaviours when provided with the opportunity to express *altruistic* behaviour while Boundary Spanning. This was further illumined by a post-hoc analysis finding an unhypothesised three-way interaction between Agreeableness, Boundary Spanning and Task Interdependence on Team Cohesion (p = .024). The analysis of Simple Slopes showed that where Boundary Spanning is LOW and Task Interdependence is HIGH, Team Cohesion decreases as Agreeableness increases. Conversely, when Team Agreeableness, Boundary Spanning and Task Interdependence are all HIGH, Team Cohesion will increase. This may be explained in that high Team Agreeableness and high Task Interdependence provide strong situations that activates the expression of agreeable behaviours – within the team and with other teams. Meanwhile Boundary Spanning provides the *basis* upon which those behaviours can be expressed and resulting and an increase in cohesion. In absence of boundary spanning, cohesion declines. When activated, the *Altruism* facet of trait Agreeableness creates a desire to help;

Interdependence creates a *demand* for help, and boundary spanning provides the basis by which the two might be matched.

A significant CONVEX quadratic interaction between Agreeableness and Boundary Buffering on Team Cohesion was found (p = .042) lending support to hypothesis **H4.11** – that Team Boundary Buffering will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Team Cohesion. In this case, the analysis of Simple Slopes suggests that Team Cohesion increases as Agreeableness increases when Boundary Buffering is HIGH. However, it would seem that even moderate reductions in trait elevation or increases in variability in Team Agreeableness when Boundary Buffering is HIGH, are likely to diminish Team Cohesion; perhaps as the demands associated with boundary tightening activities challenge the social relations within the team by reducing *Trust* or *Compliance* – both of which are underlying facets of Agreeableness.

Finally, and following a similar pattern to the previous example, a significant two-way CONVEX quadratic interaction effect was found between Agreeableness and Boundary Buffering on Team Viability (p = .012) lending support to Hypothesis **H4.14** – that Team Boundary Buffering will moderate the CONVEX curvilinear association between Mean Team Agreeableness and Team Viability. Analysis of Simple Slopes shows that Team Viability increases when Agreeableness and Boundary Buffering are both HIGH, but even moderate reductions in trait elevation, or increases in variability in Agreeableness, are likely to be detrimental to Team Viability as the demands associated with boundary tightening activities challenge the social relations within the team.

10.8. Team Conscientiousness

10.8.1. Team Conscientiousness and Team Effectiveness

Previous studies have found that elevated levels of Conscientiousness have consistently provided the strongest predictors of Team Performance (Barrick and Mount, 1993, 1998, 2001, Bell, 2007, Bergner et al., 2010, Hurtz and Donovan, 2000, Lepine et al., 1997, Mohammed and Angell, 2003, Neuman et al., 1999, Neuman and Wright, 1999, Peeters et al., 2006a, Salgado, 2003, Salgado et al., 2013, Van Vianen and De Dreu, 2001). Consequently, researchers expect this trait to result in effort and perseverance towards team goals (LePine, 2003, Mohammed and Angell, 2003, Molleman et al., 2004, Neuman and Wright, 1999, Van Vianen and De Dreu, 2001), task commitment (Barry and Stewart, 1997, Taggar, 2002), cooperation (Molleman et al., 2004), and adaptability in the face of change (LePine, 2003). Trait elevation in Team Conscientiousness will create a context where member effort is encouraged and social-loafing is discouraged, thus improving the work effort from team members. For example, individuals high in Conscientiousness are more likely to engage in *backing-up* behaviours and other forms of contextual performance (Morgeson et al., 2005). These behaviours can further reinforce proscriptive performance norms and communicate strong behavioural expectations to team members (Cialdini and Trost, 1998). A more Conscientious team should create a context in which member Conscientiousness is encouraged and rewarded, thus eliciting greater activation in trait Conscientiousness for those who are predisposed to behave that way (Mohammed and Angell, 2003). Conversely, a low conscientious team member is more likely to withhold effort, initiating feelings of inequity in more conscientious team members. Thus, rather than activating behaviours associated with Conscientiousness, social-loafing by even one team member may result in other team members reducing their contributions as a means of restoring equity. This phenomenon is known as the *sucker effect* (Hart et al., 2001). Conscientiousness presents itself as a *supplementary* trait and is thought to combine additively such that the higher the mean level of Conscientiousness within the team, the more effectively the team will perform (Christiansen and Tett, 2013, p.750). Van Vianen and De Dreu (2001) report that homogeneity of trait Conscientiousness will lead to Team Cohesion. In contrast, heterogeneity, or variability, of Conscientiousness may lead to conflict, morale disengagement, including shirking, free-riding (or social loafing) (Humphrey et al., 2007), and Performance loss (Mohammed and Angell, 2003, Molleman et al., 2004). Therefore, lower variation in Conscientiousness at the high pole of Conscientiousness is likely to be positively associated with higher levels of Team Effectiveness (Barrick et al., 1998, Halfhill et al., 2005, Humphrey et al., 2007, 2011, Kichuk, 1996, Kichuk and Wiesner, 1998, Peeters et al., 2006a).

Moderated by Task Complexity, Le et al. (2011) found support for the hypothesis that the relationship between traits Conscientiousness and Task Performance were curvilinearly related such that the relationship is initially positive but becomes weaker as trait strength increases; the relationship subsequently diminishes and disappears as Conscientiousness increase further (p.114 and 116). Indeed, in this example, it was rationalised that, beyond a certain point, high Conscientiousness may no longer promote Task Performance because excessively conscientious individuals can be overly rigid, inflexible, and compulsive perfectionists that pay too much attention to small details while overlooking more important goals (Mount et al., 2008, Tett, 1998). Further, highly conscientious people are likely to be more prone to self-deception and rigidity, which may inhibit learning new skills or acquiring new knowledge, ultimately leading to lower Performance (LePine et al., 2000, Martocchio and Judge, 1997), and Moscoso and Salgado (2004) argued that extreme levels of Conscientiousness and Emotional Stability are known to result in maladaptive behaviour and may not be beneficial to Job Performance at all (p. 360). Given the differential relationships previously reported, the relationship between Team Conscientiousness, between Conscientiousness, Team Boundary Management (Boundary Spanning, Buffering, and Reinforcement)and Team Effectiveness (Performance, Team Cohesion and Team Viability) are expected to be curvilinear, in keeping with previously reported findings (Le et al., 2011p.114 and 116).

10.8.2. Main and Interaction Effects: Team Conscientiousness and Team Effectiveness

Consistent with previous studies, the results of this study found a significant CONVEX quadratic main effect between Team Conscientiousness and Performance (p = .022) lending support to Hypothesis **H5.1** – that Mean Team Conscientiousness will have a CONVEX curvilinear relationship with Performance. This result is expected, given the task-oriented nature of Conscientiousness and Performance.

Also consistent with previous research, there was a significant CONCAVE quadratic two-way interaction between Mean Squared and Deviation Conscientiousness on Performance (p = .003) lending support to Hypothesis **H5.2** – that Deviation in Team Conscientiousness will moderate the CONCAVE curvilinear association between Mean Team Neuroticism and Performance. An analysis of Simple Slopes reveals that Performance decreases, to a point, and then increases again as Conscientiousness increases, and when VARIANCE in Conscientiousness is LOW. Conversely, Performance increases, to a point, and then decreases as Conscientiousness increases when VARIANCE in Conscientiousness is HIGH. In either case, Performance is optimised when Team Conscientiousness ELEVATION is HIGH, and VARIANCE is LOW. Interestingly, analysis of Simple Slopes indicated that Performance was worse when Team Conscientiousness was LOW and VARIANCE was HIGH, than when elevation and variance are both LOW. While this is directionally consistent with previous research, the indication is that VARIANCE in Team Conscientiousness has a greater negative influence than does low elevation. This is an important finding for Team Composition practice if conflict, morale disengagement, including shirking, free-riding (or social loafing) (Humphrey et al., 2007), and Performance loss (Mohammed and Angell, 2003, Molleman et al., 2004) are to be minimised or avoided, since variance may activate traits in conscientious that result in otherwise conscientious individuals withholding effort in response to the *sucker effect* (Hart et al., 2001).

10.8.3. Conditional Effects: Team Conscientiousness, Team Boundary Management and Team Effectiveness

As the most consistent predictor of job performance, Conscientiousness is reported to be relatively insensitive to the moderating influence of other variables (Matthews et al., 2003, p.415). However, this study found a number of hypothesised, and unhypothesised moderated relationships. For example, the Team Conscientiousness and Performance relationship was found to be moderated by Team Boundary Buffering and Reinforcement; meanwhile, the relationships between Team Conscientiousness and Team Cohesion and Team Viability were both moderated by Team Boundary Spanning.

The only hypothesis that was supported was **H5.8** – that Team Boundary Reinforcement will moderate the CONCAVE curvilinear association between Mean Team Conscientiousness and Performance (p = .000). Analysis of Simple Slopes revealed that Performance declined, to a point, and then increased again as Conscientiousness increased and when Boundary Reinforcement was LOW. Conversely, Performance decreased as Conscientiousness increased when Boundary Reinforcement was HIGH. Although the slope differences were not significant, the general nature of the relationship was that the combination of HIGH Conscientiousness and HIGH Boundary Reinforcement was detrimental to Performance, conversely LOW Boundary Reinforcement was beneficial to Performance in highly conscientious teams. Given the nature of the facets underlying trait conscientiousness, this result is a little puzzling since Performance was higher with lower elevations of conscientiousness when Boundary Reinforcement was high. Perhaps it this might be explained by the innate inflexibility of a highly conscientious team inhibiting the social processes and negotiations inherent to Team Boundary Reinforcement, lending support to the notion that *too much (or too little)* (conscientiousness) is detrimental (e.g. Grant and Schwartz, 2011, Le et al., 2011, Vergauwe et al., 2017).

A number of noteworthy (unhypothesised) linear interactions were noted. For example: there was a POSITIVE two-way interaction between Team Conscientiousness and Boundary Buffering on Performance (p = .015), such that when Boundary Buffering was HIGH, an increase in Conscientiousness resulted in an increase in Performance. Conversely when Boundary Buffering was LOW, an increase in Conscientiousness results in a slight decrease in Performance. This result suggests that Team Boundary Buffering contributes some explanatory value to the Team Conscientiousness and Performance relationship, perhaps by activating the underlying facets of conscientiousness – *Competence, Order, Dutifulness, Achievement Striving, Self-Discipline,* and *Deliberation*.

An unhypothesised post-hoc analysis of Simples Slopes provided further insight into this relationship in that a NEGATIVE three-way interaction was found between Team

Conscientiousness, Boundary Buffering, Team Interdependence and Performance (p = .001). Analysis showed that Performance increased when Team Conscientiousness and Boundary Buffering were both HIGH and when Team Interdependence was LOW; conversely Performance deceased when Team Conscientiousness, Boundary Buffering and Team Interdependence were all HIGH. Performance also decreased when Team Conscientiousness, Boundary Buffering and Team Interdependence were all LOW. This suggests that while Boundary Buffering promotes Performance in highly conscientious teams, tasks requiring high levels of interdependent working will create a stronger situation resulting in teams having difficulty in balancing the need to tighten their team boundaries, against the demands created by interdependent working - which necessitate more permeable boundaries. The implication for team composition is that moderate elevations of Team Conscientiousness may be better suited to promoting Performance through Team Boundary Buffering by teams that have intensively interdependent work tasks.

Further, a significant POSITIVE two-way linear interaction was noted between Conscientiousness and Boundary Spanning on Team Cohesion (p = .017), such that when Boundary Spanning was HIGH, Team Cohesion increased as Conscientiousness increased. Conversely, when Boundary Spanning is LOW, Team Cohesion decreased as Conscientiousness increased. A similar pattern of results was also noted with Team Viability. This might suggest that the Achievement Striving facet of conscientiousness might be activated in high conscientious teams undertaking Boundary Spanning work, since the aim of this team process is to secure the resources needed for successful task completion.

Finally, a significant POSITIVE linear two-way interaction was found between Conscientiousness and Boundary Spanning on Team Viability (p = .028), such that Team Viability increased as Conscientiousness increased when Boundary Spanning was HIGH. Conversely, Team Viability decreased as Conscientiousness increased when Boundary Spanning was LOW. The pattern and nature of this relationship is similar to the previous example.

10.9. Contribution to Theory

This study contributes to theory in a number of ways. Firstly, by answering a variety of calls for additional research into the deep-level compositional factors associated with boundary management processes (Dey, 2017); by responding to calls by Seibert and DeGeest (2017) to investigate the processes and behaviours through which team personality is related to team effectiveness (p.393); and by Prewett et al. (2009: p.290-292) to investigate the links between personality traits and team outcomes via their effects on the team processes and behaviours known to be associated with them. It also answers calls by a number of researchers for more research into the nature of the curvilinear relationship between Personality and Performance (Murphy and Dzieweczynski, 2005, Le et al., 2011); and for team research to include considerations of Interdependence (Kozlowski and Bell, 2003). Hampered by small effect sizes and equivocal results (Driskell et al., 1987, Mount et al., 1998, Porter et al., 2003), scholars have called for more complex, multivariate models to be developed beyond the dyadic relationship between personality-performance. This study responds to these calls by introducing various moderating variables to the examination of the personality and team effectiveness relationship. Finally, this study contributes to knowledge by undertaking the study in a team context bounded by *knowledge work* undertaken in *distributed structures*, both of which are known to have significant consequences for team working.

Secondly, this study contributes to theory with the addition of new knowledge relating to the differential relationships between team personality traits and Team Effectiveness moderated by Team Boundary Management, more specifically in relation to evidence of the nuances associated with elevation and deviation of Team Personality traits from the perspective of Team Composition. These are outlined as follows: -

10.9.1. Team Neuroticism

This study contributes to theory by examining the curvilinear effects and moderating influences of Team Boundary Management on the relationships between: Neuroticism and Team Effectiveness variables (i.e. Performance, Team Cohesion and Team viability). Despite calls for more studies on the antecedents of Boundary Management, curvilinearity of relationships between personality and performance, and more nuanced studies of this relationship, these have not been extensively examined previously. In particular, this study found evidence that the negative affect associated with Boundary Spanning, namely role overload, etc, also compiles at the team level when teams are composed of highly Neurotic individuals, and individuals that have even modest levels of Neuroticism are especially sensitive to role-stress – to the detriment of Team Cohesion.

The Study also contributes to practice as the finding that Team Boundary Spanning has a negative consequence for Team Effectiveness in highly Neurotic teams is noteworthy. This requires practitioners to be mindful of the influence that Similarity Attraction and Attraction-Selection-Attrition can have on trait homogeneity; more specifically the negative affect on Team Effectiveness as a result of Trait Activation.

10.9.2. Team Extraversion

The finding that Team Extraversion has a curvilinear relationship with Team Effectiveness is noteworthy and directionally consistent with the literature regarding curvilinearity of personality-performance relationship, i.e. the proposition that *too much, or too little* [Extraversion] is detrimental (e.g. Grant and Schwartz, 2011, Le et al., 2011, Vergauwe et al., 2017) is supported. Further, the examination of the associations between Team Extraversion, Team Boundary Management and Team Effectiveness variables offer a number of contributions to theory and practice. For example, the finding that Homogeneity of Team Extraversion at the high pole is beneficial to Team Outcomes is contrary to the majority of the personality-performance literature which posits that it is the variance at the high pole of the trait that asserts a positive influence on performance. This adds support to previous studies (Prewett et al., 2016).

Similarly, the finding that Team Cohesion is optimal with moderate levels of Extraversion is noteworthy, as the combination of high levels of Boundary Spanning and high Team Extraversion are decretive to Team Cohesion. This has important practical implications for team composition since the result is consistent with previous theoretical explanations - that a Highly Extraverted teams will activate Extraverted behaviour, in particular, the *Sociability* and *Dominance* facets of Extraversion. In combination, the opportunity to *socialise* afforded by Team Boundary Spanning, diminishes Team Cohesion. This requires practitioners to be mindful of the influence that *Similarity Attraction* and *Attraction-Selection-Attrition* can have on trait homogeneity; more specifically the negative affect on Team Effectiveness as a result of Trait Activation as an extraverted team recruits extraverted team members.

10.9.3. Team Openness to Experience

Consistent with previous findings, Openness to Experience offers little in explaining the relationships with Performance, although the evaluation of its association with Team Boundary Buffering is novel. Results show that Boundary Buffering is decretive to Performance when Team Openness is HIGH, and this relationship is further compromised when Task Interdependence is also HIGH.

10.9.4. Team Agreeableness

Findings of a quadratic interaction are consistent with the proposition that *too much, too little,* or *too different* [Agreeableness] is detrimental (e.g. Grant and Schwartz, 2011, Le et al., 2011, Vergauwe et al., 2017). It certainly appears to be the case that a low trait elevation of Agreeableness, coupled with high Boundary Buffering is detrimental to Performance; and when Agreeableness and Boundary Buffering are HIGH, Performance declines when tasks require interdependent working. Given Team Interdependence presents a stronger motivational influence than do the behavioural norms associated with membership in a highly Agreeable team, the consequence for practice relates to the understanding that there is a risk of motivation loss in agreeable teams faced with the dilemma of promoting their own performance while balancing the need to respond to external demands for assistance, and being a good *corporate citizen*.

A further consideration for practice is the negative impact on Performance that a single team member can have (Barrick et al., 1998, Bell, 2007), and how best to address the issues associated with even moderate forms of neurodiversity.

10.9.5. Team Conscientiousness

Responding to calls to investigate the antecedents of Boundary Management, this study has contributed to theory by examining and finding significant relationships between: Team Conscientiousness and Team Effectiveness moderated by each of the Team Boundary Management activities (Boundary Spanning, Buffering and Reinforcement), and including further moderating influences of Interdependence - despite controlling for Collaboration.

Although results of main and interaction effects are consistent with previous studies in confirming that high levels of team Conscientiousness are beneficial to team outcomes, the finding that variance in low team conscientiousness has a greater negative influence on Performance than low elevation alone. This suggests that homogeneity in Conscientiousness is a crucial consideration in Team composition practice if conflict, morale disengagement, including shirking, free-riding, social loafing (Humphrey et al., 2007), and Performance loss (Mohammed and Angell, 2003, Molleman et al., 2004) are to be minimised or avoided. The finding of three-way interaction effect is also significant. Most noteworthy being the relationships between Team Conscientiousness and Performance when moderated by Boundary Buffering and Team Interdependence. Apart from extending existing theory, it also contributes to team composition practice by indicating that moderate elevations of team conscientiousness, and low trait variance, may be best suited to promoting performance through boundary buffering for teams whose tasks are highly interdependent.

Finally, the affirmation of the curvilinear relationships between Team conscientiousness is also noteworthy, on one hand, extending theory with the clarification of the role of Team Boundary Reinforcement, on the other, further reinforcing the need to carefully consider the practical implications curvilinearity has on Team Composition. Not only is it clear from the results of this study that *'more is not always better',* it's also the case that *too much, too* *little and too different* can be problematic (e.g. Grant and Schwartz, 2011, Le et al., 2011, Vergauwe et al., 2017) in the case of Team Conscientiousness.

10.10. Contribution to Practice

10.10.1. A Better Understanding

This research contributes to practice in a number of ways. For example, the synthesis of the new knowledge set out in the previous section provides practitioners with the opportunity to adjust team composition practice and provides deeper insight into the opportunities and trade-offs. As these are discussed at length in the previous sections they have not been repeated in detail.

Prominent among the contributions to practice is the recognition of the significant implication trait aggregation has on team composition. Trait oriented approaches to trait aggregation used in context of team composition differentiate between two personality characteristics, i.e. overall team *trait elevation* and *variability* of trait elevation within the team (Barrick et al., 1998, Mohammed and Angell, 2003, Neuman et al., 1999, O'Neill and Allen, 2011). These, uniquely, or in combination, have a highly differentiated effect on performance. Aimed at maximising team outcomes, trait-oriented approached propose that team composition choices should be guided by *person-team fit* in respect of *Supplementary* and *Complementary* traits, with each of the five personality traits being represented by one or the other in determining whether team composition should aim to achieve trait homogeneity or heterogeneity, e.g. elevation of trait conscientiousness should homogenous as variance is decretive to team outcomes. In contrast, Neuroticism should be heterogenous, as variance is generally beneficial to team outcomes. This is referred to as, *Person-Team* fit and it is theoretically consistent with the *Similarity Attraction* and *Attraction-Selection-Attrition* paradigms. This has a potentially significant implication for practice since, in absence of deliberate team selection and composition interventions, teams will be formed of individuals with broadly similar personality characteristics, regardless of whether or not the compound motivational effect of those characteristics is compatible with achieving team outcomes that are consistent with the goals of the organisation. This study has found that the relationships resulting from trait elevation and variance are result in highly differentiated results, depending on the strength of the situational factors associated with the relationship. This suggests that team composition should not be left to chance or be limited to selection through the consideration of functional and technical knowledge and skills alone, as these are unlikely to guarantee successful performance outcomes, regardless of how highly developed they are.

Similarly, the group phenomena resulting from the compilation of Team Personality traits is theoretically consistent with *Trait Activation Theory*. This has been explained in some detail in earlier Chapters. The implication for practice comes with the recognition, in this study, just how nuanced the personality and performance relationship is depending upon the situational strength of the variables in consideration. For example, this study found instances where Boundary Management positively moderated the Team Personality and Team Effectiveness relationship, but that the inclusion of Interdependence reversed the polarity of the relationship such that it became negative. Given Collaboration was used as a control variable, this was an important finding as it requires team composition practice to give appropriate consideration to the situational strength of a wider variety of variables, beyond personality trait elevation and variance. As an example, this study found that Team Boundary Spanning had a negative consequence for Team Effectiveness in highly Neurotic teams. This requires practitioners to be mindful of the influence of these wider interactions since their relative strength determines behaviour in way that may not be expected. For example, the finding that Interdependence presents a stronger motivational influence than do the behavioural norms associated high traits elevations of various team traits is also a key finding for team composition practice, particularly in relation to the potential motivation loss in agreeable teams faced with the dilemma of posed by balancing the need to promote team performance against the need to demonstrate being good *corporate citizens* by responding to external demands for assistance. The flip side of this coin is that this makes highly agreeable teams an ideal target for Boundary Spanning activity by other teams.

The finding that Team Cohesion is optimal with moderate levels of Extraversion is noteworthy and has a consequence for team composition because it is contrary and a general belief that more extraversion is better. It is also contrary to much of the personality and performance literature that posits that high trait extraversion elevation and high variance are optimal for team composition. Left to their own devices an extraverted team would recruit extraverted team members and the resulting behaviours that are expressed would result in high levels of satisfaction. However, that satisfaction may not necessarily equate to higher performance in relation to team outcomes, or consistent with the goals of the organisation.

The impact on group dynamics of the *one bad apple* effect is a key consideration for team composition practice as the inclusion of individuals that are highly Neurotic, and/or Disagreeable, will likely result in negative affect arising from trait activation. Although this finding is not novel, this study found that the *bad apple* effect wasn't limited to high neuroticism and low agreeableness. IT was found that variance in Team Conscientiousness had a greater negative influence on Performance than low elevation of Team Conscientiousness. This is a crucial consideration for Team composition practice if conflict, morale disengagement and Performance loss are to be avoided. This finding also drew the conclusion that moderate elevations of Team Conscientiousness, and low trait variance, may be better suited to promoting performance than High Team Conscientiousness, especially when teams engage in boundary Buffering while undertaking tasks that are highly interdependent.

Finally, the finding of moderated curvilinear trait relationships with Team Effectiveness variables is an important consideration for team composition practice since it is not only apparent that *'more is not necessarily better'*. In some circumstances it's also the case that *too much (Neuroticism and Conscientiousness), too little (Conscientiousness, Agreeableness and Extraversion) and too different (Conscientiousness and Agreeableness)* can be counter-productive to team outcomes.

10.10.2. A Practical Tool

This research also contributes to practice by extending understanding of the utility of data derived from personality assessment in relation team composition and the compromises that need to be considered. It does this through the provision of a simple tool (currently developed in the form of a simple Microsoft Excel Spreadsheet), that can be used, in combination of the knowledge provided throughout this reports, to quickly ascertain the optimal team composition trait combinations associated with Team Effectiveness and Team Boundary Management.

This can help to inform Human Resource (HR) strategy about organisational development. It can also assist team leaders with their team composition decisions, help them understand the motivational influences on the behaviours in their teams, and guide learning and development support for individuals and teams whose job functions requires a broad range of lateral social interactions in a distributed team context undertaking knowledge work.

10.10.3. Overview of the '*Tool'*

Although the tool is based upon a simple Microsoft Excel Spreadsheet, **Figure 10.1** and **Figure 10.2** are two representations of its current state of development. They are presented here to aid explanations about how they might be used in practice.

Currently, the tool has two screen views. **Figure 10.1** puts Team Boundary Management in focus as the outcome criterion for Personality traits and the aim of this view is to guide Team composition considerations specifically in relation to Boundary Management activities. Although this wasn't the primary focus of this study, understanding the antecedents of Team Boundary Management must be of interest given previous research has found that boundary Management positively predicts performance outcomes, and the changing team context requires increasingly greater volumes of lateral interactions, which in turn benefit from Boundary Management.

What these diagrams show is that the tool simply requires the user to configure the tool with the appropriate variables to optimise a required outcome. For example, in **Figure 10.1,** one might set the appropriate filters to reveal the relationships associated with Boundary Buffering, including the potential conditional effects.

Figure 10.1: Personality and Boundary Management

TRAIT	TRAIT VARIANT	MODERATING VARIABLE	CONDITIONAL EFFECT / INTERACTION	BOUNDARY SPANNING	BOUNDARY BUFFERING	BOUNDARY REINFORCEMENT
Conscientiousness	m^2	Conscientiousness Variance	$C^{m2} * C^{sd}$			*7.292**
Extraversion	sd	Neuroticism Deviation	$E^{m} * N^{SD}$		*0.681**	
Neuroticism			N^{m}		*-0.496**	
Neuroticism			N^{h}		*-0.417**	
Neuroticism	m	Neuroticism Variance	$N^{m} * N^{sd}$		*2.603**	
Agreeableness	m	Goal Interdependence	$A^{m} * GI$			*-1.178**
Agreeableness	h	Goal Interdependence	$A^{h} * GI$		*-1.061**	*-1.423***
Conscientiousness	h	Goal Interdependence	$C^{h} * GI$			*-0.923***
Conscientiousness	m^2	Goal Interdependence	$C^{m2} * GI$			*2.500***
Extraversion	h	Goal Interdependence	$E^{h} * GI$			*-0.772***
Neuroticism	h	Goal Interdependence	N^{h}		*-0.390**	
Neuroticism		Goal Interdependence	GI	*0.218**		

Apply filters for a nuanced view

Alternatively, as in **Figure 10.2,** one might choose from a wider range of filters to reveal the relationships associated with Team Effectiveness outcomes, including the potential conditional effects that are associated with those relationships.

Figure 10.2: Personality, Boundary Management and Team Outcomes

TRAIT	MODERATING VARIABLE	CONDITIONAL EFFECT / INTERACTION	TEAM PERFORMANCE	PERFORMANCE	TEAM COHESION	TEAM VIABILITY
Agreeableness		A^{m}			*0.647**	
Agreeableness		A^{m2}				*1.982**
Agreeableness		A^{l}			*0.468**	
Agreeableness		A^{sd}			*-1.092**	
Agreeableness		$A^{m} * A^{sd}$				
Agreeableness		$A^{m2} * A^{sd}$		*-12.231**	*-15.710**	
Conscientiousness		C^{l}			*0.529**	*0.358**
Conscientiousness		C^{sd}			*-0.965**	
Conscientiousness	C^{sd}	$C^{m2} * C^{sd}$		*-9.190***		
Extraversion		E^{m2}			*-1.356**	
Extraversion		E^{sd}				
Extraversion	E^{sd}	$E^{m} * E^{sd}$	*-2.668**			*-2.788***
Neuroticism		N^{m}			*-0.519**	
Neuroticism		N^{m2}		*0.817**		
Neuroticism		N^{h}			*-0.447**	*-0.318**
Neuroticism	N^{sd}	$N^{m} * N^{sd}$	*2.926**			

Apply filters for a nuanced view

More development work is required to make the Tool more user-friendly, but this is beyond the scope of this project. It's may also be the case that the two screen views represented by **Figure 10.1** and **Figure 10.2** can be rationalised in a more sophisticated application, and allowing a more sophisticated and nuanced analysis with a wider array configuration choices.

For example, future development might automate the visualisation of the associations found in this study. Again, the development of this software application is beyond the scope of this research.

10.10.4. Adding further Value

What is not immediately apparent is the wide variety of variables that might be included in this tool. For example, the constraints associated with this thesis limited the evaluation to a considerably far smaller number of variables than were actually collected. This constraint does not apply to the application of this tool and, analysis and results could be extended to include the influence of: individualism and collectivism, or important demographic variables, such as tenure; or any combination of the (sub-clinical) Dark Triad traits, Machiavellianism, Narcissism, and Psychopathy. Together these might increase the versatility and value of the information provided.

Of course, this represents a starting point and as the database develops then statistical power and reliability will improve, and additional variables might be added, as appropriate.

10.10.5. How and when might this be used in Practice?

Since the purpose of this study is to guide team composition, practice the tool is intended to be used whenever team composition decisions are being made, or consideration is being given to how performance might be improved, and/or challenging behaviours resolved.

Although the tool is not appropriate for recruitment decisions, the information provides can *augment* data held on candidates, inform choices about person-team fit, and develop optimal scenarios for teams whose performance is critical to organisation functioning. Given the findings in this and previous studies about the importance of trait elevation and variance in terms of individuals differences, this is an appropriate use of the tool and supporting information.

Other than recruitment and selection, the tool is also useful in the early stages of initiating project teams that need to function in the diverse, uncertain, distributed/virtual world of transformation and change management. These, in particular are the conditions upon which this study has been undertaken. This would enable team leaders to extend the detail regarding job requirements to a more nuanced candidate profile. Given many large organisations operate *Centres of Excellence*, or *Communities of Practice,* where resources with specific functional specialisms are pooled, this would help to guide resource allocation.

It may also be the case that it is not appropriate to deselect and remove problematic individuals from teams if their personality profile is inconsistent with positive tam outcomes. Highly Neurotic individuals might be an example of this. In this case, the tool might be used, not only to identify such individuals, but also to seed them in sub-groups within the team that are more complimentary.

From the perspective of Organisational Development, the tool might also inform and guide the opportunities for Personality Development through learning interventions. Again, Neuroticism and conscientiousness are traits that have been found to be particularly responsive to Personality Development with changes of up to one standard deviation being achieved in a fairly short period of time. However, this specific topic is beyond the scope of this research project (Baranski et al., 2017, Caspi and Roberts, 2001, Caspi et al., 2005, English and Carstensen, 2014, Hudson and Fraley, 2015, Hudson and Fraley, 2016, Hudson and Roberts, 2014, Hudson et al., 2012, Roberts, 2006, Roberts, 2009, Roberts and Caspi, 2001, Roberts et al., 2017, Roberts et al., 2006, Tasselli et al., 2018).

A significant practical challenge for team composition in most organisations is the lack of spare resource. Unlike sports teams that have a *Substitute's Bench* to help facilitate tactical considerations and mitigate the impacts of injury, business organisations face considerable resource constraints and are forced to make compromises based on the resources available to them. In this situation, the tool might be used in reverse, by using real-time personality data to identify the potential performance challenges. Then, addressing team composition 'issues' with learning and development, in the same way as in the previous point. For example, increasing self-awareness, team-building by including team personality data and training around the potential challenges; by providing wellbeing training to those identified as being especially susceptible to role stress occurring during boundary spanning, and particularly during the inception phase of newly formed projects. They can also introduce interaction effects associated with Social Exchange. Although this was excluded this this study, Social Exchange variables (Team-Member and Leader-Member Exchange) are known to exert strong situational influences on personality trait related behaviours.

10.11. Limitations and Future Research

Although careful consideration was given to sample size, the choice of participants, and the decision to include a variety of different types of organisations and industry sectors, with the aim of improving generalisability, limits on variety, and over-reliance on data from a single large organisation does compromise the conclusions that might be drawn. Future studies might consider this issue and provide data from a greater variety of organisational contexts in order to enrich these results. A significantly larger sample size is also recommended for team-level studies

One particular area of concern relates to Boundary Spanning, and the limited results found. Although the work context of the participating sample was assessed, and in each case the expected boundary conditions were met, the variety of work tasks make it difficult to determine the extent of boundary management. This problem has been noted in prior literature in that rather than being one thing or another, tasks may require a dynamic workflow combinations of *Pooled/Additive*, *Sequential*, *Reciprocal* or require *Intensive* interdependent working, Future studies are encouraged to investigate the nature of interdependence in team research since it's clear that interdependence has a significant conditional effect, including reversing the polarity of interaction effects.

According to (Mathieu et al., 2017), there are no simple answers to the question how to best compose a team since this depends on a variety of other dynamics, such as the extent to which other composition and contextual influences can be accommodated in composition choices before team composition becomes impractical. For example, this might include decisions about whether or not to accommodate or mitigate for intergroup biases based on dissimilarities (p.457). Results indicate that trait elevation plays a key role in predicting team outcomes, particularly so when traits also interact with other situational variables triggering Trait Activation. Bell (2007), provided evidence for effects of minimum and maximum member score models of trait aggregation, which suggests that the currently dominant focus on central tendency may leave important issues unaddressed (Mathieu et al., 2017, p.458). Although this study sought to attend to this by investigation the quadratic relationships, future studies are encouraged to expand their view by specifically considering alternative trait elevations.

Another area of promise is consideration of curvilinearity in respect of personality--performance relationships. Literature on previous studies typically reports linear relationships, so studies of linearity are dominant in. This study has shown that traits have a curvilinear relationship with Team Effectiveness, directly, and through interactions with a variety of *situational factors*. Limitations of sample size, and constraints create by the potential for Type I errors have limited the extent of analysis possible. Therefore, more research is recommended to properly expose the presence of curvilinearity and identify the nature of the relationships between each of the Big Five traits, important organisational outcomes, and appropriate moderating and mediating influences. For example, it was not possible to properly investigate the role of Personality Traits as moderators I terms of the potential Trait-on-Trait interactions. A few previous studies have identified such effects

(Burke and Witt, 2004, Goleman, 1998, Judge and Erez, 2007, Ode et al., 2008, 2009, Penney et al., 2011, Witt, 2002, Witt et al., 2002), and a limited post-hoc review in this study also identified a number of un-hypothesised effects - see **APPENDIX 2**. There is a scarcity of knowledge on trait-on-trait interactions. This study included a cursory view as a post-hoc analysis and evidence was found for the predictive value of considering the moderating role of some personality traits. Prior research into this area is limited, so it is recommended that this is addressed in future studies.

The Input-Process-Output (IPO) model used in this study has provided the methodological framework in many previous studies. Despite this, changes are needed if the science of teamwork is to be advanced. For example, Social Network Analysis may provide improved insights about variable patterns and linkages within and between teams, compared to existing methods, as multi-level, multi-plex, dynamic analytic tools are now becoming more prevalent (Zappa and Lomi, 2015). Future researchers are encouraged to formally consider the temporal issues, such as the lack of uniformity of variables over time, and the temporal nature of team evolution and group dynamics, including new quantitative measurement techniques, methodologies and analytical methods, as appropriate. This is particularly germane to Project team arrangement where members come together initially and may be highly interdependent, yet later fragment into subgroups with some individual contributors. This restructuring may reoccur many times as task demands shift over the course of a project or service.

Collecting data via self-reported surveys has long been a concern, faking in particular (Hogan et al., 2007, Lee et al., 2017, Mueller-Hanson et al., 2003, Norman, 1963a, Zickar and Drasgow, 1996, Zickar and Gibby, 2006). While potentially creating a host of new concerns, newer measurement protocols may help to overcome such hurdles and liberate the study of teams as dynamic, complex systems. For example, approaches such as computer-aided textual analysis, streaming physical and spatial data such as that yielded by wearable sensors, and emotional facial recognition techniques, may offer improved opportunities generating team-related data, thereby enabling complex longitudinal analyses of different types. Leveraging such continuous streams of data may hold the key to unlocking the survey and human observation shackles limiting progress in teams' research (Mathieu et al., 2017) so future studies are encouraged to adopt more advanced measurement methods, as they become available.

The nature of teams is changing. For example, literature on teams has long recognised that *"large teams are bad teams"* because of problems associated with process losses attributable to coordination and motivation challenges (Hackman, 2002). Thus, if the scope and complexity associated with some task requires as many as 20 specialised individuals composing a single large team, it is likely to cause more problems than it solves (Mathieu et al., 2017, p.461). This was noted in my own experiences in Chapter One, and by other team scholars (Tannenbaum et al., 2012). This creates various methodological challenges, including creating definitional issues and murky boundary conditions leading (Edmondson, 2012) to advocate moving away from traditional definitions of teams in favour of ‘teaming’, where diverse sets of individuals are brought together as needs demand, and then disband. This is particularly germane to Project team arrangement where members come together initially and may be highly interdependent, yet later fragment into subgroups with some individual contributors. This restructuring may reoccur many times as task demands shift over the course of a project or service. Edmondson suggests that the fluidity provided by teaming allows organisations to better adapt to chaotic, rapidly changing business environments. On the other hand, reducing the utility of the “team” as a meaningful unit of analysis, particularly where individuals collaborate under different structures and arrangements, such as: communities of practice, projects, agile software arrangements, and other fluid temporary units. This study addressed this as a boundary condition for the research sample and it was for this reasons that data was collected at two time-intervals approximately 3 months apart. The time period between each collection point was short enough to minimise membership instability, but long enough to allow an effective evaluation of Team Effectiveness. Future research is encouraged to consider the definitional issues associated with the changing nature of teams, to ensure that research remains relevant to practice.

Finally, The Big Five Model (John and Srivastava, 1999) of personality was chosen due to its relative paucity compared to the full version represented by the NEO-PIR and which includes 242 items. Considering the array of other variables included in the questionnaires, it was simply not practical to deploy the NEO-PIR. While the BFI is reported to have acceptable reliability and validity, it comes with an opportunity cost in terms of lower resolution. In this case by negating the ability to examine the lower, facet level relationships since these might provide greater insight into the personality and performance. It is therefore recommended that future studies evaluate these lower level relationships to understand whether facets provide more explanatory power.

10.12. Summary

This study contributes to theory by examining, through a multi-step analytic strategy including main, interaction and conditional effects, and post-hoc analysis for a more nuanced view of the relationships found. These include findings of linear and curvilinear relationships between each of the Big Five personality traits; each of the Team Boundary Management activities (Boundary Spanning, Buffering and Reinforcement); and each of the Team Outcomes (incl. Performance, Team Cohesion, and Team Viability). Further, post-hoc analysis has selectively examined the conditional effects arising from the moderating influences of Interdependence (Team, Task and Goal), variables. This provides richer understanding and insight into <u>when</u> particular personality traits, moderated by Boundary Management processes, will predict the Team Effectiveness variables in focus.

Finding that each of the Five Factor personality traits are both positively and negatively associated with Team Outcomes (Performance, Team Cohesion and Team Viability) study) was expected considering the nature of these traits, and the many previous reports of positive and negative affect associated with them (Tett et al., 1994, Tett et al., 1999). However, there have been no previous studies examining the role of Boundary Management in the relationship between Personality and Performance, or of the relationship between personality and Boundary Management, or of the curvilinear nature of these relationships. Consequently, this study makes a meaningful contribution to Theory and Practice. Equally, subsequent analysis using Simple Slopes (Dawson, 2014, Dawson and Richter, 2006) has provided a more nuanced view of the nature of these relationships. For example, revealing that Interdependence has a strong moderating influence, impacting the relationships between Personality, Team Boundary Management, and Team Effectiveness both positively and negatively. This is entirely consistent with Trait Activation theory, and some aspects of previous studies. The prevalence of curvilinear relationships was also an important finding, particularly considering the small number of previous studies that this research has extended with the inclusion of Boundary Management.

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APPENDIX 1: APPROACH TO LITERATURE REVIEW

In undertaking this literature review, a broad range of sources were reviewed, including published (academic) books, journal articles, Doctoral Theses, and conference papers covering a range of fields beyond the domain of Organisational Psychology.

The literature review involved a sequential and systematic approach with the following steps: -

- ⇒ Considering the background context, initial literature review, and research problem outlined in Chapter 1, I developed a broad range of keywords. These were mapped in a similar fashion to that described by Hart (1998, see chapter 6, p.146 to 171).
- ⇒ Refining and reducing identified themes to a manageable number and establishing the relationships between them.
- ⇒ Conducting electronic online searches of Google Scholar, Web of Science, and a range of Aston Library resources, including: Business Source Complete (EBSCO), ProQuest, and PsycINFO using the keywords identified above. This included a manual search of highly rated, peer-reviewed journals (including articles 'in-press').
- ⇒ Cross referencing articles with their corresponding theme(s). To date, these searches have yielded a database of circa 3,000 references. These were indexed within a proprietary bibliography software application, EndNote X8 (including PDF copies of the journal articles).
- ⇒ Uploading the entire EndNote X8 reference library, including embedded PDF versions of articles, to NVivo 11.
- ⇒ Configuring NVivo 11 to query (key word and phrase) each of the core themes, enabling a comprehensive electronic review.
- ⇒ Repeating each of the above steps at regular intervals to ensure as comprehensive view of the subjects as possible.

APPENDIX 2: TRAIT-ON-TRAIT INTERACTIONS

A2.1. Boundary Spanning

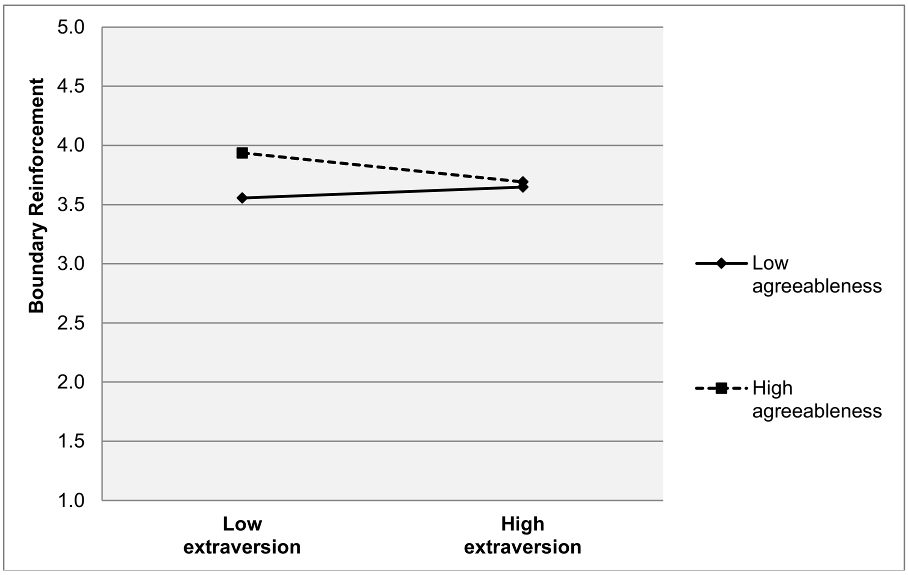
	ext	agr	con	neu
ext				
agr	x			
con	x	x		
neu	x	p .090	x	
opn	x	x	x	x

A2.2. Boundary Buffering

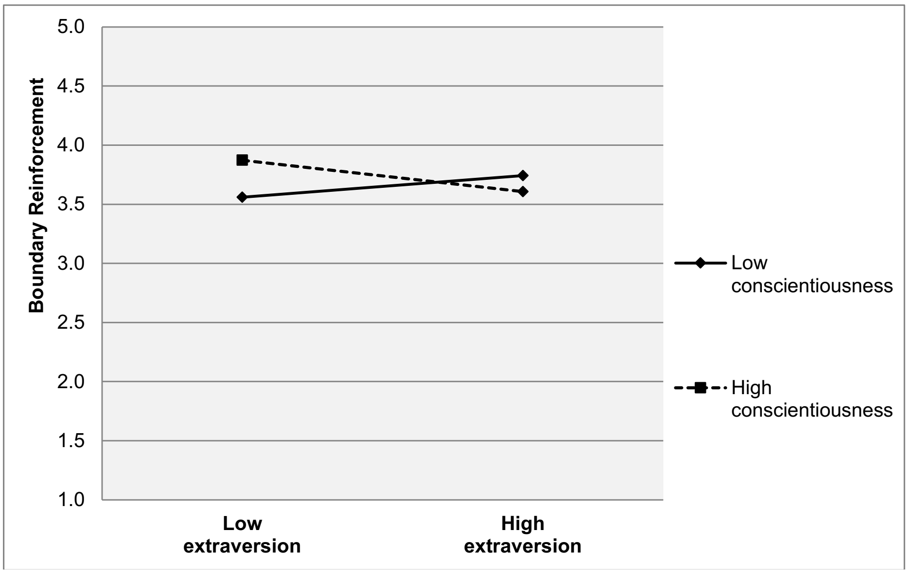
	ext	agr	con	neu
ext				
agr	x			
con	x	x		
neu	x	x	x	
opn	x	x	x	x

A2.3. Boundary Reinforcement

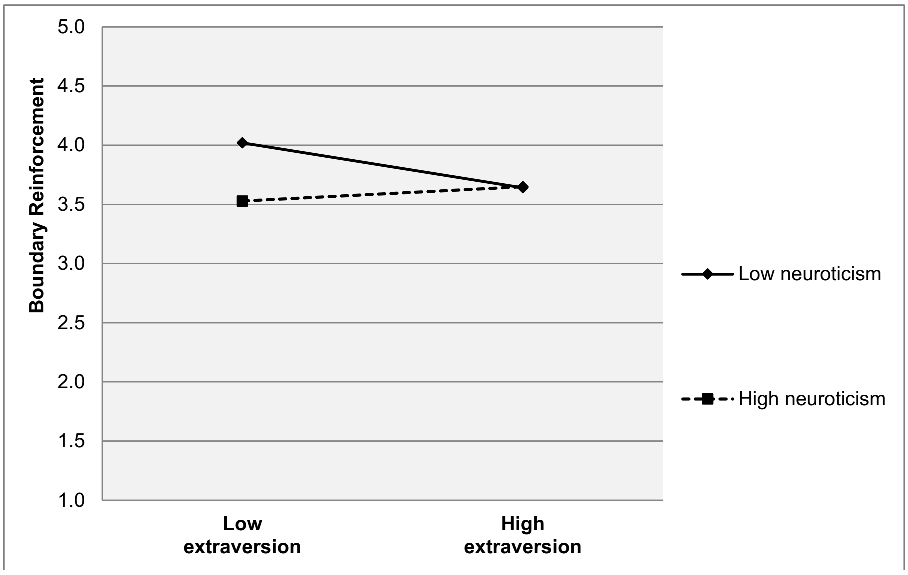
	ext	agr	con	neu
ext				
agr	p .074			
con	p .055	p .064 L m		
neu	p .020 L	x	p .004 L m	
opn	x	x	p .013 H	x



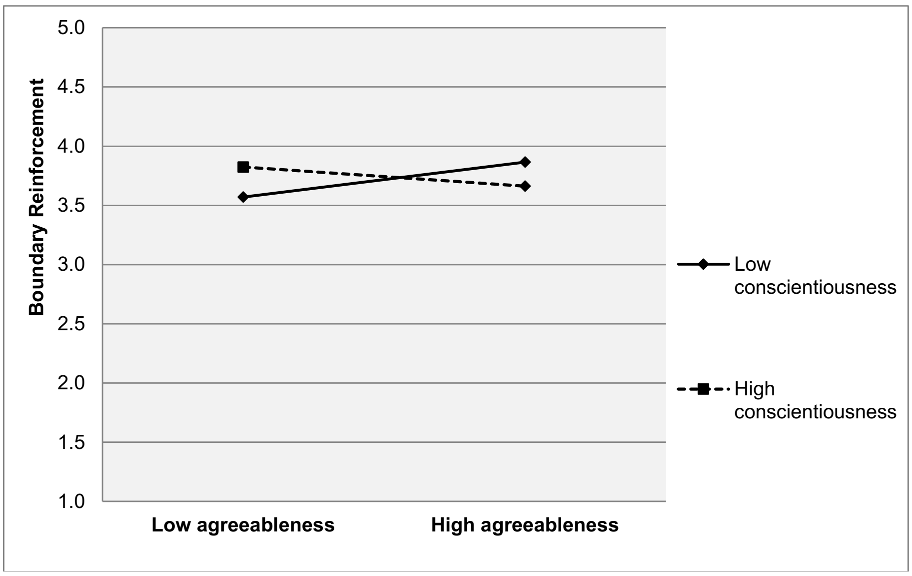
p .074 High p = .160



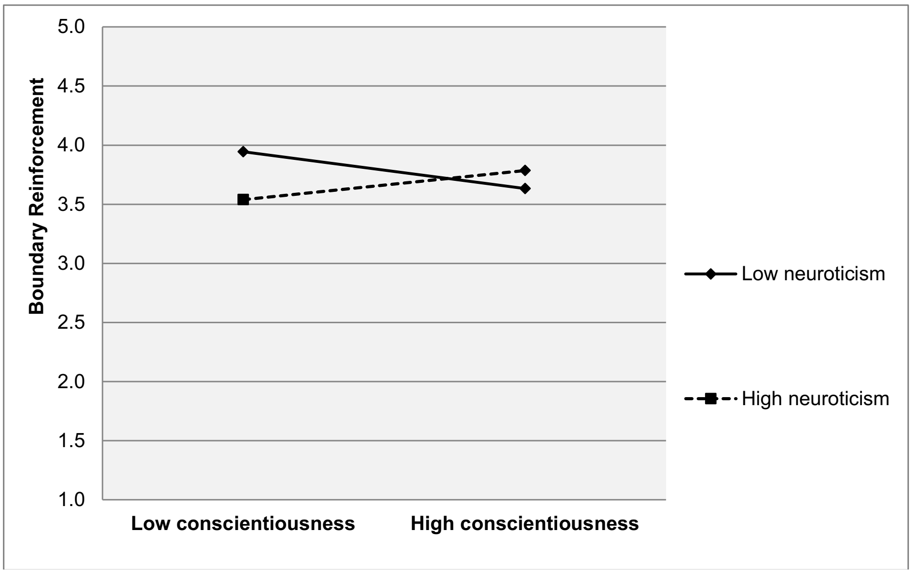
p .055 High p = .155



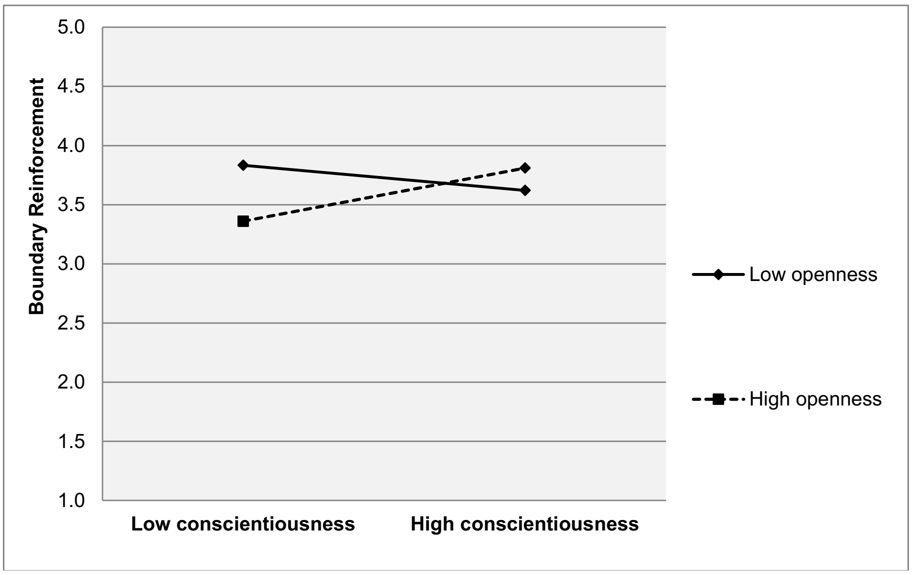
p .020 Low p = .049



p .064 Low p =.066



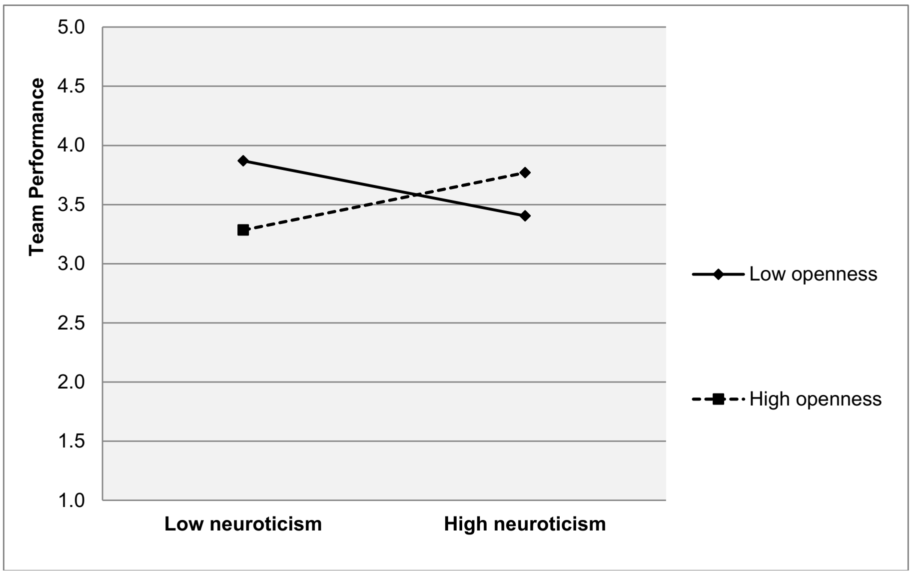
p .004 Low p =.065



p .013 High p = .026

A2.4. Team Performance

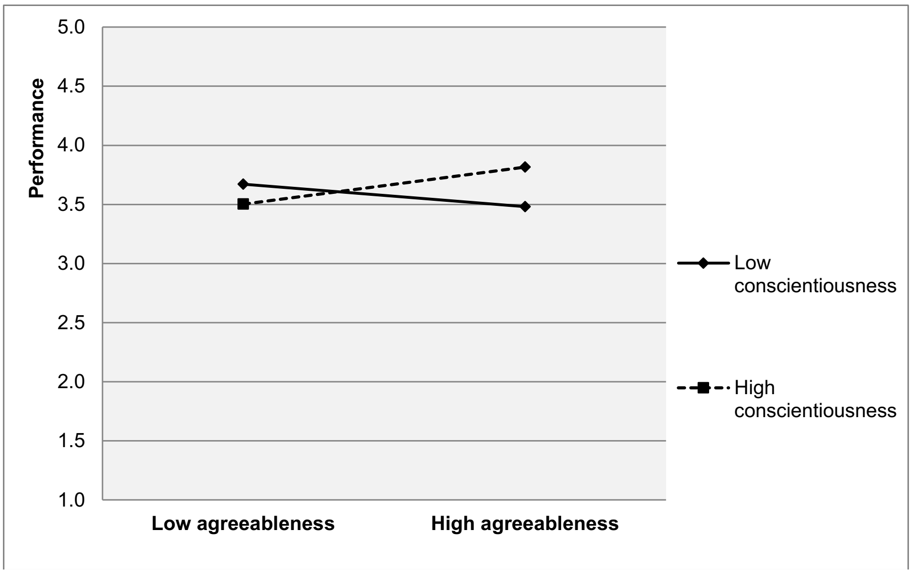
	ext	agr	con	neu
ext				
agr	x			
con	x	x		
neu	x	x	x	
opn	x	x	p .090	p .022 L&H m



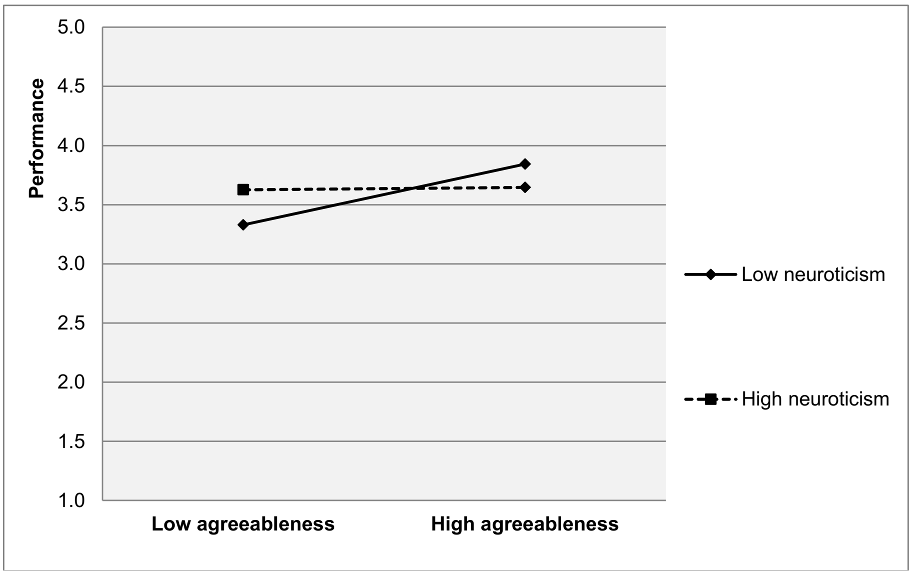
p .022 Low p = .066 & High p = .069

A2.5. Performance

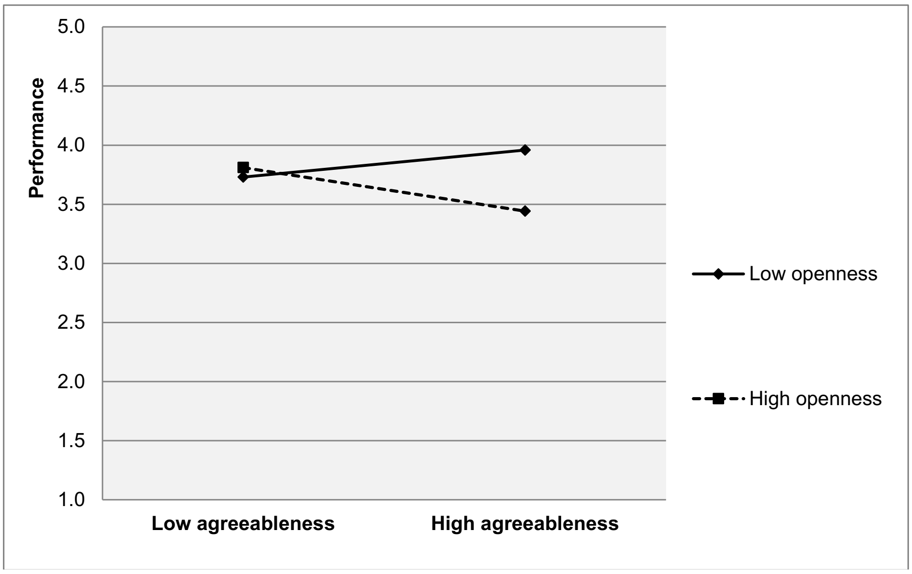
	ext	agr	con	neu
ext				
agr	x			
con	x	p .047		
neu	x	p .024 L	p .002 L	
opn	x	p .013 H m	p .000 L&H	p .001 L&H



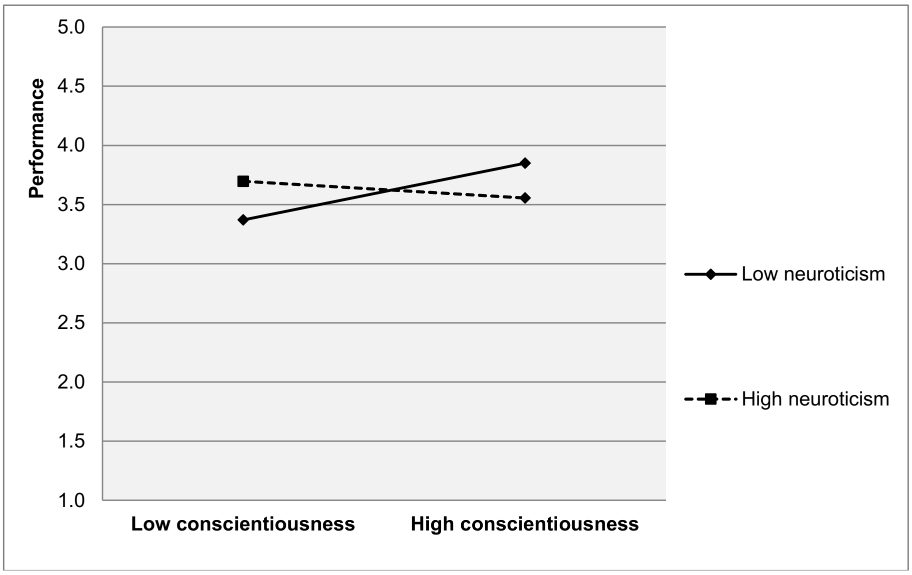
p .047 High p = .141



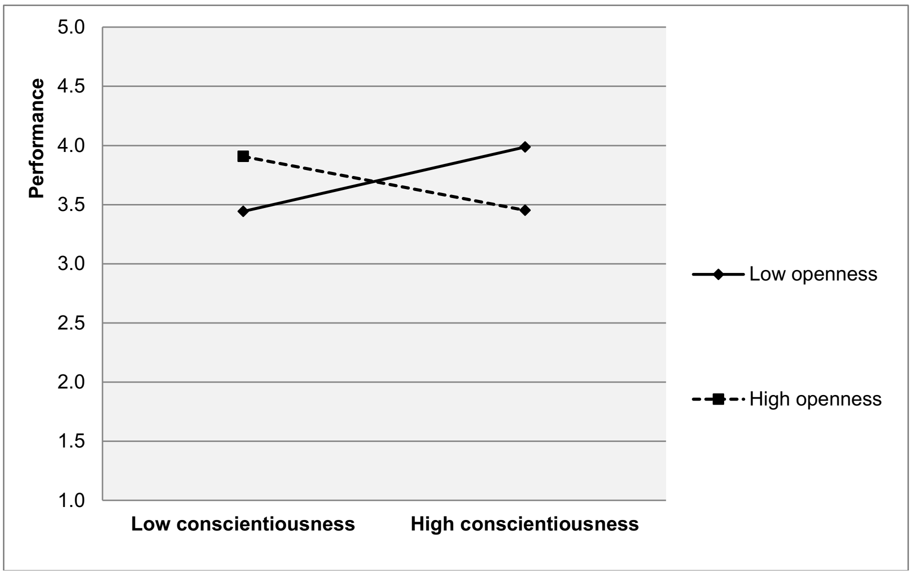
p .024 Low p = .037



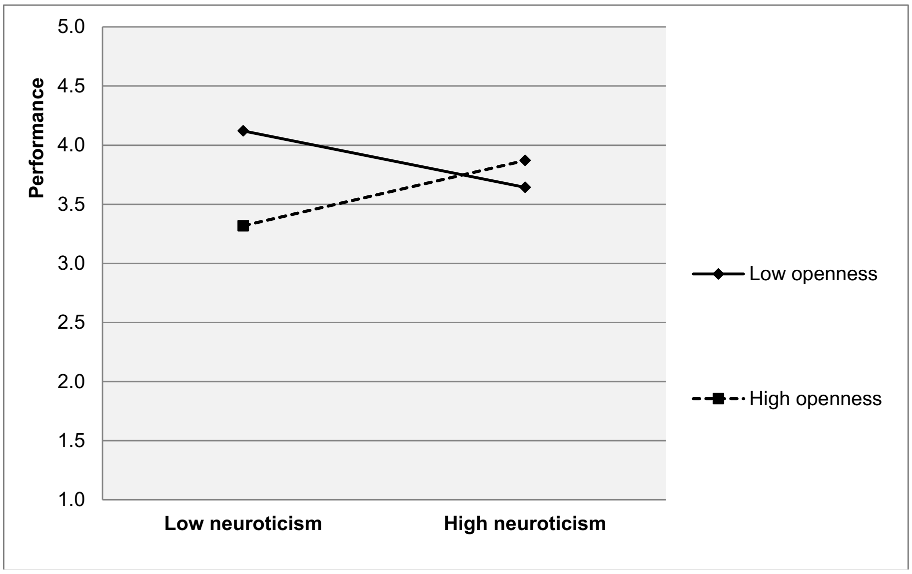
p .013 High p =.082



p .002 Low p = .007



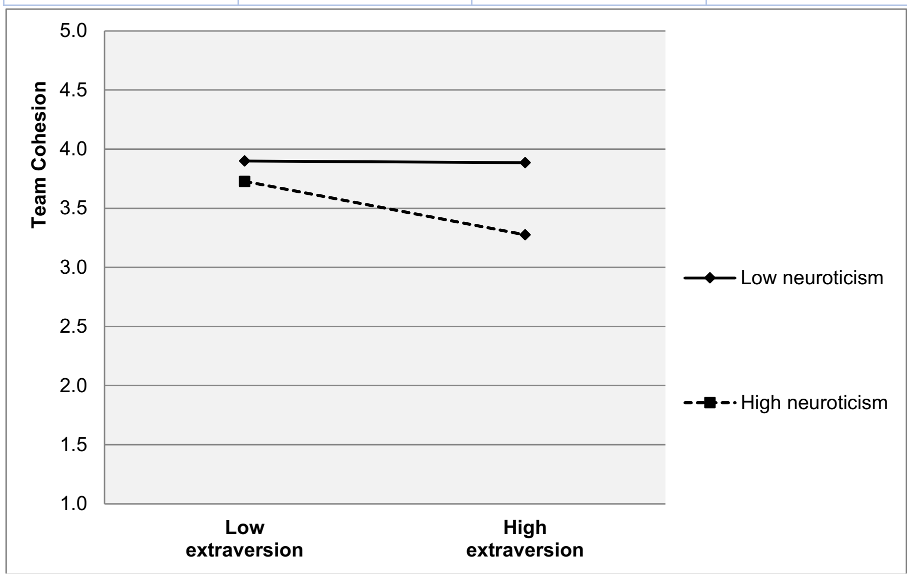
p .000 Low p = .001 & High p = .014



p .001 Low p = .013 & High p =.007

A2.6. Team Cohesion

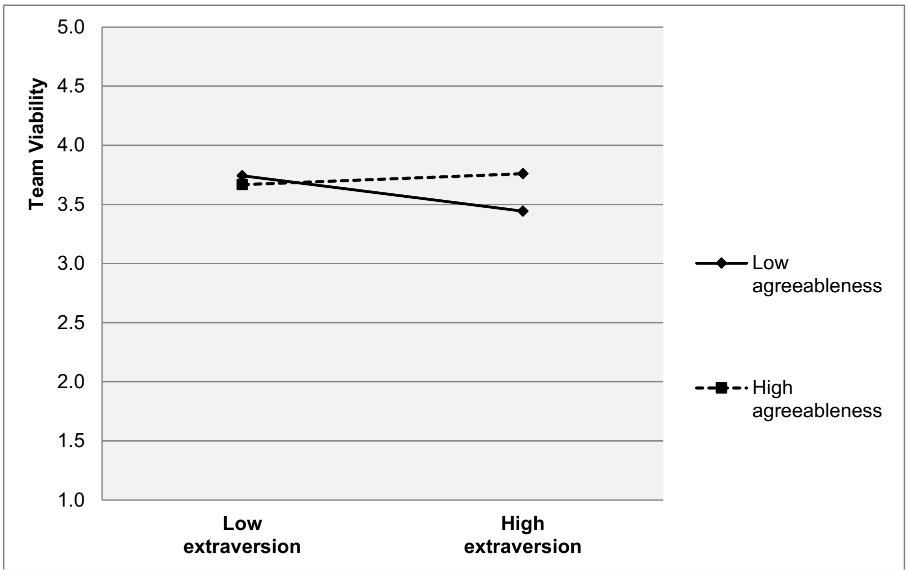
	ext	agr	con	neu
ext				
agr	x			
con	x	x		
neu	p .062 H	x	x	
opn	x	x	x	x



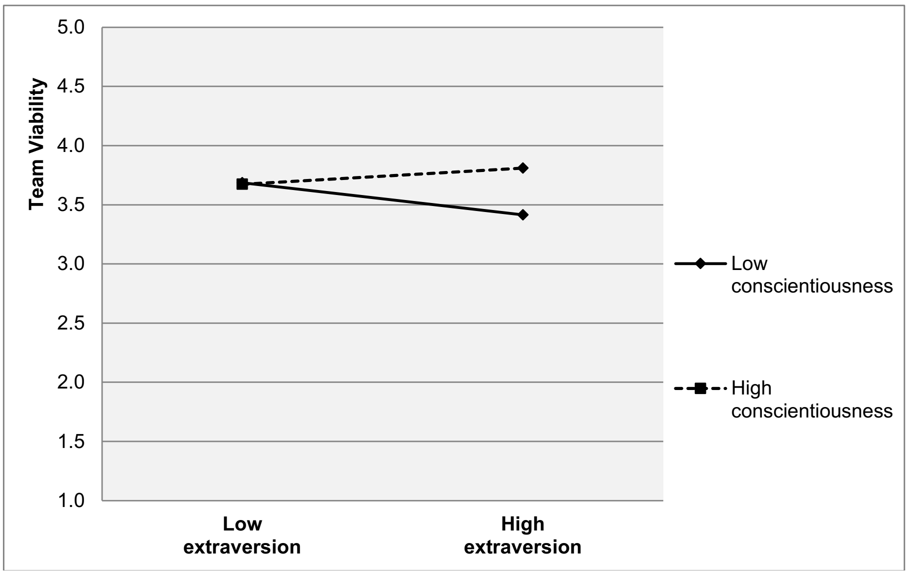
p .062 High p =.005

A2.7. Team Viability

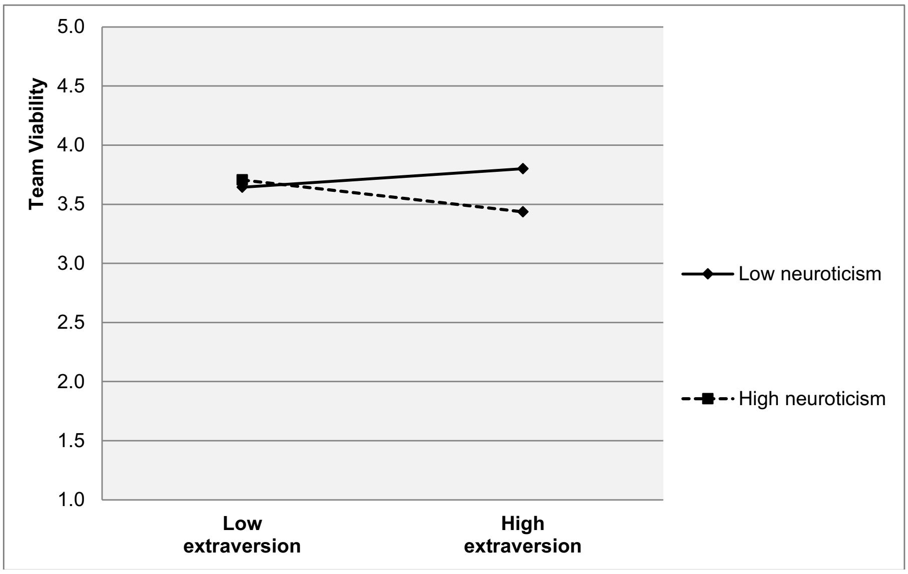
	ext	agr	con	neu
ext				
agr	p .020 L			
con	p .050 L m	x		
neu	p .029 H	x	x	
opn	x	x	x	p .081 L



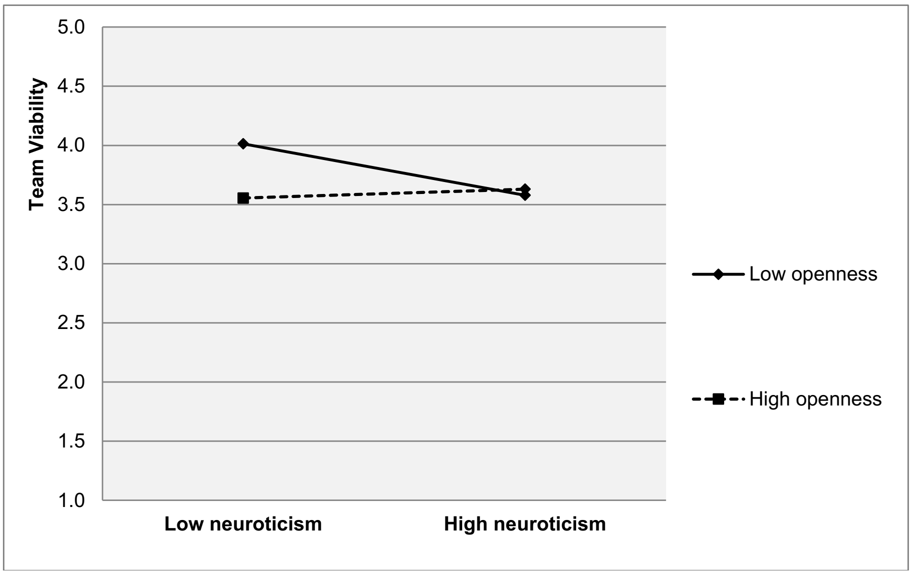
p .020 Low p = .024



p .050 Low p .053



p .029 High p .036



p .081 Low p = .018

APPENDIX 3: MODERATION: NEUROTICISM

A3.1. Conditional Effects of Neuroticism and Interdependence on Boundary Management

Table A 1: Main and interaction effects of Neuroticism and Goal Interdependence on Boundary Management

	Boundary Spanning				**Boundary Buffering**				**Boundary Reinforcement**			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
CI	0.165	0.043	0.157	0.061	0.126	0.313	0.138	0.286	0.162	0.101	0.139	0.165
Ts	-0.043	0.038	-0.042	0.044	0.001	0.973	0.001	0.969	0.01	0.676	0.007	0.785
Ts^2	0.01	0.031	0.012	0.022	0.01	0.189	0.008	0.301	0.009	0.13	0.01	0.088
Nm	-0.141	0.324	-0.164	0.259	-0.43	0.058	-0.408	0.079	-0.125	0.47	-0.128	0.467
GI	0.218	0.041	0.213	0.075	-0.057	0.725	-0.034	0.853	-0.029	0.819	-0.116	0.418
Nm * GI	**-0.466**	**0.054**	-0.482	0.181	0.374	0.312	0.481	0.395	**0.64**	**0.031**	0.201	0.642
Nm^2			0.442	0.266			-0.455	0.466			0.224	0.639
Nm^2 * GI			0.268	0.657			-0.439	0.645			0.918	0.214
R^2	0.305		0.33		0.26		0.271		0.353		0.383	

KEY.	TmI - Team interdependence
CI - Collaboration	TI - Task Interdependence
Ts - Team size	LmX - Leader-member exchange
Ts^2 - Team size squared	TmX - Team-member exchange
Nm - Neuroticism (mean)	BS - Boundary Spanning
Nm^2 - Neuroticism (mean squared)	BB - Boundary Buffering
GI - Goal interdependence	BR - Boundary Reinforcement

Table A 2: Main and interaction effects of Neuroticism and Team Interdependence on Boundary Management

	Boundary Spanning				Boundary Buffering				Boundary Reinforcement			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
Cl	0.072	0.488	0.08	0.449	0.162	0.274	0.11	0.45	0.217	0.093	0.153	0.187
Ts	-0.036	0.104	-0.029	0.202	-0.019	0.537	-0.015	0.627	0.006	0.809	0.015	0.535
Ts^2	0.01	0.042	0.011	0.033	0.013	0.073	0.013	0.072	0.009	0.137	0.009	0.1
Nm	-0.096	0.521	-0.121	0.425	-0.431	0.045	-0.37	0.081	-0.218	0.234	-0.149	0.366
TmI	0.107	0.343	0.044	0.72	0.059	0.712	0.004	0.979	0.014	0.919	-0.086	0.513
Nm * TmI	0.149	0.77	0.393	0.476	**-1.548**	**0.036**	-1.164	0.129	-0.493	0.429	0.126	0.833
Nm^2			0.318	0.258			-0.409	0.289			-0.393	0.198
Nm^2 * TmI			1.174	0.331			2.712	0.106			**4.116**	**0.003**
R^2	0.224		0.262		0.324		0.393		0.275		0.457	

KEY.	TmI - Team interdependence
Cl - Collaboration	TI - Task Interdependence
Ts - Team size	LmX - Leader-member exchange
Ts^2 - Team size squared	TmX - Team-member exchange
Nm - Neuroticism (mean)	BS - Boundary Spanning
Nm^2 - Neuroticism (mean squared)	BB - Boundary Buffering
GI - Goal interdependence	BR - Boundary Reinforcement

Table A 3: Main and interaction effects of Neuroticism and Task Interdependence on Boundary Management

	Boundary Spanning				Boundary Buffering				Boundary Reinforcement			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
CI	0.129	0.123	0.135	0.113	0.15	0.239	0.15	0.257	0.163	0.112	0.13	0.197
Ts	-0.044	0.039	-0.04	0.058	-0.003	0.933	-0.005	0.875	0.014	0.585	0.007	0.781
Ts^2	0.01	0.046	0.01	0.056	0.009	0.241	0.008	0.31	0.008	0.188	0.011	0.079
Nm	-0.124	0.392	-0.164	0.272	-0.527	0.021	-0.488	0.04	-0.205	0.247	-0.206	0.246
TI	0.219	0.059	0.26	0.054	0.115	0.512	0.099	0.633	0.033	0.812	-0.126	0.423
Nm * TI	-0.054	0.894	0.13	0.776	-0.012	0.984	-0.113	0.875	**0.882**	**0.081**	0.357	0.514
Nm^2			0.351	0.264			-0.338	0.491			-0.001	0.998
Nm^2 * TI			-0.28	0.755			-0.009	0.995			**1.924**	**0.078**
R^2	0.273		0.314		0.249		0.262		0.319		0.389	

KEY.	TmI - Team interdependence
CI - Collaboration	TI - Task Interdependence
Ts - Team size	LmX - Leader-member exchange
Ts^2 - Team size squared	TmX - Team-member exchange
Nm - Neuroticism (mean)	BS - Boundary Spanning
Nm^2 - Neuroticism (mean squared)	BB - Boundary Buffering
GI - Goal interdependence	BR - Boundary Reinforcement

APPENDIX 4: MODERATION: EXTRAVERSION

A4.1. Conditional Effects of Extraversion and Interdependence on Boundary Management

Table A 4: Main and interaction effects of Extraversion and Goal Interdependence on Boundary Management

	Boundary Spanning				Boundary Buffering				Boundary Reinforcement			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
CI	0.123	0.128	0.148	0.073	0.25	0.059	0.196	0.133	0.242	0.02	0.205	0.047
Ts	-0.043	0.045	-0.042	0.054	0.011	0.746	0.018	0.587	0.015	0.557	0.017	0.511
Ts^2	0.012	0.02	0.012	0.022	0.005	0.493	0.006	0.447	0.006	0.36	0.006	0.324
Em	0.147	0.371	0.098	0.584	-0.014	0.958	0.205	0.471	0.01	0.96	0.125	0.576
TI	0.151	0.188	0.234	0.068	-0.025	0.892	-0.082	0.682	0.013	0.927	-0.064	0.687
Em * GI	0.154	0.705	-0.071	0.867	-0.327	0.618	-0.105	0.877	-0.591	0.249	-0.36	0.5
Em^2			0.329	0.392			**-1.186**	**0.057**			-0.661	0.172
Em^2 * GI			-1.516	0.152			1.033	0.535			1.383	0.292
R^2	0.252		0.304		0.147		0.232		0.266		0.321	

KEY.

CI - Collaboration
Ts - Team size
Ts^2 - Team size squared
Em - Extraversion (mean)
Em^2 - Extraversion (mean squared)
GI - Goal interdependence
TmI - Team interdependence
TI - Task Interdependence
LmX - Leader-member exchange
TmX - Team-member exchange
BS - Boundary Spanning
BB - Boundary Buffering
BR - Boundary Reinforcement

Table A 5: Main and interaction effects of Extraversion and Team Interdependence on Boundary Management

	Boundary Spanning				Boundary Buffering				Boundary Reinforcement			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
Cl	0.067	0.504	0.09	0.404	0.25	0.124	0.173	0.298	0.26	0.042	0.26	0.04
Ts	-0.038	0.07	-0.04	0.07	0.01	0.752	0.022	0.501	0.018	0.483	0.031	0.21
Ts^2	0.012	0.024	0.012	0.054	0.006	0.46	0.005	0.609	0.004	0.512	-0.002	0.747
Em	0.169	0.318	0.114	0.552	-0.011	0.968	0.254	0.386	0.032	0.878	0.195	0.374
TmI	0.118	0.311	0.084	0.587	0.021	0.912	0.026	0.913	-0.061	0.672	-0.267	0.136
Em * TmI	0.112	0.806	0.073	0.889	0.046	0.949	-0.174	0.829	-0.665	0.245	-1.33	0.032
Em^2			0.239	0.577			**-1.362**	**0.043**			-1.117	0.027
Em^2 * TmI			0.272	0.833			0.827	0.676			**3.296**	**0.031**
R^2	0.236		0.246		0.142		0.23		0.255		0.379	

KEY.	
Cl - Collaboration	TmI - Team interdependence
Ts - Team size	TI - Task Interdependence
Ts^2 - Team size squared	LmX - Leader-member exchange
Em - Extraversion (mean)	TmX - Team-member exchange
Em^2 - Extraversion (mean squared)	BS - Boundary Spanning
GI - Goal interdependence	BB - Boundary Buffering
	BR - Boundary Reinforcement

Table A 6: Main and interaction effects of Extraversion and Task Interdependence on Boundary Management

	Boundary Spanning				Boundary Buffering				Boundary Reinforcement			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
Cl	0.123	0.118	0.13	0.117	0.254	0.043	0.201	0.108	0.258	0.013	0.211	0.04
Ts	-0.042	0.043	-0.044	0.041	0.016	0.609	0.022	0.493	0.019	0.466	0.02	0.437
Ts^2	0.01	0.069	0.01	0.103	-0.002	0.814	-0.002	0.779	0.004	0.609	0.001	0.873
Em	0.177	0.281	0.135	0.462	0.061	0.811	0.275	0.321	0.041	0.846	0.173	0.441
TI	0.203	0.078	0.166	0.257	-0.05	0.779	-0.049	0.822	-0.012	0.937	-0.14	0.433
Em * TI	-0.095	0.853	-0.175	0.749	**-1.642**	**0.046**	-1.559	0.065	-0.617	0.354	-0.79	0.243
Em^2			0.185	0.655			**-1.221**	**0.056**			**-0.944**	**0.068**
Em^2 * TI			0.378	0.785			1.162	0.579			2.835	0.101
R^2	0.28		0.287		0.222		0.292		0.246		0.332	

KEY.	TmI - Team interdependence
Cl - Collaboration	TI - Task Interdependence
Ts - Team size	LmX - Leader-member exchange
Ts^2 - Team size squared	TmX - Team-member exchange
Em - Extraversion (mean)	BS - Boundary Spanning
Em^2 - Extraversion (mean squared)	BB - Boundary Buffering
Gl - Goal interdependence	BR - Boundary Reinforcement

APPENDIX 5: MODERATION: OPENNESS

A5.1. Conditional Effects of Openness and Interdependence on Boundary Management

Table A 7: Main and interaction effects of Openness and Goal Interdependence on Boundary Management

	Boundary Spanning				Boundary Buffering				Boundary Reinforcement			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
Cl	0.157	0.051	0.171	0.038	0.196	0.119	0.223	0.086	0.255	0.017	0.25	0.026
Ts	-0.04	0.052	-0.04	0.054	0.016	0.607	0.022	0.483	0.013	0.633	0.011	0.68
Ts^2	0.01	0.03	0.011	0.022	0.006	0.419	0.005	0.443	0.007	0.263	0.007	0.273
Om	0.351	0.061	0.307	0.146	0.3	0.301	0.123	0.711	-0.173	0.473	-0.136	0.631
GI	0.133	0.164	-0.009	0.941	-0.01	0.946	-0.003	0.989	0.098	0.428	0.099	0.569
Om * GI	0.235	0.407	0.032	0.923	**1.010**	**0.027**	0.82	0.123	-0.172	0.643	-0.129	0.772
Om^2			-0.269	0.523			0.815	0.228			-0.168	0.769
Om^2 * GI			1.187	0.110			-0.023	0.984			-0.011	0.992
R^2	0.309		0.355		0.257		0.286		0.255		0.257	

KEY.	TmI - Team interdependence
Cl - Collaboration	TI - Task Interdependence
Ts - Team size	LmX - Leader-member exchange
Ts^2 - Team size squared	TmX - Team-member exchange
Om - Openness (mean)	BS - Boundary Spanning
Om^2 - Openness (mean squared)	BB - Boundary Buffering
GI - Goal interdependence	BR - Boundary Reinforcement

Table A 8: Main and interaction effects of Openness and Team Interdependence on Boundary Management

	Boundary Spanning				Boundary Buffering				Boundary Reinforcement			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
Cl	0.141	0.124	0.161	0.081	0.233	0.118	0.271	0.069	0.242	0.048	0.249	0.036
Ts	-0.036	0.071	-0.027	0.181	0.009	0.766	0.025	0.434	0.017	0.502	0.023	0.378
Ts^2	0.01	0.039	0.01	0.034	0.007	0.351	0.007	0.357	0.007	0.241	0.008	0.154
Om	0.409	0.035	0.598	0.027	0.221	0.469	0.373	0.379	-0.23	0.356	0.323	0.335
TmI	0.059	0.607	-0.03	0.814	0.165	0.377	0.026	0.899	0.021	0.888	-0.084	0.599
Om * TmI	0.375	0.187	-0.489	0.5	-0.715	0.121	-1.647	0.162	-0.281	0.45	-2.258	0.018
Om^2			0.131	0.774			0.674	0.361			-0.885	0.133
Om^2 * TmI			1.935	0.140			2.465	0.241			**3.592**	**0.034**
R^2	0.311		0.358		0.211		0.270		0.252		0.347	

KEY.	TmI - Team interdependence
Cl - Collaboration	TI - Task Interdependence
Ts - Team size	LmX - Leader-member exchange
Ts^2 - Team size squared	TmX - Team-member exchange
Om - Openness (mean)	BS - Boundary Spanning
Om^2 - Openness (mean squared)	BB - Boundary Buffering
GI - Goal interdependence	BR - Boundary Reinforcement

Table A 9: Main and interaction effects of Openness and Task Interdependence on Boundary Management

	Boundary Spanning				Boundary Buffering				Boundary Reinforcement			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
Cl	0.162	0.037	0.166	0.042	0.244	0.045	0.296	0.026	0.252	0.014	0.293	0.009
Ts	-0.033	0.112	-0.036	0.081	0.032	0.325	0.029	0.381	0.01	0.705	0.007	0.798
Ts^2	0.008	0.072	0.009	0.051	0.004	0.613	0.006	0.418	0.007	0.251	0.009	0.152
Om	0.194	0.332	0.142	0.521	0.129	0.679	-0.066	0.854	-0.166	0.527	-0.33	0.272
TI	0.135	0.24	0.018	0.896	-0.086	0.631	-0.232	0.305	0.071	0.635	-0.077	0.682
Om * TI	0.319	0.277	0.228	0.665	**1.041**	**0.027**	0.245	0.774	-0.290	0.449	-0.919	0.201
Om^2			-0.842	0.137			0.362	0.690			-0.001	0.999
Om^2 * TI			1.132	0.128			1.265	0.292			1.32	0.188
R^2	0.309		0.379		0.257		0.282		0.254		0.287	

KEY.

Cl - Collaboration

Ts - Team size

Ts^2 - Team size squared

Om - Openness (mean)

Om^2 - Openness (mean squared)

GI - Goal interdependence

TmI - Team interdependence

TI - Task Interdependence

LmX - Leader-member exchange

TmX - Team-member exchange

BS - Boundary Spanning

BB - Boundary Buffering

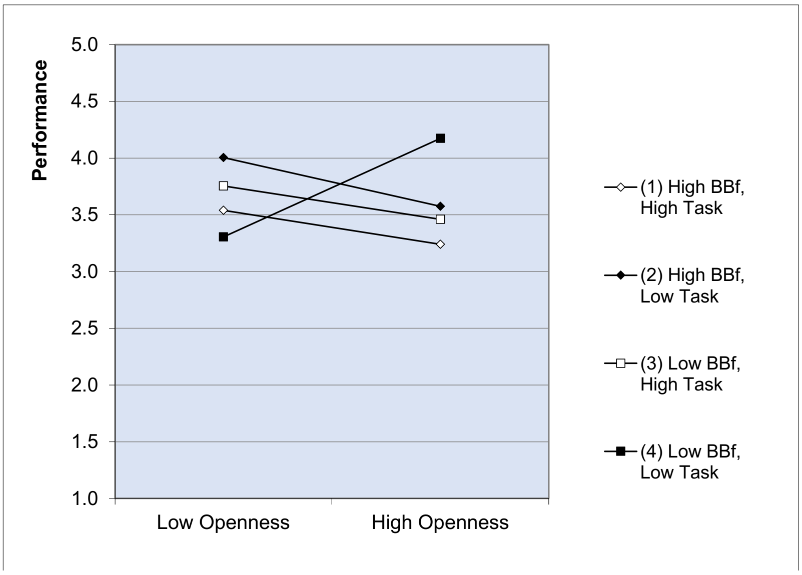
BR - Boundary Reinforcement

A5.2. Conditional Effects of Openness, Boundary Buffering and Interdependence on Performance

KEY.	TmI - Team interdependence
CI - Collaboration	TI - Task Interdependence
Ts - Team size	LmX - Leader-member exchange
Ts^2 - Team size squared	TmX - Team-member exchange
Cm - Conscientiousness (mean)	BS - Boundary Spanning
Cm^2 - Conscientiousness (mean squared)	BB - Boundary Buffering
GI - Goal interdependence	BR - Boundary Reinforcement

Table A 10: Three-way interaction effects of Openness, Task Interdependence and Boundary Buffering on Performance

	B	*p*	B	*p*	B	*p*
CI	-0.008	0.937	-0.042	0.679	0.082	0.413
Ts	0.021	0.396	0.027	0.303	0.032	0.184
Ts^2	0.011	0.062	0.010	0.147	0.013	0.036
Om	-0.002	0.994	0.017	0.949	-0.076	0.750
BB	0.045	0.705	0.026	0.832	-0.081	0.492
TI	**-0.364**	**0.013**	-0.268	0.090	-0.308	0.033
Om * BB			**-0.866**	**0.085**	-1.243	0.010
Om * TI			0.652	0.157	-1.186	0.104
BB * TI			-0.008	0.980	-0.299	0.333
Om * BB * TI					**2.859**	**0.003**
R^2	0.221		0.295		0.444	



Pair of slopes	t-value for slope difference	p-value for slope difference
(1) and (2)	0.704	0.486
(1) and (3)	-0.020	0.984
(1) and (4)	**-3.016**	**0.005**
(2) and (3)	-0.341	0.735
(2) and (4)	**-3.668**	**0.001**
(3) and (4)	**-2.363**	**0.023**

APPENDIX 6: MODERATION: AGREEABLENESS

A6.1. Conditional Effects of Agreeableness and Interdependence on Boundary Management

Table A 11: Main and interaction effects of Agreeableness and Goal Interdependence on Boundary Management

	Boundary Spanning				Boundary Buffering				Boundary Reinforcement			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
CI	0.173	0.032	0.149	0.078	0.166	0.177	0.169	0.202	0.182	0.057	0.15	0.135
Ts	-0.042	0.05	-0.041	0.056	0.005	0.883	0.005	0.885	0.012	0.637	0.013	0.605
Ts2	0.01	0.044	0.01	0.041	0.008	0.282	0.008	0.309	0.008	0.147	0.008	0.154
Am	-0.074	0.727	0.083	0.792	0.493	0.14	0.46	0.353	0.332	0.194	0.429	0.253
GI	0.147	0.134	0.132	0.341	0.006	0.97		0.999	0.072	0.531	-0.004	0.981
Am * GI	0.631	0.131	0.698	0.398	**-1.114**	**0.087**	-1.066	0.412	**-1.178**	**0.02**	-0.669	0.494
Am2			0.552	0.481			-0.112	0.927			0.361	0.697
Am2 * GI			0.374	0.862			0.123	0.971			1.737	0.497
R2	0.278		0.295		0.238		0.238		0.357		0.378	

KEY.	TmI - Team interdependence
CI - Collaboration	TI - Task Interdependence
Ts - Team size	LmX - Leader-member exchange
Ts^2 - Team size squared	TmX - Team-member exchange
Am - Agreeableness (mean)	BS - Boundary Spanning
Am^2 - Agreeableness (mean squared)	BB - Boundary Buffering
GI - Goal interdependence	BR - Boundary Reinforcement

Table A 12: Main and interaction effects of Agreeableness and Team Interdependence on Boundary Management

	Boundary Spanning				Boundary Buffering				Boundary Reinforcement			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
Cl	0.179	0.083	0.164	0.113	0.154	0.347	0.13	0.443	0.235	0.077	0.2	0.141
Ts	-0.023	0.288	-0.019	0.384	-0.003	0.937	0.001	0.976	0.014	0.606	0.021	0.451
Ts2	0.007	0.134	0.007	0.125	0.008	0.324	0.007	0.353	0.006	0.304	0.006	0.325
Am	-0.263	0.268	0.003	0.99	0.563	0.144	0.448	0.335	0.267	0.382	0.396	0.284
TmI	0.021	0.848	-0.012	0.922	0.083	0.648	0.029	0.884	0.005	0.972	-0.075	0.635
Am * TmI	**1.228**	**0.053**	1.537	0.02	-0.482	0.63	-0.56	0.596	0.162	0.839	0.363	0.665
Am2			1.064	0.214			-1.393	0.322			-0.362	0.745
Am2 * TmI			0.276	0.911			3.94	0.337			3.928	0.23
R2	0.286		0.337		0.186		0.21		0.251		0.285	

KEY.	
Cl - Collaboration	TmI - Team interdependence
Ts - Team size	TI - Task Interdependence
Ts^2 - Team size squared	LmX - Leader-member exchange
Am - Agreeableness (mean)	TmX - Team-member exchange
Am^2 - Agreeableness (mean squared)	BS - Boundary Spanning
GI - Goal interdependence	BB - Boundary Buffering
	BR - Boundary Reinforcement

Table A 13: Main and interaction effects of Agreeableness and Task Interdependence on Boundary Management

	Boundary Spanning				Boundary Buffering				Boundary Reinforcement			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
Cl	0.145	0.066	0.106	0.2	0.18	0.14	0.208	0.104	0.215	0.032	0.181	0.092
Ts	-0.041	0.052	-0.041	0.05	-0.002	0.954	-0.002	0.944	0.01	0.704	0.01	0.714
Ts2	0.01	0.038	0.012	0.022	0.009	0.208	0.009	0.239	0.008	0.165	0.01	0.128
Am	-0.061	0.772	0.225	0.433	0.495	0.138	0.621	0.163	0.306	0.255	0.53	0.155
TI	0.204	0.07	0.197	0.149	0.061	0.721	0.28	0.18	0.037	0.792	0.013	0.941
Am * TI	-0.67	0.298	-0.939	0.225	**-1.757**	**0.083**	-2.869	0.019	-1.025	0.21	-1.151	0.246
Am2			1.015	0.139			-0.046	0.965			0.832	0.341
Am2 * TI			0.266	0.909			**-6.557**	**0.073**			0.763	0.799
R2	0.281		0.321		0.239		0.301		0.28		0.297	

KEY.

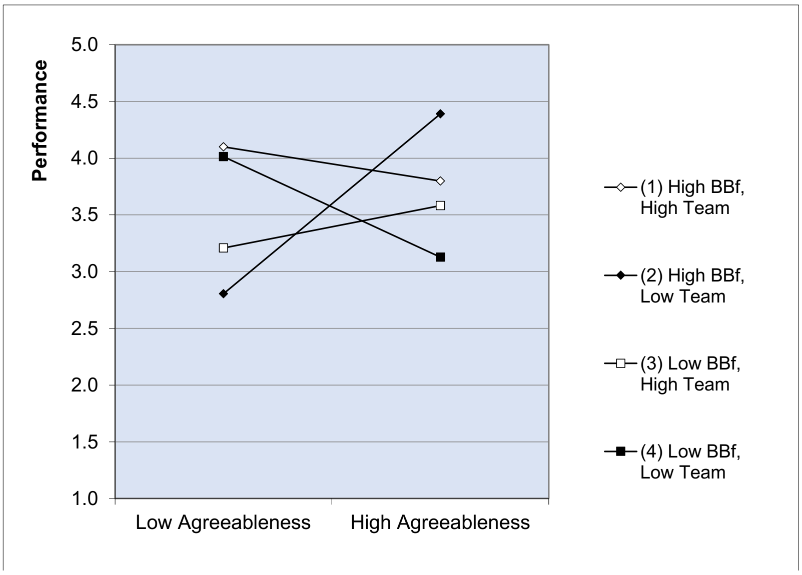
- Cl - Collaboration
- Ts - Team size
- Ts^2 - Team size squared
- Am - Agreeableness (mean)
- Am^2 - Agreeableness (mean squared)
- Gl - Goal interdependence
- TmI - Team interdependence
- TI - Task Interdependence
- LmX - Leader-member exchange
- TmX - Team-member exchange
- BS - Boundary Spanning
- BB - Boundary Buffering
- BR - Boundary Reinforcement

A6.2. Conditional Effects of Agreeableness, Boundary Buffering and Interdependence on Performance

KEY.	TmI - Team interdependence
CI - Collaboration	TI - Task Interdependence
Ts - Team size	LmX - Leader-member exchange
Ts^2 - Team size squared	TmX - Team-member exchange
Am - Agreeableness (mean)	BS - Boundary Spanning
Am^2 - Agreeableness (mean squared)	BB - Boundary Buffering
GI - Goal interdependence	BR - Boundary Reinforcement

Table A 14: Three-way interaction effects of Agreeableness, Team Interdependence and Boundary Buffering on Performance

	B	*p*	B	*p*	B	*p*
CI	-0.013	0.923	-0.059	0.664	-0.030	0.819
Ts	0.011	0.691	0.007	0.795	0.006	0.817
Ts^2	0.009	0.163	0.006	0.363	0.007	0.295
Am	0.059	0.841	0.340	0.289	0.421	0.176
BB	0.031	0.809	0.117	0.354	0.280	0.057
TmI	0.015	0.918	0.038	0.794	0.082	0.564
Am * BB			**1.361**	**0.015**	1.891	0.002
Am * TmI			-0.559	0.494	-0.635	0.418
BB * TmI			0.338	0.320	0.472	0.158
Am * BB * TmI					**-6.148**	**0.043**
R^2	0.082		0.257		0.336	



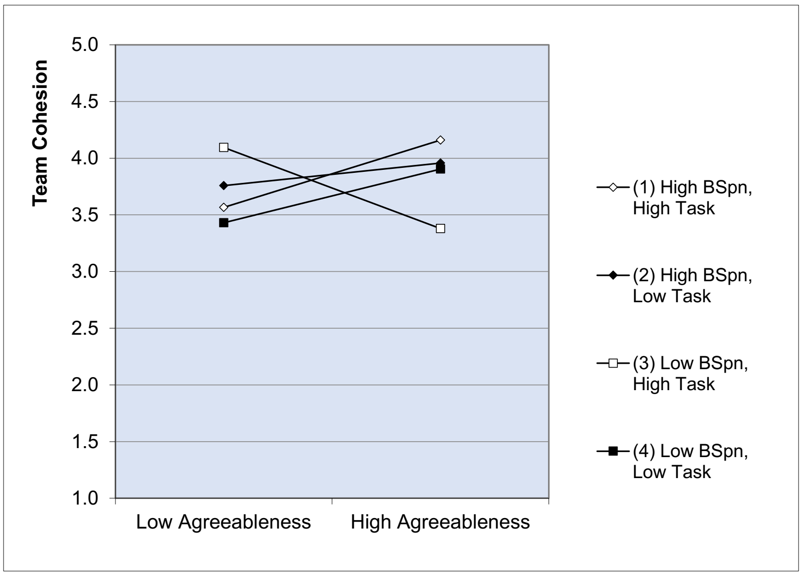
Pair of slopes	t-value for slope difference	p-value for slope difference
(1) and (2)	**-2.202**	**0.034**
(1) and (3)	-1.000	0.324
(1) and (4)	1.325	0.193
(2) and (3)	**2.451**	**0.019**
(2) and (4)	2.740	0.009
(3) and (4)	1.527	0.135

A6.3. Conditional Effects of Agreeableness, Boundary Spanning and Interdependence on Team Cohesion

KEY.	TmI - Team interdependence
CI - Collaboration	TI - Task Interdependence
Ts - Team size	LmX - Leader-member exchange
Ts^2 - Team size squared	TmX - Team-member exchange
Am - Agreeableness (mean)	BS - Boundary Spanning
Am^2 - Agreeableness (mean squared)	BB - Boundary Buffering
GI - Goal interdependence	BR - Boundary Reinforcement

Table A 15: Three-way interaction effects of Agreeableness, Task Interdependence and Boundary Spanning on Team Cohesion

	B	*p*	B	*p*	B	*p*
CI	-0.191	0.115	-0.144	0.210	-0.175	0.113
Ts	-0.002	0.941	0.000	0.998	0.004	0.890
Ts^2	0.014	0.060	0.011	0.120	0.009	0.174
Am	**0.665**	**0.040**	0.408	0.190	0.301	0.310
BS	0.158	0.495	0.240	0.304	0.230	0.297
TI	0.032	0.852	0.072	0.688	0.044	0.799
Am * BS			**2.282**	**0.009**	1.648	0.053
Am * TI			0.336	0.721	-1.005	0.344
BS * TI			-0.133	0.762	-0.110	0.791
Am * BS * TI					**5.850**	**0.024**
R^2	0.214		0.363		0.445	



Pair of slopes	t-value for slope difference	p-value for slope difference
(1) and (2)	1.081	0.286
(1) and (3)	**3.728**	**0.001**
(1) and (4)	0.249	0.804
(2) and (3)	**1.855**	**0.072**
(2) and (4)	-0.563	0.577
(3) and (4)	-1.797	0.081

APPENDIX 7: MODERATION: CONSCIENTIOUSNESS

A7.1. Conditional Effects of Conscientiousness and Interdependence on Boundary Management

Table A 16: Main and interaction effects of Conscientiousness and Goal Interdependence on Boundary Management

	Boundary Spanning				Boundary Buffering				Boundary Reinforcement			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
CI	0.172	0.045	0.166	0.06	0.168	0.22	0.153	0.275	0.205	0.055	0.185	0.057
Ts	-0.05	0.026	-0.048	0.052		0.993	-0.002	0.968	0.022	0.434	0.003	0.903
Ts2	0.012	0.018	0.012	0.026	0.009	0.274	0.01	0.239	0.005	0.418	0.01	0.099
Cm	0.151	0.513	0.178	0.464	0.385	0.306	0.465	0.238	-0.085	0.77	0.035	0.896
GI	0.138	0.152	0.127	0.296	0.042	0.786	-0.045	0.815	0.092	0.445	-0.173	0.195
Cm * GI	**0.554**	**0.081**	0.57	0.093	-0.151	0.766	-0.029	0.957	-0.66	0.097	-0.292	0.426
Cm2			0.29	0.664			0.65	0.547			0.5	0.497
Cm2 * GI			0.287	0.69			1.148	0.324			**2.500**	**0.003**
R2	0.291		0.295		0.179		0.199		0.296		0.466	

KEY.	TmI - Team interdependence
CI - Collaboration	TI - Task Interdependence
Ts - Team size	LmX - Leader-member exchange
Ts^2 - Team size squared	TmX - Team-member exchange
Cm - Conscientiousness (mean)	BS - Boundary Spanning
Cm^2 - Conscientiousness (mean squared)	BB - Boundary Buffering
GI - Goal interdependence	BR - Boundary Reinforcement

Table A 17: Main and interaction effects of Conscientiousness and Team Interdependence on Boundary Management

	Boundary Spanning				Boundary Buffering				Boundary Reinforcement			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
Cl	0.142	0.198	0.177	0.118	0.205	0.227	0.164	0.345	0.307	0.025	0.309	0.021
Ts	-0.033	0.134	-0.025	0.316	0.003	0.938	-0.018	0.633	0.019	0.459	-0.012	0.67
Ts2	0.01	0.063	0.007	0.245	0.009	0.265	0.014	0.114	0.006	0.29	0.011	0.093
Cm	-0.077	0.722	0.007	0.974	0.379	0.256	0.215	0.545	0.042	0.873	-0.145	0.584
TmI	0.13	0.271	0.204	0.115	0.133	0.461	0.037	0.85	0.089	0.534	0.063	0.666
Cm * TmI	0.386	0.29	-0.316	0.612	0.726	0.197	1.785	0.069	**0.835**	**0.063**	1.503	0.042
Cm2			0.341	0.567			-0.988	0.285			-1.679	0.018
Cm2 * TmI			-2.327	0.156			3.241	0.199			1.449	0.439
R2	0.237		0.277		0.211		0.247		0.296		0.397	

KEY.	TmI - Team interdependence
Cl - Collaboration	TI - Task Interdependence
Ts - Team size	LmX - Leader-member exchange
Ts^2 - Team size squared	TmX - Team-member exchange
Cm - Conscientiousness (mean)	BS - Boundary Spanning
Cm^2 - Conscientiousness (mean squared)	BB - Boundary Buffering
GI - Goal interdependence	BR - Boundary Reinforcement

Table A 18: Main and interaction effects of Conscientiousness and Task Interdependence on Boundary Management

	Boundary Spanning				Boundary Buffering				Boundary Reinforcement			
	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*	B	*p*
Cl	0.176	0.042	0.178	0.046	0.208	0.126	0.228	0.101	0.248	0.028	0.239	0.028
Ts	-0.04	0.062	-0.032	0.178	-0.004	0.895	-0.001	0.981	0.013	0.63	-0.018	0.536
Ts2	0.009	0.066	0.008	0.169	0.011	0.166	0.009	0.297	0.008	0.234	0.014	0.039
Cm	0.019	0.934	0.027	0.909	0.62	0.092	0.576	0.124	0.165	0.577	0.137	0.63
TI	0.184	0.104	0.244	0.102	-0.001	0.998	0.089	0.7	0.009	0.948	-0.247	0.171
Cm * TI	0.338	0.394	0.32	0.446	0.757	0.23	0.934	0.161	0.191	0.71	0.244	0.632
Cm2			0.166	0.829			-1.121	0.354			-0.54	0.562
Cm2 * TI			-0.394	0.741			-1.868	0.321			1.839	0.208
R2	0.274		0.284		0.205		0.227		0.236		0.339	

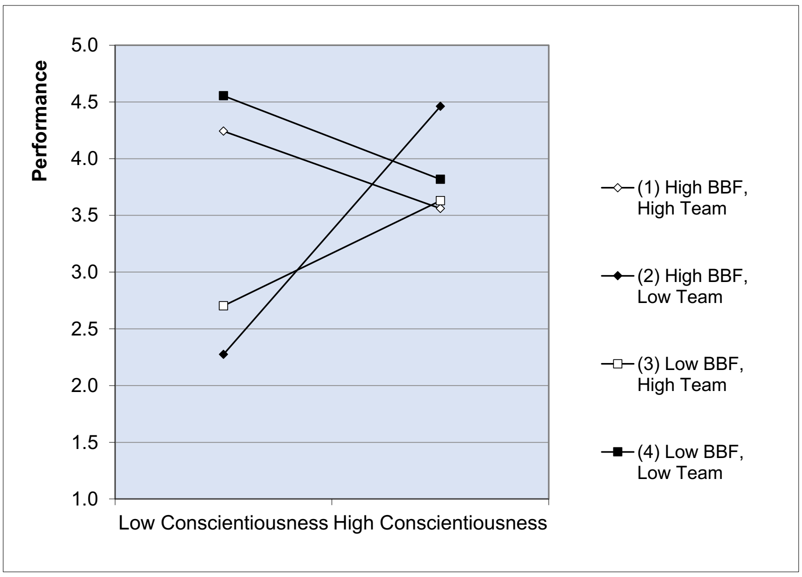
KEY.	TmI - Team interdependence
Cl - Collaboration	TI - Task Interdependence
Ts - Team size	LmX - Leader-member exchange
Ts^2 - Team size squared	TmX - Team-member exchange
Cm - Conscientiousness (mean)	BS - Boundary Spanning
Cm^2 - Conscientiousness (mean squared)	BB - Boundary Buffering
GI - Goal interdependence	BR - Boundary Reinforcement

A7.2. Conditional Effects of Conscientiousness, Boundary Buffering and Interdependence on Performance

KEY.	TmI - Team interdependence
CI - Collaboration	TI - Task Interdependence
Ts - Team size	LmX - Leader-member exchange
Ts^2 - Team size squared	TmX - Team-member exchange
Cm - Conscientiousness (mean)	BS - Boundary Spanning
Cm^2 - Conscientiousness (mean squared)	BB - Boundary Buffering
GI - Goal interdependence	BR - Boundary Reinforcement

Table A 19: Three-way interaction effects of Conscientiousness, Team Interdependence and Boundary Buffering on Performance

	B	*p*	B	*p*	B	*p*
CI	-0.048	0.728	-0.030	0.826	0.110	0.378
Ts	0.006	0.821	0.009	0.732	-0.009	0.678
Ts^2	0.010	0.121	0.008	0.216	-0.002	0.751
Cm	0.204	0.468	0.228	0.383	0.804	0.005
BB	0.018	0.890	0.065	0.596	-0.040	0.711
TmI	0.028	0.845	-0.082	0.573	-0.226	0.092
Cm * BB			**1.075**	**0.009**	1.203	0.001
Cm * TmI			-0.573	0.205	-1.065	0.012
BB * TmI			0.472	0.135	1.392	0.000
Cm * BB * TmI					**-7.708**	**0.001**
R^2	0.093		0.290		0.488	



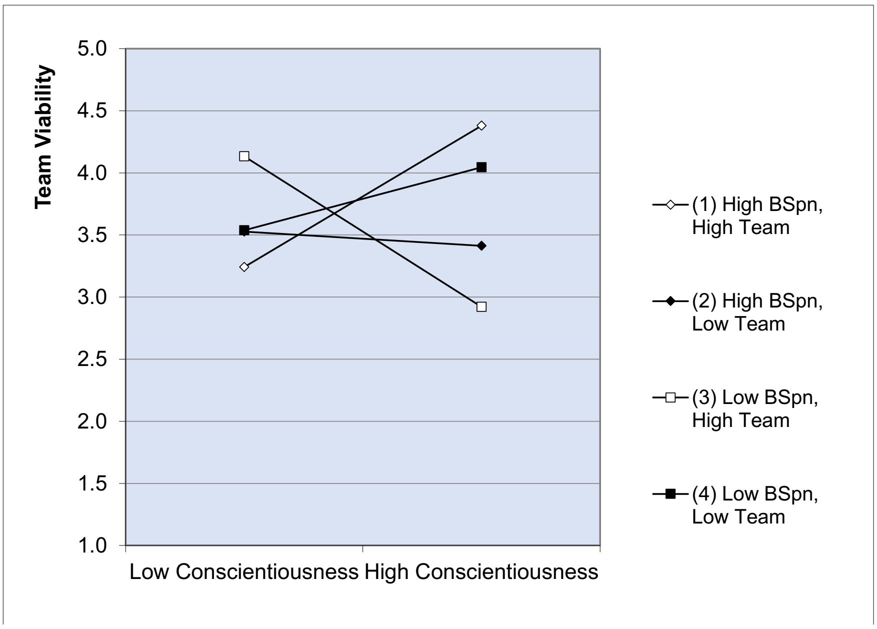
Pair of slopes	t-value for slope difference	p-value for slope difference
(1) and (2)	**-4.067**	**0.000**
(1) and (3)	**-2.649**	**0.012**
(1) and (4)	0.206	0.838
(2) and (3)	**3.909**	**0.000**
(2) and (4)	**4.549**	**0.000**
(3) and (4)	**2.931**	**0.006**

A7.3. Conditional Effects of Conscientiousness, Boundary Spanning and Interdependence on Team Viability

KEY.	TmI - Team interdependence
Cl - Collaboration	TI - Task Interdependence
Ts - Team size	LmX - Leader-member exchange
Ts^2 - Team size squared	TmX - Team-member exchange
Cm - Conscientiousness (mean)	BS - Boundary Spanning
Cm^2 - Conscientiousness (mean squared)	BB - Boundary Buffering
GI - Goal interdependence	BR - Boundary Reinforcement

Table A 20: Three-way interaction effects of Conscientiousness, Team Interdependence and Boundary Spanning on Team Viability

	B	*p*	B	*p*	B	*p*
Cl	-0.156	0.202	-0.065	0.617	-0.039	0.757
Ts	-0.025	0.315	-0.040	0.115	-0.038	0.119
Ts^2	0.016	0.008	0.018	0.004	0.017	0.004
Cm	0.393	0.109	0.214	0.394	0.151	0.534
BS	-0.008	0.966	-0.067	0.700	-0.027	0.872
TmI	-0.008	0.948	0.024	0.858	0.035	0.789
Cm * BS			**2.379**	**0.030**	2.394	0.024
Cm * TmI			0.172	0.680	-0.413	0.413
BS * TmI			0.270	0.286	0.821	0.033
Cm * BS * TmI					**7.648**	**0.059**
R^2	0.188		0.302		0.367	



Pair of slopes	t-value for slope difference	p-value for slope difference
(1) and (2)	**1.975**	**0.056**
(1) and (3)	**2.770**	**0.009**
(1) and (4)	1.302	0.201
(2) and (3)	**2.494**	**0.017**
(2) and (4)	-0.737	0.466
(3) and (4)	-1.793	0.081

APPENDIX 8: MEDIATION

Mediation:

Mediation: A given variable may be said to function as a mediator to the extent that it accounts for the relationship between the predictor and the criterion. Mediators explain how external physical events take on internal psychological significance (Baron and Kenny, 1986, p.1176).

Little to no support was found for the mediating role of Team Boundary Management in the Team Personality and Team Outcomes relationship. These results are detailed in Chapters 5 to 9. Primarily this was because comparatively few main effects were found between Team Personality and Team Boundary Management. **Table A21** below provides an overview of the significant main effects that were found.

Table A 21: Summary of Main Effects, Personality Traits and Boundary Management

	Boundary Spanning	Boundary Buffering	Boundary Reinforcement
Main Effects			
Neuroticism	--	linear p =.022	--
Extraversion	--	--	--
Agreeableness	--	--	--
Conscientiousness	--	--	--
Openness	linear p =.081	--	--

Meanwhile, **Table A22** below summarises the main effects between Team Personality and each of the Boundary Management activities and provides some new insights into the relationship between Team Personality and Team Boundary Management processes, these are relatively limited in their utility since most of the significant results relate to Neuroticism and Boundary Buffering. Despite this, the novelty of these findings is worthy of mention on the basis of the absence of prior studies into the antecedents of Boundary Management, or its relationship to Team Personality traits.

Table A 22: Summary of Main Effects, Team Personality and Boundary Management

	Boundary Spanning	Boundary Buffering	Boundary Reinforcement
Main Effects			
Neuroticism	Linear N^{SD} p = .092	Linear N^{m} p = .022, N^{l} p = .097, N^{h} p = .031; quadratic N^{m2} p = .083	--
Extraversion	--	Linear E^{SD} p = .045; quadratic E^{m2} p = .062	Linear E^{SD} p = .055
Agreeableness	--	--	--
Conscientiousness	--	--	--
Openness	Linear O^{m} p = .081, O^{h} p = .096	Linear O^{h} p = .069	--

Table A22 reveals each of the hypothesised relationships between Neuroticism, Extraversion and Openness on Boundary Buffering were supported by significant (positive and negative) direct effects. It is not surprising that the tendency of Neurotics to be high-strung and intolerant of uncertainty (Barrick et al., 2001, Costa Jr and McCrae, 1992, Henderson et al., 1981, Molleman et al., 2004, Stokes, 1985, Van Vianen and De Dreu, 2001) would negatively influence Boundary Buffering, or manifest as a curvilinear relationship Driskell et al. (1987). These results support the view that Boundary Buffering is negatively impacted as Neuroticism increases (from low to high) and when variance in Neuroticism within the team is low. Conversely that Boundary Buffering increases as Neuroticism increases when variance in Neuroticism across the team is high. Results of previous studies reporting on heterogeneity in Neuroticism between team members have been mixed (negative effect: Mohammed and Angell, 2003, Prewett et al., 2009, Stewart, 2003, positive effect: Neuman et al., 1999, Bell, 2007 (based on study in field setting not lab setting)), although given the relationship between Agreeableness and Performance, one might intuitively conclude, as others have (Barrick et al., 1998, Neuman et al., 1999, Van Vianen and De Dreu, 2001), that the presence of even a few highly neurotic individuals would degrade team effectiveness by disrupting cooperation, cohesion, and the team atmosphere.

A8.1. Mediation Analysis

The Process analysis reported in **Table A23** (Boundary Spanning), **Table A24** (Boundary Buffering) and **Table A25** (Boundary Reinforcement) would indicate little to no support for the mediating role of Team Boundary Management within the IPO framework using Team Neuroticism.

Table A 23: Mediation effects of Boundary Spanning in the association of Neuroticism and Outcomes

	Effect of IV on M		***Effect of M on DV***		***Direct effect***		***Indirect effect***		
	a [i]	*SE*	b [ii]	*SE*	c' [iii]	*SE*	$a^x b$ [iv]	*CI lower*	*CI upper*
Team Performance	$-.0635^{ns}$	0.1411	$.0751^{ns}$	0.2451	$-.0270^{ns}$	0.2272	$-.0048^{ns}$	-0.1244	0.0571
Performance	$-.0635^{ns}$	0.1411	$-.0676^{ns}$	0.1960	$.0371^{ns}$	0.1817	$.0043^{ns}$	-0.0353	0.1149
Team Cohesion	$-.0635^{ns}$	0.1411	$.1018^{ns}$	0.2144	-.5129*	0.1988	$-.0065^{ns}$	-0.1796	0.0450
Team Viability	$-.0635^{ns}$	0.1411	$-.0419^{ns}$	0.1723	$-.2443^{ns}$	0.1598	$.0027^{ns}$	-0.0928	0.0413

Notes.
[i] **a**, the effect of each personality factor on (**Boundary Spanning**)
[ii] **b**, the effect of (**Boundary Spanning**) on (**Outcomes**)
[iii] **c**, the total effect of each personality factor on (**Outcomes**)
[iv] **c'** , the direct total effect of each personality factor on (**Outcomes**)
[v] **a^xb**, the indirect total effect of each personality factor on (**Outcomes**) via (**Boundary Spanning**)
SE, standard errors
^{ns} $p>0.10$, † $p<0.10$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

Table A 24: Mediation effects of Boundary Buffering in the association of Neuroticism and Outcomes

	Effect of IV on M		***Effect of M on DV***		***Direct effect***		***Indirect effect***		
	a [i]	*SE*	b [ii]	*SE*	c' [iii]	*SE*	$a^x b$ [iv]	*CI lower*	*CI upper*
Team Performance	-.4961*	0.2085	0.2941	0.1597	$.1142^{ns}$	0.2323	$-.1459^{ns}$	-0.4732	0.0068
Performance	-.4961*	0.2085	0.0531	0.1325	$.0678^{ns}$	0.1928	$-.0264^{ns}$	-0.1893	0.1318
Team Cohesion	-.4961*	0.2085	0.1338	0.1440	-.4530*	0.2094	$-.0664^{ns}$	-0.2545	0.0196
Team Viability	-.4961*	0.2085	$.1865^{ns}$	0.1131	$-.1491^{ns}$	0.1644	$-.0925^{ns}$	-0.3106	0.0119

Notes.
[i] **a**, the effect of each personality factor on (**Boundary Buffering**)
[ii] **b**, the effect of (**Boundary Buffering**) on (**Outcomes**)
[iii] **c**, the total effect of each personality factor on (**Outcomes**)
[iv] **c'** , the direct total effect of each personality factor on (**Outcomes**)
[v] **a^xb**, the indirect total effect of each personality factor on (**Outcomes**) via (**Boundary Buffering**)
SE, standard errors
^{ns} p>0.10, † p<0.10, * p<0.05, ** p<0.01, *** p<0.001.

Table A 25: Mediation effects of Boundary Reinforcement in the association of Neuroticism and Outcomes

	Effect of IV on M		***Effect of M on DV***		***Direct effect***		***Indirect effect***		
	a [i]	*SE*	b [ii]	*SE*	c' [iii]	*SE*	$a^x b$ [iv]	*CI lower*	*CI upper*
Team Performance	-.2396^{ns}	0.1716	.3161^{ns}	0.1958	.0440^{ns}	0.2252	-.0757^{ns}	-0.2808	0.1190
Performance	-.2396^{ns}	0.1716	-.0298^{ns}	0.1613	.0343^{ns}	0.1856	.0071^{ns}	-0.1105	0.1913
Team Cohesion	-.2396^{ns}	0.1716	.0740^{ns}	0.1764	-.5016*	0.2029	-.0177^{ns}	-0.1272	0.0952
Team Viability	-.2396^{ns}	0.1716	.1182^{ns}	0.1406	-.2133^{ns}	0.1617	-.0283^{ns}	-0.1356	0.0704

Notes.
[i] **a**, the effect of each personality factor on (**Boundary Reinforcement**)
[ii] **b**, the effect of (**Boundary Reinforcement**) on (**Outcomes**)
[iii] **c**, the total effect of each personality factor on (**Outcomes**)
[iv] **c'** , the direct total effect of each personality factor on (**Outcomes**)
[v] **$a^x b$**, the indirect total effect of each personality factor on (**Outcomes**) via (**Boundary Reinforcement**)
SE, standard errors
^{ns} $p>0.10$, † $p<0.10$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

APPENDIX 9: MEDIATION: EXTRAVERSION

A9.1. Mediation Analysis

The Process analysis reported in **Table A26** (Boundary Spanning), **Table A27** (Boundary Buffering) and **Table A28** (Boundary Reinforcement) would indicate little to no support for the mediating role of Team Boundary Management within the IPO framework using Team Extraversion.

Table A 26: Mediation effects of Boundary Spanning in the association of Extroversion and Outcomes

	Effect of IV on M		***Effect of M on DV***		***Direct effect***		***Indirect effect***		
	a [i]	*SE*	b [ii]	*SE*	c' [iii]	*SE*	$a^x b$ [iv]	*CI lower*	*CI upper*
Team Performance	$.1477^{ns}$	0.1624	$.0874^{ns}$	0.2466	$-.0806^{ns}$	0.2652	$.0129^{ns}$	-0.0886	0.1043
Performance	$.1477^{ns}$	0.1624	$-.0987^{ns}$	0.1949	$.2218^{ns}$	0.2096	$-.0146^{ns}$	-0.0901	0.0500
Team Cohesion	$.1477^{ns}$	0.1624	$.1875^{ns}$	0.2261	$-.3739^{ns}$	0.2431	$.0277^{ns}$	-0.0904	0.1340
Team Viability	$.1477^{ns}$	0.1624	$-.0052^{ns}$	0.1771	$-.1465^{ns}$	0.1904	$-.0008^{ns}$	-0.1008	0.0591

Notes.
[i] **a**, the effect of each personality factor on (**Boundary Spanning**)
[ii] **b**, the effect of (**Boundary Spanning**) on (**Outcomes**)
[iii] **c**, the total effect of each personality factor on (**Outcomes**)
[iv] **c'** , the direct total effect of each personality factor on (**Outcomes**)
[v] **$a^x b$**, the indirect total effect of each personality factor on (**Outcomes**) via (**Boundary Spanning**)
SE, standard errors
^{ns} $p>0.10$, † $p<0.10$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

Table A 27: Mediation effects of Boundary Buffering in the association of Extroversion and Outcomes

	Effect of IV on M		***Effect of M on DV***		***Direct effect***		***Indirect effect***		
	a [i]	*SE*	b [ii]	*SE*	c' [iii]	*SE*	$a^x b$ [iv]	*CI lower*	*CI upper*
Team Performance	.0131^{ns}	0.2572	0.267	0.1504	-.0642^{ns}	0.2537	.0035^{ns}	-0.2233	0.1295
Performance	.0131^{ns}	0.2572	.0382^{ns}	0.1233	.2077^{ns}	0.2080	-.0005^{ns}	-0.0911	0.0751
Team Cohesion	.0131^{ns}	0.2572	0.2384	0.1392	-.3431^{ns}	0.2347	-.0031^{ns}	-0.2019	0.1172
Team Viability	.0131^{ns}	0.2572	.2208*	0.1065	-.1444^{ns}	0.1796	-.0029^{ns}	-0.1925	0.0921

Notes.
[i] **a**, the effect of each personality factor on (**Boundary Buffering**)
[ii] **b**, the effect of (**Boundary Buffering**) on (**Outcomes**)
[iii] **c**, the total effect of each personality factor on (**Outcomes**)
[iv] **c'** , the direct total effect of each personality factor on (**Outcomes**)
[v] **$a^x b$**, the indirect total effect of each personality factor on (**Outcomes**) via (**Boundary Buffering**)
SE, standard errors
^{ns} $p>0.10$, † $p<0.10$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

Table A 28: Mediation effects of Boundary Reinforcement in the association of Extroversion and Outcomes

	Effect of IV on M		***Effect of M on DV***		***Direct effect***		***Indirect effect***		
	a [i]	*SE*	b [ii]	*SE*	c' [iii]	*SE*	$a^x b$ [iv]	*CI lower*	*CI upper*
Team Performance	$.0120^{ns}$	0.2034	$.3086^{ns}$	0.1914	$-.0714^{ns}$	0.2553	$.0037^{ns}$	-0.202	0.1198
Performance	$.0120^{ns}$	0.2034	$-.0374^{ns}$	0.156	$.2077^{ns}$	0.2081	$-.0004^{ns}$	-0.135	0.0550
Team Cohesion	$.0120^{ns}$	0.2034	$.1672^{ns}$	0.1802	$-.3482^{ns}$	0.2403	$.0020^{ns}$	-0.1191	0.0859
Team Viability	$.0120^{ns}$	0.2034	$.1578^{ns}$	0.1393	$-.1492^{ns}$	0.1858	$.0019^{ns}$	-0.1003	0.0694

Notes.
[i] **a**, the effect of each personality factor on (**Boundary Reinforcement**)
[ii] **b**, the effect of (**Boundary Reinforcement**) on (**Outcomes**)
[iii] **c**, the total effect of each personality factor on (**Outcomes**)
[iv] **c'** , the direct total effect of each personality factor on (**Outcomes**)
[v] $\mathbf{a^x b}$, the indirect total effect of each personality factor on (**Outcomes**) via (**Boundary Reinforcement**)
SE, standard errors
^{ns} $p>0.10$, † $p<0.10$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

APPENDIX 10: MEDIATION: OPENNESS

A10.1. Mediation Analysis

The Process analysis reported in **Table A29** (Boundary Spanning), **Table A30** (Boundary Buffering) and **Table A31** (Boundary Reinforcement) would indicate little to no support for the mediating role of Team Boundary Management within the IPO framework using Team Openness.

Table A 29: Mediation effects of Boundary Spanning in the association of Openness and Outcomes

	Effect of IV on M		***Effect of M on DV***		***Direct effect***		***Indirect effect***		
	a^{i}	*SE*	b^{ii}	*SE*	$c'^{\ iii}$	*SE*	$a^{x}b^{\ iv}$	*CI lower*	*CI upper*
Team Performance	$.3299^{\dagger}$	0.1844	$.0486^{ns}$	0.2530	$.1357^{ns}$	0.3171	$.0160^{ns}$	-0.0908	0.3290
Performance	$.3299^{\dagger}$	0.1844	$-.0355^{ns}$	0.2018	$-.1660^{ns}$	0.2529	$.0117^{ns}$	-0.1486	0.1207
Team Cohesion	$.3299^{\dagger}$	0.1844	$.1443^{ns}$	0.2386	$-.0221^{ns}$	0.2991	$.0476^{ns}$	-0.2016	0.4285
Team Viability	$.3299^{\dagger}$	0.1844	$.0089^{ns}$	0.1821	$-.1561^{ns}$	0.2282	$.0029^{ns}$	-0.1792	0.2306

Notes.
^{i} **a**, the effect of each personality factor on (**Boundary Spanning**)
^{ii} **b**, the effect of (**Boundary Spanning**) on (**Outcomes**)
^{iii} **c**, the total effect of each personality factor on (**Outcomes**)
^{iv} **c'** , the direct total effect of each personality factor on (**Outcomes**)
^{v} **a^{x}b**, the indirect total effect of each personality factor on (**Outcomes**) via (**Boundary Spanning**)
SE, standard errors
^{ns} $p>0.10$, † $p<0.10$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

Table A 30: Mediation effects of Boundary Buffering in the association of Openness and Outcomes

	Effect of IV on M		***Effect of M on DV***		***Direct effect***		***Indirect effect***		
	a [i]	*SE*	b [ii]	*SE*	c' [iii]	*SE*	a×b [iv]	*CI lower*	*CI upper*
Team Performance	.2980^{ns}	0.2964	.2616	0.1522	.0738^{ns}	0.2993	.0780^{ns}	-0.1743	0.3195
Performance	.2980^{ns}	0.2964	.0521^{ns}	0.1253	-.1932^{ns}	0.2465	.0155^{ns}	-0.1252	0.1648
Team Cohesion	.2980^{ns}	0.2964	.2436	0.1443	-.0470^{ns}	0.2837	.0726^{ns}	-0.2409	0.3301
Team Viability	.2980^{ns}	0.2964	.2387*	0.1071	-.2243^{ns}	0.2107	.0711^{ns}	-0.1709	0.3097

Notes.
[i] **a**, the effect of each personality factor on (**Boundary Buffering**)
[ii] **b**, the effect of (**Boundary Buffering**) on (**Outcomes**)
[iii] **c**, the total effect of each personality factor on (**Outcomes**)
[iv] **c'** , the direct total effect of each personality factor on (**Outcomes**)
[v] **a×b**, the indirect total effect of each personality factor on (**Outcomes**) via (**Boundary Buffering**)
SE, standard errors
^{ns} p>0.10, † p<0.10, * p<0.05, ** p<0.01, *** p<0.001.

Table A 31: Mediation effects of Boundary Reinforcement in the association of Openness and Outcomes

	Effect of IV on M		***Effect of M on DV***		***Direct effect***		***Indirect effect***		
	a [i]	*SE*	b [ii]	*SE*	c' [iii]	*SE*	a^{x}b [iv]	*CI lower*	*CI upper*
Team Performance	-.1883^{ns}	0.2354	0.3247	0.1918	.2129^{ns}	0.2983	-.0611^{ns}	-0.4515	0.0946
Performance	-.1883^{ns}	0.2354	-.0505^{ns}	0.1579	-.1872^{ns}	0.2456	.0095^{ns}	-0.1783	0.1441
Team Cohesion	-.1883^{ns}	0.2354	.1693^{ns}	0.1859	.0574^{ns}	0.2891	-.0319^{ns}	-0.2188	0.0865
Team Viability	--.1883^{ns}	0.2354	.1470^{ns}	0.1408	-.1254^{ns}	0.219	-.0277^{ns}	-0.2274	0.0424

Notes.
[i] **a**, the effect of each personality factor on (**Boundary Reinforcement**)
[ii] **b**, the effect of (**Boundary Reinforcement**) on (**Outcomes**)
[iii] **c**, the total effect of each personality factor on (**Outcomes**)
[iv] **c'** , the direct total effect of each personality factor on (**Outcomes**)
[v] **a^{x}b**, the indirect total effect of each personality factor on (**Outcomes**) via (**Boundary Reinforcement**)
SE, standard errors
^{ns} p>0.10, † p<0.10, * p<0.05, ** p<0.01, *** p<0.001.

APPENDIX 11: MEDIATION: AGREEABLENESS

A11.1. Mediation Analysis

The Process analysis reported in **Table A32** (Boundary Spanning**), Table A33** (Boundary Buffering) and **Table A34** (Boundary Reinforcement) would indicate little to no support for the mediating role of Team Boundary Management within the IPO framework using Team Agreeableness.

Table A 32: *Mediation effects of Boundary Spanning in the association of Agreeableness and Outcomes*

	Effect of IV on M		***Effect of M on DV***		***Direct effect***		***Indirect effect***		
	a^{i}	*SE*	b^{ii}	*SE*	$c'^{\,iii}$	*SE*	$a^{x}b^{\,iv}$	*CI lower*	*CI upper*
Team Performance	$-.0904^{ns}$	0.2151	$.0888^{ns}$	0.2435	$.2576^{ns}$	0.3441	$-.0080^{ns}$	-0.0962	0.1647
Performance	$-.0904^{ns}$	0.2151	$.0675^{ns}$	0.1959	$.0624^{ns}$	0.2769	$.0061^{ns}$	-0.1145	0.0956
Team Cohesion	$-.0904^{ns}$	0.2151	$.1697^{ns}$	0.219	.6628*	0.3096	$-.0153^{ns}$	-0.1521	0.224
Team Viability	$-.0904^{ns}$	0.2151	$-.0084^{ns}$	0.173	$.3431^{ns}$	0.2445	$.0008^{ns}$	-0.0738	0.1083

Notes.
^{i} **a**, the effect of each personality factor on (**Boundary Spanning**)
^{ii} **b**, the effect of (**Boundary Spanning**) on (**Outcomes**)
^{iii} **c**, the total effect of each personality factor on (**Outcomes**)
^{iv} **c'** , the direct total effect of each personality factor on (**Outcomes**)
^{v} **a^{x}b**, the indirect total effect of each personality factor on (**Outcomes**) via (**Boundary Spanning**)
SE, standard errors
^{ns} $p>0.10$, † $p<0.10$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

Table A 33: *Mediation effects of Boundary Buffering in the association of Agreeableness and Outcomes*

	Effect of IV on M		***Effect of M on DV***		***Direct effect***		***Indirect effect***		
	a^{i}	*SE*	b^{ii}	*SE*	$c'^{\ iii}$	*SE*	$a^{x}b^{\ iv}$	*CI lower*	*CI upper*
Team Performance	$.4659^{ns}$	0.3305	$.2549^{ns}$	0.1537	$.1308^{ns}$	0.3408	$.1188^{ns}$	-0.0611	0.3962
Performance	$.4659^{ns}$	0.3305	$.0322^{ns}$	0.1276	$.0535^{ns}$	0.2828	$.0150^{ns}$	-0.1173	0.223
Team Cohesion	$.4659^{ns}$	0.3305	$.1869^{ns}$	0.1406	0.5603	0.3117	$.0871^{ns}$	-0.0507	0.322
Team Viability	$.4659^{ns}$	0.3305	0.1976	0.1083	$.2518^{ns}$	0.2402	$.0920^{ns}$	-0.0467	0.2941

Notes.
^{i} **a**, the effect of each personality factor on (**Boundary Buffering**)
^{ii} **b**, the effect of (**Boundary Buffering**) on (**Outcomes**)
^{iii} **c**, the total effect of each personality factor on (**Outcomes**)
^{iv} **c’** , the direct total effect of each personality factor on (**Outcomes**)
^{v} **a^{x}b**, the indirect total effect of each personality factor on (**Outcomes**) via (**Boundary Buffering**)
SE, standard errors
^{ns} p>0.10, † p<0.10, * p<0.05, ** p<0.01, *** p<0.001.

Table A 34: *Mediation effects of Boundary Reinforcement in the association of Agreeableness and Outcomes*

	Effect of IV on M		***Effect of M on DV***		***Direct effect***		***Indirect effect***		
	a^{i}	*SE*	b^{ii}	*SE*	$c'^{\ iii}$	*SE*	$a^{x}b^{\ iv}$	*CI lower*	*CI upper*
Team Performance	$.2896^{ns}$	0.2637	$.2926^{ns}$	0.1937	$.1648^{ns}$	0.3396	$.0847^{ns}$	-0.1007	0.3882
Performance	$.2896^{ns}$	0.2637	$-.0436^{ns}$	0.1599	$.0811^{ns}$	0.2803	$-.0126^{ns}$	-0.2413	0.1397
Team Cohesion	$.2896^{ns}$	0.2637	$.1068^{ns}$	0.1791	0.6165	0.3141	$.0309^{ns}$	-0.0886	0.1973
Team Viability	$.2896^{ns}$	0.2637	$.1279^{ns}$	0.1397	$.3068^{ns}$	0.2449	$.0370^{ns}$	-0.0672	0.1789

Notes.
^{i} **a**, the effect of each personality factor on (**Boundary Reinforcement**)
^{ii} **b**, the effect of (**Boundary Reinforcement**) on (**Outcomes**)
^{iii} **c**, the total effect of each personality factor on (**Outcomes**)
^{iv} **c'** , the direct total effect of each personality factor on (**Outcomes**)
^{v} **a^{x}b**, the indirect total effect of each personality factor on (**Outcomes**) via (**Boundary Reinforcement**)
SE, standard errors
^{ns} $p>0.10$, † $p<0.10$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

APPENDIX 12: MEDIATION: CONSCIENTIOUSNESS

A12.1. Mediation Analysis

The Process analysis reported in **Table A35** (Boundary Spanning), **Table A36** (Boundary Buffering) and **Table A37** (Boundary Reinforcement) would indicate little to no support for the mediating role of Team Boundary Management within the IPO framework using Team Conscientiousness.

Table A 35: Mediation effects of Boundary Spanning in the association of Conscientiousness and Outcomes

	Effect of IV on M		***Effect of M on DV***		***Direct effect***		***Indirect effect***		
	a [i]	*SE*	b [ii]	*SE*	c' [iii]	*SE*	$a^{x}b$ [iv]	*CI lower*	*CI upper*
Team Performance	$-.0704^{ns}$	0.2081	$.0822^{ns}$	0.2444	$.1360^{ns}$	0.3339	$-.0058^{ns}$	-0.0894	0.1450
Performance	$-.0704^{ns}$	0.2081	$-.0629^{ns}$	0.1946	$.1982^{ns}$	0.2659	$.0044^{ns}$	-0.0862	0.0769
Team Cohesion	$-.0704^{ns}$	0.2081	$.1588^{ns}$	0.2233	$.5058^{ns}$	0.3051	$-.0122^{ns}$	-0.1817	0.1594
Team Viability	$-.0704^{ns}$	0.2081	$-.0090^{ns}$	0.1711	0.3958	0.2338	$.0006^{ns}$	-0.0829	0.1039

Notes.
[i] **a**, the effect of each personality factor on (**Boundary Spanning**)
[ii] **b**, the effect of (**Boundary Spanning**) on (**Outcomes**)
[iii] **c**, the total effect of each personality factor on (**Outcomes**)
[iv] **c'** , the direct total effect of each personality factor on (**Outcomes**)
[v] $\mathbf{a^{x}b}$, the indirect total effect of each personality factor on (**Outcomes**) via (**Boundary Spanning**)
SE, standard errors
^{ns} $p>0.10$, † $p<0.10$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

Table A 36: Mediation effects of Boundary Buffering in the association of Conscientiousness and Outcomes

	Effect of IV on M		***Effect of M on DV***		***Direct effect***		***Indirect effect***		
	a^{i}	*SE*	b^{ii}	*SE*	$c'^{\ iii}$	*SE*	$a^{x}b^{\ iv}$	*CI lower*	*CI upper*
Team Performance	$.4262^{ns}$	0.3203	0.2657	0.1536	$.0170^{ns}$	0.3292	$.1133^{ns}$	-0.0923	0.4296
Performance	$.4262^{ns}$	0.3203	0.0192	0.1266	$.1945^{ns}$	0.2712	$.0082^{ns}$	-0.2171	0.1472
Team Cohesion	$.4262^{ns}$	0.3203	0.2021	0.1426	$.4085^{ns}$	0.3055	$.0861^{ns}$	-0.0706	0.4169
Team Viability	$.4262^{ns}$	0.3203	0.1922	0.1071	$.3145^{ns}$	0.2296	$.0819^{ns}$	-0.0654	0.3470

Notes.
^{i} **a**, the effect of each personality factor on (**Boundary Buffering**)
^{ii} **b**, the effect of (**Boundary Buffering**) on (**Outcomes**)
^{iii} **c**, the total effect of each personality factor on (**Outcomes**)
^{iv} **c'** , the direct total effect of each personality factor on (**Outcomes**)
^{v} **a^{x}b**, the indirect total effect of each personality factor on (**Outcomes**) via (**Boundary Buffering**)
SE, standard errors
^{ns} p>0.10, † p<0.10, * p<0.05, ** p<0.01, *** p<0.001.

Table A 37: Mediation effects of Boundary Reinforcement in the association of Conscientiousness and Outcomes

	Effect of IV on M		***Effect of M on DV***		***Direct effect***		***Indirect effect***		
	a [i]	*SE*	b [ii]	*SE*	c' [iii]	*SE*	a×b [iv]	*CI lower*	*CI upper*
Team Performance	$.1164^{ns}$	0.2579	$.3043^{ns}$	0.1918	$.0948^{ns}$	0.3251	$.0354^{ns}$	-0.1809	0.3742
Performance	$.1164^{ns}$	0.2579	$-.0444^{ns}$	0.1571	$.2078^{ns}$	0.2663	$-.0052^{ns}$	-0.1961	0.1495
Team Cohesion	$.1164^{ns}$	0.2579	$.1455^{ns}$	0.1799	$.4777^{ns}$	0.3049	$.0169^{ns}$	-0.1278	0.168
Team Viability	$.1164^{ns}$	0.2579	$.1414^{ns}$	0.1363	$.3799^{ns}$	0.2311	$.0165^{ns}$	-0.1127	0.1749

Notes.
[i] **a**, the effect of each personality factor on (**Boundary Reinforcement**)
[ii] **b**, the effect of (**Boundary Reinforcement**) on (**Outcomes**)
[iii] **c**, the total effect of each personality factor on (**Outcomes**)
[iv] **c'** , the direct total effect of each personality factor on (**Outcomes**)
[v] **a×b**, the indirect total effect of each personality factor on (**Outcomes**) via (**Boundary Reinforcement**)
SE, standard errors
^{ns} $p>0.10$, † $p<0.10$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

APPENDIX 13: QUESTIONNAIRES

<u>Proposed online questionnaire to team members (Time 1)</u>

INSTRUCTIONS

Invitation to participate

You are invited to take part in a research study conducted as part of a Doctor of Business Administration (DBA) research project at Aston Business School.

What is the purpose of the study?

Teams are being used increasingly by organisations, resulting in a century of scientific research investigating how they might be used more effectively. However, over the last twenty-five years, changes in conditions, including globalisation and technology developments, have led to the development of new forms of distributed team structures, often referred to as 'virtual teams. Unfortunately, these 'teams' create considerable challenges for those involved, and scientific research into *how* and *when* such teams function effectively is lagging behind real-world practice.

Why have you been invited to participate?

You have been invited to participate because you have been identified by your team leader as the member of a project team currently undertaking a project or project related task in your organisation. Other members of your team are also being asked to participate in the study.

Do I have to take part?

No, participation in this research is entirely voluntary and if you decide to take part but later change your mind you are free to withdraw at any time.

However, by taking participating in the study you will have the opportunity to be entered into a prize draw to win one (1) of three (3) iPad Minis. All you need to do to qualify for the prize draw is to provide information that is used in the study and enter your email address following the final question.

What is the process I have to follow?

Participation is simple. You will be asked to complete <u>two</u> online questionnaires – this first questionnaire will take about 20 minutes, and then a second shorter online questionnaire, taking about five (5) minutes, roughly three months later.

Will I be asked to share commercially sensitive and confidential information?

No, the data being collected for this research is <u>neither commercially sensitive nor controversial</u>, and you will not be asked to provide details about the company you work for. The data being gathered is purely about you, your team, and your experiences of working virtually. Even so, all responses are collected anonymously so they cannot be linked to respondents.

Will what I say in this study be kept confidential?

Yes, all the information you provide will be kept strictly confidential and the data generated will be held in accordance with the Data Protection Act. Results from the study will be reported in an aggregate form (e.g. for the 'team' as whole) and will be reported in a manner in which it is not possible to identify the responses of specific teams or individuals.

Who can I contact for Further Information?

If you have any questions about the research study then please contact the lead researcher, Nick Keca, (email: [redacted] for further information.

If you have any concerns about the way in which the study has been conducted, you should contact the Secretary of the Aston Business School Research Ethics Committee (email: [redacted]

SECTION 1: YOUR TEAM

IMPORTANT: Please enter the 'team identification' number (from the top of the email sent to you) into the box below:

This is required because your responses are anonymised, and this is the only way we can match your responses to those of the other members of your team who all have the same number.

About Your Team

1. By what name is your team known? (this might be a practice, function, or a project team name)

____

2. How many people are in this team? _____________ Members

3. How long have you worked in your current team? ______ Years ______ Months

4. How long have you worked with your current team leader or manager? ____ Years ____ Months

5. Does your work primarily involve creating information, data, and/or Knowledge, or are you primarily involved in making things? ☐ Yes ☐ No

6. Do you consider yourself to work in a matrix management structure? ☐ Yes ☐ No
Note: Matrix management is a type of organisational management in which people with similar skills are pooled for work assignments, resulting in more than one manager (sometimes referred to as solid line and dotted line reports, in reference to traditional business organisation charts).

7. Is your team located in the same immediate area (*i.e. you can easily talk to each other*), or, is your team dispersed, either in other areas of the same building, in other locations, other parts of the country (*nationally*), or different countries (*internationally*)?

- Located together ☐
- Located apart but on same site ☐
- Located apart and on other sites (based nationally) ☐
- Located apart and on other sites (based internationally) ☐

8. At what stage of the project / task is your team?

- DEFINE /I NITIATION / START ☐
- DEVELOP / DELIVERY / MID-POINT ☐
- DEPLOY / FINAL / CLOSE ☐

9. Have you worked with other members of your team on other projects / tasks before? ☐ Yes ☐ No

If Yes, approximately how many other projects / tasks have you worked together? ________

SECTION 5: BACKGROUND INFORMATION

The following section asks you for some background information about you and the organisation you work for. This information is important so we can compare the experiences of different types of staff.

About You

20. Age: ____ Years

21. Gender: ☐ Male ☐ Female

22. Is English your first language? ☐ Yes ☐ No

23. What is your Nationality? ______________________

24. What is the highest level of formal education you have attained?

High school (e.g. A Levels)	☐
Foundation Degree (e.g. HND, HNC)	☐
Bachelor's / Undergraduate Degree (e.g. BA (Hons), BSc (Hons))	☐
Masters / Postgraduate Degree (e.g. MA, MSc)	☐
Doctorate (e.g. PhD, DBA)	☐

25. How long have you worked in your current job? ____ Years ____ Months

26. How long have you worked at this organisation? ____ Years ____ Months

About Your Employer

27. What industry sector do you generally work in?

Service Sector	☐
Manufacturing Sector	☐
Third Sector (e.g. Charity or Not-For-Profit)	☐

28. Approximately how many people work in your organisation? _________

Prize draw

If you would like to enter the prize draw to win one (1) of three (3) iPad Minis that I will give away at the end of the research project, please enter your email address in the box below.

[NOTE: Your email address is stored separately to your data, which is anonymised]

That's all!

Thank you for your contribution.

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<u>Proposed questionnaire distributed to team leaders (Time 2)</u>

INSTRUCTIONS

Invitation to participate

You are invited to participate in the 2nd part of this research study conducted as part of a Doctor of Business Administration (DBA) research project at Aston Business School.

What is the purpose of the study?

Teams are being used increasingly by organisations, resulting in a century of scientific research investigating how they might be used more effectively. However, over the last twenty-five years, changes in conditions, including globalisation and technology developments, have led to the development of new forms of distributed team structures, often referred to as 'virtual teams'. Unfortunately, these 'teams' create considerable challenges for those involved, and scientific research into *how* and *when* such teams function effectively is lagging behind real-world practice.

Why have you been invited to participate?

You have been invited to participate because you have been identified by your team leader as the member of a project team currently undertaking a project or project related task in your organisation. Other members of your team are also being asked to participate in the study.

Do I have to take part?

No, participation in this research is entirely voluntary and if you decide to take part but later change your mind you are free to withdraw at any time.

However, by taking participating in the study you will have the opportunity to be entered into a prize draw to win one (1) of three (3) iPad Minis. All you need to do to qualify for the prize draw is to provide information that is used in the study and enter your email address following the final question.

What is the process I have to follow?

Participation is simple. You will be asked to complete <u>two</u> online questionnaires – this first questionnaire will take about 20 minutes, and then a second shorter online questionnaire, taking about five (5) minutes, roughly three months later.

Will I be asked to share commercially sensitive and confidential information?

No, the data being collected for this research is <u>neither commercially sensitive nor controversial</u>, and you will not be asked to provide details about the company you work for. The data being gathered is purely about you, your team, and your experiences of working virtually. Even so, all responses are collected anonymously so they cannot be linked to respondents.

Will what I say in this study be kept confidential?

Yes, all the information you provide will be kept strictly confidential and the data generated will be held in accordance with the Data Protection Act. Results from the study will be reported in an aggregate form (e.g. for the 'team' as whole) and will be reported in a manner in which it is not possible to identify the responses of specific teams or individuals.

Who can I contact for Further Information?

If you have any questions about the research study then please contact the lead researcher, Nick Keca, (email: [redacted]) for further information.

If you have any concerns about the way in which the study has been conducted, you should contact the Secretary of the Aston Business School Research Ethics Committee (email: [redacted]**).**

PAGE 1 of 4

SECTION 1: YOUR TEAM

IMPORTANT: Please enter the 'team identification' number (from the top of the email sent to you) into the box below:

This is required because your responses are anonymised, and this is the only way we can match your responses to those of the other members of your team who all have the same number.

1. What is the name of the team you are managing / leading (this might be a practice, function, or a project team name)?

____

2. How many people are in this team? ___________ Members

3. How long have you been the manager / leader of the team? ____ Years ____ Months

4. How long have you worked in your role as team leader / manager? ____ Years ____ Months

5. Is the team you lead / manage located in the same immediate area (*i.e. you can easily talk to each other*), or, is your team dispersed, either in other areas of the same building, in other locations, other parts of the country (*nationally*), or different countries (*internationally*)?

- Located together. ☐
- Located apart but on same site. ☐
- Located apart and on other sites (based nationally). ☐
- Located apart and on other sites (based internationally). ☐

6. At what stage of the project / task is the team you lead / manage?

- DEFINE / INITIATION / START ☐
- DEVELOP / DELIVERY / MID-POINT ☐
- DEPLOY / FINAL/CLOSE ☐

7. Do you consider yourself to work in a matrix management structure? ☐ Yes ☐ No

Note: Matrix management is a type of organisational management in which people with similar skills are pooled for work assignments, resulting in more than one manager (sometimes referred to as solid line and dotted line reports, in reference to traditional business organisation charts).

SECTION 2: PERFORMANCE OF YOUR TEAM

Aston University

Illustration removed for copyright restrictions

SECTION 4: BACKGROUND DETAILS

The following questions ask for some background information about you and the organisation you work for. This information is important so we can compare the experiences of different types of staff.

About You

11. Age: _______ Years

12. Gender: ☐ Male ☐ Female

13. Is English your first language? ☐ Yes ☐ No

14. What is your Nationality? ______________________

15. What is the highest level of formal education you have attained?

- High school (e.g. A Levels) ☐
- Foundation Degree (e.g. HND, HNC) ☐
- Bachelor's / Undergraduate Degree (e.g. BA(Hons), BSc(Hons)) ☐
- Masters / Postgraduate Degree (e.g. MA, MSc) ☐
- Doctorate (e.g. PhD, DBA) ☐

16. How long have you worked in your current job? ____ Years ____ Months

17. How long have you worked at this organisation? ____ Years ____ Months

18. What industry sector do you generally work in?

- Service Sector ☐
- Manufacturing Sector ☐
- Third Sector (e.g. charity or Not-For-Profit) ☐

18. Approximately how many people work in your organisation? ____________

Prize draw

If you would like to enter the prize draw to win one (1) of three (3) iPad Minis that I will give away at the end of the research project, please enter your email address in the box below.

[NOTE: Your email address is stored separately to your data, which is anonymised]

That's all!

Thank you for your contribution.

PAGE 4 of 4

APPENDIX 14: PARTICIPATION

<u>Proposed text of email 'invite' to team members (Time 1)</u>

To: XXX
From: [redacted]
Subject: Participate in Virtual Team research and get a chance to win an iPad Mini 3

Dear XXX,

I am writing to invite you to take part in a research study which is being conducted as part of a Doctorate of Business Administration at Aston Business School. The study intends to examine how 'virtual team' (e.g. where team members may be geographically dispersed) impacts on how the teams function.

Your programme director/manager, XXX, has expressed an interest in the research study and has identified you as being a member of their project team (XXX).

I will also be contacting the other members of your team with the aim of gathering responses on how you and your team members work together.

What are the benefits?
Participating in the study is important as it helps to progress understanding about the dynamics of virtual working. Since all organisations are increasing working virtually, this is very important research as our understanding of distributed team working is lagging behind organisational practice.

At the end of the questionnaire you will be asked if you would like to enter the prize draw where I am offering you the chance to enter a prize draw to win an iPad Mini 3. Three will be available and the winners would be selected randomly from those who participate in the research study when data collection has been completed (early 2016).

What is required of you?
As part of the study I will be asking all members of your team to complete two online questionnaires. The first questionnaire is available to complete now via this link (url link provided to online questionnaire as shown here). It should take about 20 minutes to complete.

When prompted please enter XXX on page 2 of the questionnaire – this is a 'team identification' number and is required so that your responses can be matched with those of your other team members.

I will contact you again in 3 months with further instructions of how to complete a (shorter) second questionnaire, which will take about five (5) minutes to complete.

Who will see my responses?
Any responses given are strictly confidential. Nobody from your organisation will see your completed responses and any data generated will be held in accordance with the Data Protection Act 1998.

I hope that you and your team members will agree to take part in the study. If you would like any further information about the study, then please feel free to contact me.

Kind regards

Aston University

Information on this page has been removed for data protection purposes

Email: [redacted]

Appendix 4C – Proposed text of email ‘invite’ to team members (Time 1 – reminder 1 week after original invite email)

To: XXX
From: [redacted]
Subject: Participate in Virtual Team research and get a chance to win an iPad Mini 3

Dear XXX,

About a week ago I wrote to you inviting you to take part in a research study which is being conducted as part of a Doctorate of Business Administration at Aston Business School. The study intends to examine how ‘virtual team’ (e.g. where team members may be geographically dispersed) impacts on how the teams function.

Your programme director/manager, XXX, expressed an interest in the research study and identified you as being a member of their project team (XXX).

If you have already completed the questionnaire then **‘Thank You’**. If you have not yet completed the questionnaire then there is still an opportunity for you to provide your experiences of working in your team.

What are the benefits?

Participating in the study is important as it helps to progress understanding about the dynamics of virtual working. Since all organisations are increasing working virtually, this is very important research as and our understanding of distributed team working is lagging behind organisational practice.

At the end of the questionnaire you will be asked if you would like to enter the prize draw where I am offering you the chance to enter a prize draw to win an iPad Mini 3. Three will be available and the winners would be selected randomly from those who participate in the research study when data collection has been completed (early 2016).

What is required of you?

As part of the study I will be asking all members of your team to complete two online questionnaires. The first questionnaire is available to complete via this link (url link provided to online questionnaire as shown in Appendix 4A). It should take about 20 minutes to complete.

When prompted please enter XXX on page 2 of the questionnaire – this is a ‘team identification’ number and is required so that your responses can be matched with those of your other team members.

I will contact you again in 3 months with further instructions of how to complete a (shorter) second questionnaire, which will take about five (5) minutes to complete.

Who will see my responses?

Any responses given are strictly confidential. Nobody from your organisation will see your completed responses and any data generated will be held in accordance with the Data Protection Act 1998.

I hope that you and your team members will agree to take part in the study. If you would like any further information about the study then please feel free to contact me.

Kind regards

Aston University

Information on this page has been removed for data protection purposes

Proposed text of email ‘invite’ to team members (Time 2)

[redacted]

To: XXX
From: [redacted]
Subject: Participate in Virtual Team research and get a chance to win an iPad Mini 3

Dear XXX,

About three months ago I wrote to you inviting you to take part in a research study which is being conducted as part of a Doctorate of Business Administration at Aston Business School. The study intends to examine how 'virtual team' (e.g. where team members may be geographically dispersed) impacts on how the teams function.

Your programme director/manager, XXX, expressed an interest in the research study and identified you as being a member of their project team (XXX).

It is now time to complete the second questionnaire, and this can be complete via this link (url link provided to online questionnaire as shown in Appendix 5A). It should take about 5 minutes to complete.

When prompted please enter XXX on page 2 of the questionnaire – this is a 'team identification' number and is required so that your responses can be matched with those of your other team members.

I hope that you and your team members will continue to participate in the study. If you would like any further information about the study then please feel free to contact me.

Kind regards

Aston University

Information on this page has been removed for data protection purposes

<u>Proposed text of email 'invite' to team members (Time 2 – reminder 1 week after original invite email)</u>

To: XXX
From: [redacted]
Subject: Participate in Virtual Team research and get a chance to win an iPad Mini 3

Dear XXX,

About a week ago I wrote to you inviting you to take part in the second part of a research study, which is being conducted as part of a Doctor of Business Administration at Aston Business School. The study intends to examine how 'virtual team' (e.g. where team members may be geographically dispersed) impacts on how the teams function.

Your programme manager, XXX, expressed an interest in the research study and identified you as being a member of their project team (XXX).

There is still time to complete the second questionnaire, and this can be complete via this link (url link provided to online questionnaire as shown in Appendix 5A). It should take about 5 minutes to complete.

When prompted please enter XXX on page 2 of the questionnaire – this is a 'team identification' number and is required so that your responses can be matched with those of your other team members.

I hope that you and your team members will continue to participate in the study. If you would like any further information about the study then please feel free to contact me.

Kind regards

Aston University

Information on this page has been removed for data protection purposes

<u>Proposed text of email 'invite' to team leaders (initial contact)</u>

To: XXX
From: [redacted]
Subject: Participate in Virtual Team research and get a chance to win an iPad Mini 3

Dear XXX,

I am writing to invite you to take part in a research study which is being conducted as part of a Doctor of Business Administration at Aston Business School. The study intends to examine how 'virtual team' (e.g. where team members may be geographically dispersed) impacts on how the teams function.

Your programme director/manager, XXX, has expressed an interest in the research study and has identified you as being the team leader / manager of the project team (XXX) and that you and your team would be willing to take part in the study.

What are the benefits?
Participating in the study is important as it helps to progress understanding about the dynamics of virtual working. Since all organisations are increasing working virtually, this is very important research as and our understanding of distributed team working is lagging behind organisational practice.

What is required of you?
Participation would involve the following:

1. Each member of your team would be invited to complete two online questionnaires – the first questionnaire now, and the second questionnaire in roughly three months time.
2. You, as team leader / manager, would be asked to complete an online questionnaire in three months (I will remind you when it is time). This should take about five (5) minutes to complete.
3. At about the same time I will also invite a small number of team leaders / managers to participate in a short interview to discuss their experiences of working in virtual teams, and to delve a little deeper into their observations about working in virtual teams. This discussion would be conducted by telephone.

Who will see my responses?
Any responses given are strictly confidential. Nobody from your organisation will see any completed responses (from you or your team) and any data generated would be held in accordance with the Data Protection Act 1998.

I hope that you will agree to take part in the study. If you are happy to participate in the study then I would need to liaise with you directly to confirm the members of your team and their contact details.

If you would like any further information about the study then please feel free to contact me.

Kind regards

Proposed text of email 'invite' to team leaders (Time 2)

To: XXX
From: [redacted]
Subject: Participate in Virtual Team research and get a chance to win an iPad Mini 3

Dear XXX,

About three months ago I wrote to you inviting you to take part in a research study which is being conducted as part of a Doctorate of Business Administration at Aston Business School. The study intends to examine how 'virtual team' (e.g. where team members may be geographically dispersed) impacts on how the teams function.

You are the programme director/manager of project team (XXX), which has participated in the research study. The members of your team have now completed questionnaires about their experiences of working in the team and I would now like to invite you to complete a short questionnaire which should take you about five (5) minutes.

The questionnaire can be accessed and completed via this link (url link provided to online questionnaire as shown in Appendix 6A) and should take about 5 minutes to complete.

When prompted please enter XXX on page 2 of the questionnaire – this is a 'team identification' number and is required so that your responses can be matched with those of your other team members.

If you would like any further information about the study then please feel free to contact me.

Kind regards

APPENDIX 15: ETHICAL CONSIDERATIONS

A15.1. Informing Participants

Since the research project has undertaken a quantitative approach, quantitative data has been derived from questionnaires and various forms of information have been provided to inform participants about the purpose of the research project and the expectations of participants. Despite the variety of organisations involved in the project, the pool of participants is largely limited to a professional group of English-speaking participants. This was managed by targeting organisations whose headquarters are based in English speaking domains and therefore communicate in English on a day-to-day basis. As a result, there were no issues of literacy.

No sensitive groups of individuals are included for ethical consideration in the data gathering process, e.g. minors, etc.

Recognising that response is crucial to the success of the project, everything possible was done to encourage participation. Therefore, information was collected in a variety of media formats to suit the participant's preferences and/or circumstances. For example, these included any combination of a printed leaflet, pre-formatted Microsoft PowerPoint show (or similar file delivered through an open source format), email, or HTML content as a precursor to online questionnaires.

A15.2. Incentivised Participation

An attractive incentive was offered to encourage participants to return completed questionnaires. This was in the form of four popular electronic tablets presented in a prize draw including all those participants have provided a complete set of data used in the study.

The tablets will be offered at the end of the research project to individuals based on a draw – random selection - thereby giving every qualifying participant an equal chance (approximately 1:125) to win one of the four prizes.

A15.3. Informed Consent

In each case participants provided their explicit consent and confirmed their understanding of the information they received, i.e. email reply, online confirmation, etc. Where information was provided verbally, it was delivered from a defined script to ensure consistency. These measures form the basis of the requirement for 'informed consent'.

The information provided to participants informed them about the nature of the research, the methodology adopted and how the information they provided ids to be used. It also informed them of the ethical requirements of the research project and their rights within the applicable ethical framework and principles.

A15.4. Right to Withdraw Data

Participants were advised of their right to withdraw their data from use in this research.

A15.5. Data Storage and Digitisation

Recognising the importance of anonymity, confidentiality, ethical compliance, and the potentially diverse media formats in which confidential data might be recorded, this research project will seek to digitise all forms of media in which confidential project data is recorded, including project sensitive information useful to future researchers. The following guidelines will be adopted: -

1. Data will be stored and retained in compliance with BPS or ABS research ethics guidelines
2. Copies of project sensitive data will only be held by the author, project supervisors and ABS
3. In an attempt to maintain anonymity, participants will be entered into a register file held only by the author and subsequently identified in linked reports of data by a unique identifying number, rather than by name
4. Sensitive emails containing confidential data will either be encrypted, or the content provided by password protected file attachment with passwords provided by separate email cover.
5. Hard copies - pictures, prints, photographs, written records and notes will be promptly digitised and reproduced in password protected digital files
6. Recordings of verbal discussions will be digitally recorded and stored in encrypted and/or password protected file formats
7. Raw data files will be password protected and stored in a maximum of three locations (including two back-up copies)
8. Backup copies will be encrypted and/or password protected
9. A minimal number of USB memory sticks containing project data will be used and each will be uniquely identified for control purposes, and password protected for access with file content being separately password protected.

A15.6. Disposal of Data and Records

1. Data will only be retained in compliance with BPS or ABS research ethics guidelines
2. Obsolete hardcopies of project information securely shredded. Hardcopies containing confidential information will be securely shredded on the day it becomes obsolete.

3. Obsolete digital data files will be securely deleted from computer hard drives. Obsolete USB memory sticks will be re-formatted.
4. ABS will be provided with a single secure copy of the entire ‘project’ file at the end of the project to aid future research.

A15.7. Providing Feedback

Ensuring that participants received a summary of the research findings is crucial to maintaining goodwill and the reputation of ABS. Equally important is the ability for future researchers to understand the data and conclusions provided in the report of the research project, such that they are able to replicate and develop results. These issues will be addressed as follows: -

A15.8. Feedback to Participants

All participants will be provided with a summarised copy of the research results in a format appropriate to their level of participation and acknowledging the requirements for anonymity and confidentiality - personal or commercial.

Each participant will be afforded the opportunity to discuss and/or question the results to ensure understanding and maintain goodwill for future research participation. These may take the form of individual report, team level feedback reports and a summary group level report.

A15.9. Records for Future Researchers

Records will be provided for future researchers in the digital format discussed in detail above and held safely by ABS.

⇒ References from literature reviewed will be held on a copy of EndNote
⇒ Anonymised statistical data will be provided in a file copy of SPSS
⇒ Anonymised qualitative data will be provided in a file copy of NVivo
⇒ Methodology, technique and tools will be explained in detail within the project report
⇒ All conclusions will be cross referenced to a digital file containing raw data, as appropriate

Data provided by participants will be storage in its raw digital form which can be linked to the participant register file.