CREATIVITY IN THE AUSTRALIAN HIGH-TECH INDUSTRY: THE JOINT EFFECTS OF INDIVIDUAL DIFFERENCES AND SOCIAL NETWORKING

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August 2014

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I dedicate this thesis to those who were not as fortunate as I to have such academic opportunities. Rest in peace Pra Dedushka David and Dedushka Yakov.

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ABSTRACT

Creativity is increasingly important in contemporary organisations, particularly those in the high-tech IT industry, where organisational success is highly dependent on constant improvement. Consequently, research on creativity has been burgeoning in recent times. Examination of the creativity literature reveals several inconsistencies and ambiguities. In particular, an emphasis on the prototypical creative individual has limited the focus of much of the existing research to considerations of personality traits as the main predictors of individual creativity. As a result unitary and monolithic considerations of creativity dominate the literature with multifaceted considerations of creativity neglected. The present research was designed to address this limitation by assessing more malleable and practical individual difference variables in relation to creativity. Specifically, the relationships between proactivity and creativity as well as creative self-efficacy (CSE) and creativity were examined.

In recognition of the multifaceted nature of creativity, the networking perspective was also incorporated into this study. In particular, both networking parameters (*i.e.* weak and outside ties) and roles (*i.e.* brokerage and centrality) were considered concurrently in relation to individual creativity. Furthermore, the potential for these networking variables to mediate the relationship between individual differences (*i.e.* proactivity and CSE) and individual creativity was also explored. In doing so this research integrated both the individual difference and networking perspectives on creativity.

Data from 180 employees were matched with data from 51 corresponding supervisors working in a large Australian IT organisation. Use of this context enabled improved

generalisability of the study findings as previous research has largely been limited to Asian and/or student samples. The proposed mediation effects were examined using the joint test in structural equation modelling. Overall, mixed support was found for the ten hypotheses.

These mixed findings, including several unexpected negative relationships, provided particularly novel insights into the relationships of interest, in turn answering important questions about individual creativity. In particular, the findings demonstrated that the relationship between proactivity and creativity was fully mediated by brokerage and centrality and that the relationship between CSE and creativity was partially mediated by brokerage and centrality. Networking parameters (*i.e.* weak and outside ties) were however not significant mediators in the relationship between individual differences and creativity. Interestingly, brokerage was the most significant antecedent to individual creativity. Overall, the findings corroborate, extend and challenge existing findings on individual creativity and as such have significant theoretical and methodological implications for future creativity research.

STATEMENT OF AUTHORSHIP

Except with the Research Graduate School Committee's approval, this thesis contains no material which has been accepted for the award of any other degree or diploma in any university or other institution. It is affirmed, to the best of my knowledge, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.
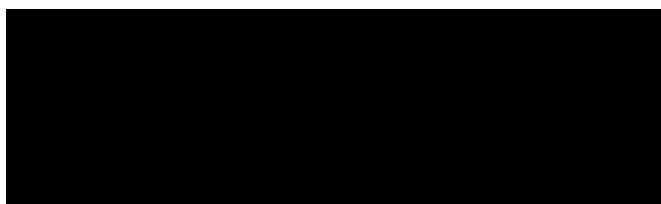
Olga Abeysekera

August 2014

ACKNOWLEDGEMENTS

This thesis represents a major accomplishment in my life, which would not have been possible without the unwavering support and guidance of those closest to me and my research.

First and foremost I would like to acknowledge the incomparable support I have had from my family. My parents, Dimitri and Anna have rigorously affirmed their belief in me and my abilities to achieve my goals throughout this process – which has invaluably helped me to maintain my own belief in my abilities. Over the course of the past year, with the birth of my first child, my parents have generously made their babysitting services available, allowing me the time I needed to ensure the birth of my next big feat, this thesis. My babushka's strength during the most trying time our family has had to endure, with the loss of her husband, my dedushka, has helped strengthen my resolve to never give up and live life to the fullest. This perspective has helped me see this project through to the very end. The tenacity with which my brother, Daniel, goes about his demanding business inspires me to work harder and aim higher. Such tenacity I tried to apply to my thesis work, in direct view of my brother's ongoing success.

I struggle to put into words my appreciation for my husband's support throughout my PhD journey. Lakmal came into my life when I was one year into my PhD. He helped me be level-headed and empowered me to overcome the ongoing obstacles in my PhD path. All the while, my dear husband loved and motivated me. Having completed a PhD himself, Lakmal was familiar with the pressures and was incredible in helping me minimise the intellectual and emotional strains of the process. Lakmal, you have been my centre around

which all of my work and success revolves. Your words of wisdom will never cease to amaze and inspire me.

My dearest daughter Maya has undoubtedly been the biggest source of inspiration for me. From the time I was pregnant and producing some of my best work on this thesis, to now watching her thrive and develop new skills every day. Maya, my love, you inspire me to do my very best at everything I turn my hand to every day. You are the light in my life that has allowed me to see clearly through any intellectual fog that has clouded my research.

Particular thanks must be paid to my main supervisor Dr. Belinda Allen, who went out of her way to support me even before officially becoming my supervisor. Belinda had faith in me and my work enough to assume a supervisory role two-and-a-half years and many hurdles into my candidature. Together, we have worked incredibly well together. Meeting and corresponding regularly, Belinda's advice, general guidance and support has been invaluable. I must also acknowledge Prof. Fang Lee Cooke for her supportive supervision. Fang's own PhD experience is truly inspirational and certainly motivated me through my many struggles. I must also thank Dr. Brian Cooper for sharing his valuable time and expertise with me, vetting my methodology and results.

The administrative staff at the university also need recognition for their tireless efforts to accommodate and improve my PhD experience. In particular, Liza Binder went out of her way to help me throughout various struggles I encountered along the way. She not only supported me in a professional capacity, guiding me through the proper channels for resolving various issues and inquiries that I had, but she also made herself available to me

for friendly and personal consultations. Liza has certainly been a major positive factor, motivating my persistence in the PhD program.

My amazingly selfless friend Kheeran and members from his organisation need to be acknowledged for their participation in this study, without whom this thesis could not have been completed. Thank you for your involvement in and endorsement of this research throughout your organisation. Being granted the opportunity to meet with different teams and feeling the widespread support for my research really motivated me to produce my best research to date.

My good friends who have been there to listen to me, advise and comfort me through this process need to also be acknowledged. Stojanka has been a constant source of support for me, being a close girlfriend who also happens to be doing a PhD; I have really appreciated our countless light-hearted discussions about the trials and tribulations of the PhD Process. My office mates, Andy, Nathan, Ryan and Mulyadi have also been a wonderful source of motivation for me, focussing on the positives of the process and never failing to make me laugh. As a mother, Diah has shown me that it is possible to complete a PhD whilst still spending quality time with your family - and I am very grateful for that perspective.

While working on my PhD I have been fortunate enough to work and spend time with a number of incredible academics, each of whom have inspired me in different ways. Professor Jakob Madsen, Professor Cherrie Zhu, Associate Professor Ramanie Samaratunge, Associate Professor Sen Sedjaya and Dr. Glennis Hanley have all been generous in their encouragement of my academic efforts. I am very fortunate to have had you all play a part in my getting here and I now look to the future with great optimism.

1 INTRODUCTION

1.1 The Rise of Creativity

The 'creative class' is a new type of social class that theorists and practitioners alike can ill-afford to ignore.

> *"If you are a scientist or engineer, an architect or designer, a writer, artist or musician, or if you use your creativity as a key factor in your work in business, education, health care, law or some other profession, you are a member (of the creative class). With 38 million members (in the United States), more than 30 percent of the nation's workforce, the Creative Class has shaped and will continue to shape deep and profound shifts in the ways we work, in our values and desires, and in the very fabric of our everyday lives"* (Florida, 2002, p. xxvii).

Indeed the pervasiveness of the 'creative class' directly reflects the importance of creativity in the modern world and more pertinently, the world of work. Furthermore, the rise of creativity is expected to intensify as we move further into this, the creative age, where a broad social, cultural and geographic milieu conducive to creativity prevails. This pertains to the 'creative economy', which Florida (2002) espouses to be steadily spreading around the globe, for which attention by both management theorists and practitioners must be paid.

While creativity has most commonly been associated with music and other fine arts, in more recent times it has been heralded as the foundation for innovation, the driving force of economic growth, and the mechanism through which competitive advantage is maintained (McAdam & McClelland, 2002; Oldham & Cummings, 1996; Pirola-Merlo & Mann, 2004). In light of this, a plethora of relevant research has been conducted, spanning across different disciplines - including behavioural psychology, sociology, economics and management. The past decade in particular has witnessed a burgeoning of interest in the creativity concept, due to the essential role it plays in organisations attaining and sustaining success (Bains & Tran, 2006; McAdam & McClelland, 2002; Shalley, Gilson, & Blum, 2000). Management theorists and practitioners, in particular, are affording extra attention to the nature of and need for creativity in the workplace.

Although when initially proposed by Guilford (1950) and then later by Barron and Harrington (1981) the idea that creativity was separate from traditional intelligence was rejected by some, this idea has since become widely accepted (Runco, 2004). Creativity is now recognised as being distinct from traditional measures of intelligence (*i.e.* intelligence quotient) and therefore, distinct research methods need to be applied to investigate the intricacies of individual creativity.

Since Guilford's (1950) seminal address (when parting as president of the American Psychological Association) on the systematic study of creativity, scientific investigation surrounding creativity has become an area of active investigation. Guilford (1950) emphasised the importance of thinking about creativity and creative products in a new way where creativity was represented by patterns of primary abilities which vary with different social spheres.

Barron and Harrington (1981) later investigated various types and aspects of creativity in terms of theoretical viability, measurement methods, other related abilities and the proliferation of the field. This research emphasised the importance of examining creativity and creative behaviour as opposed to the more easy to assess traditional intelligence constructs (such as the intelligence quotient). It was not until the 1990s however that the volume of creativity research increased dramatically, and creativity was linked with organisations achieving competitive advantage (McAdam & McClelland, 2002).

Creativity at work involves the development and implementation of novel and useful ideas about products, services, procedures and even problem solving practices (Amabile, 1996, 1998; Amabile, Conti, Coon, Lazenby, & Herron, 1996; Oldham & Cummings, 1996; Shalley, Zhou, & Oldham, 2004; Woodman, Sawyer, & Griffin, 1993). This construct is at the core of contemporary business practices, driving organisations towards the achievement of competitive advantage and sustained success. Creativity enables organisations to adjust to shifting market conditions, respond to opportunities, and manage potential threats (Shalley *et al.*, 2004). Therefore, ensuring the maximisation of creative potential in employees and their creative output has been deemed vital for the survival and success of contemporary organisations (Chong & Ma, 2010; Florida, 2002; Rietzschel, De Dreu, & Nijstad, 2009). Creativity can take place at the individual, team and/or system level in an organisation. However, until we better understand individual creativity, propositions pertaining to the team and system levels can be called into question. The present study will therefore investigate individual creativity, in order to answer many important questions that persist in the literature.

Contemporary organisational climates are characterised by increasing competition, diversification, and globalisation. This context has made the assessment and clarification of the creativity concept more difficult. Creativity is an inherently complex phenomenon subject to a myriad of broad contextual and social influences (Agars, Kaufman, & Locke, 2008; Woodman *et al.*, 1993; Yuan & Woodman, 2010) which is exacerbated by the turbulent times besetting modern organisations. Thus, as organisational environments grow in complexity, so too does the creativity construct. In fact, according to some, as the antecedents to creativity change in line with changing situations, so does the actual definition of creativity (Sacramento, Dawson, & West, 2008).

According to Shalley *et al.* (2004, p. 953) "...there is now a need for the development of a more comprehensive model of employee creativity. It needs to include some of what is already known about creativity at work and most importantly, it needs to incorporate new directions that account for changing contexts and the need for a clear and operational creativity construct." Given the established importance of creativity in the contemporary business world, the present study addresses this research agenda proposed by Shalley *et al.* (2004). More specifically, the current study will assess multiple antecedents to creativity concurrently, while integrating established perspectives on creativity, in a novel context. The individual difference perspective on creativity has been particularly popular amongst creativity scholars (Shalley *et al.*, 2004) and so will be incorporated in the present research.

1.2   The Individual Difference Perspective on Creativity

Individuals differ across many continuums and as such are likely to be differentially predisposed or inclined towards acting creatively. Connecting individual experiences to provide stimulus for and sources of individual creative output highlights the potentially

expansive effect that individual differences may pose on individual creativity. Therefore, theorists have been attempting to account for various stable and malleable difference characteristics as they relate to creativity (Barron & Harrington, 1981; Gong, Huang, & Farh, 2009; James, Chen, & Goldberg, 1992; Mathisen & Bronnick, 2009; Mumford, 2003; Shalley *et al.*, 2004; Woodman *et al.*, 1993).

Creativity theorists have long been advocating the importance of different personalities in relation to individual creativity (Barron & Harrington, 1981; Egan, 2005; Feist, 1998; George & Zhou, 2001; Gough, 1979; McCrae, 1987; Piedmont, McCrae, & Costa, 1991; Shalley *et al.*, 2004). These considerations largely focus on the Five Factor Model of personality and the Creative Personality Scale. Such personality considerations have dominated research on the individual difference perspective on creativity (Shalley *et al.*, 2004).

Nevertheless, it has been suggested that personality traits should only be considered as a partial explanation for creativity (Woodman *et al.*, 1993). Woodman *et al.* (1993) emphasise the importance of other individual difference characteristics (as opposed to personality traits), which actually determine individual behaviours and in turn have greater potential to underlie individual creative behaviour. Furthermore, individual differences that influence individual behaviour tend to be more malleable and therefore can be managed (James *et al.*, 1992), which makes such variables particularly pertinent to research in the management domain. In light of this, creativity research has been steadily moving away from personality considerations alone, towards more practically applicable considerations of behaviourally oriented and malleable personal dispositions and difference characteristics.

In an effort to comprehensively consider individual creativity, two malleable individual difference variables will be assessed, specifically, proactivity and creative self-efficacy (CSE) will be considered in relation to creativity. Proactive people take initiative and go out of their way to achieve work tasks (Bateman & Crant, 1993; Chan, 2006; Crant, 2000; Frese & Fay, 2001; Ohly & Fritz, 2010; Unsworth & Parker, 2003). Such individuals are more creative at work (Kim, Hon, & Lee, 2010; Seibert, Kraimer, & Crant, 2001; Unsworth, 2001; Unsworth & Parker, 2003; Zampetakis, 2008). CSE involves an individual's belief in their own creative abilities (Beghetto, 2006; Chong & Ma, 2010; Tierney & Farmer, 2002, 2004, 2011). This belief has been found to be positively related to individual creativity (Beghetto, 2006; Beghetto, Kaufman, & Baxter, 2011; Choi, 2004; Gong *et al.*, 2009; Mathisen & Bronnick, 2009; Tierney & Farmer, 2002, 2004, 2011). Therefore, the present study aims to examine the importance of behavioural based individual differences for individual creativity.

Relatively recently, the networking perspective on creativity has also been gaining popularity amongst creativity scholars (Perry-Smith, 2006; Shalley *et al.*, 2004; Zhou, Shin, Brass, Choi, & Zhang, 2009). In order to provide a more comprehensive understanding of individual creativity, the individual difference perspective will be integrated with the networking perspective on creativity in the current research.

1.3 The Networking Perspective on Creativity

Networks consist of many nodes/actors and types of ties that bind or separate individuals and groups, affecting the flow of information and in turn individual creativity. Seeing things differently is at the core of being creative and this may require seeing things from different perspectives and through the eyes of others (Ziebro & Northcraft, 2009). For this

reason an understanding of the social networking dynamics and interactions which may facilitate creativity is increasingly relevant.

Many theorists acknowledge that a significant source of creativity stems from interactions between individuals and teams (Dionne, 2008; Perry-Smith, 2006; Runco, 2008) and several attempts have been made to identify the social network parameters that shape creativity at work (Burt, 2004; Cross & Cummings, 2004; Fleming, Mingo, & Chen, 2007; Rodan & Galunic, 2004; Uzzi & Spiro, 2005). However, these research efforts have been conducted to minimal avail. Although network scholars have identified an array of informal workplace networks, the relationship that each has with creativity is yet to be clarified (Klein, Lim, Saltz, & Mayer, 2004).

Much of the extant research on the networking perspective on creativity has been anchored in investigations of the strength-of-ties, with this research demonstrating that weak ties are more beneficial to creativity than strong ties (Baer, 2010; Granovetter, 1973; Perry-Smith, 2006; Perry-Smith & Shalley, 2003; West, 2002; Zhou *et al.*, 2009). Therefore, research on the strength-of-ties hypothesis significantly outnumbers that on other networking phenomena in relation to creativity. This narrow focus has limited our understanding of how different individuals can be social and in turn creative. Therefore, the need to investigate the impact of different social networking constructs on individual creativity persists. More specifically, it is not yet clear which network parameters (*i.e.* weak or outside ties) or roles that can be assumed within networks (*i.e.* central or brokerage positions) are optimal for creativity enhancement. The present research therefore aims to examine how different networking parameters and roles influence individual creativity.

In line with the comprehensive nature of the present research, multiple network parameters and roles will be considered concurrently. Weak and outside ties will be the networking parameters of interest, with the former representing relatively infrequent interactions and the latter representing ties to people outside of the studied organisation (Baer, 2010; Granovetter, 1973; Madjar, Oldham, & Pratt, 2002; Perry-Smith, 2006; Perry-Smith & Shalley, 2003; Zhou *et al.*, 2009). Brokerage and centrality are the networking roles of interest in the present research, with the former involving individuals connecting nodes/actors who would otherwise be unconnected and the latter representing individuals who are in the centre of the flow of information throughout a network (Ahuja, Galletta, & Carley, 2003; Borgatti, Mehra, Brass, & Labianca, 2009; Burt, 2001, 2004; Chan & Liebowitz, 2006; Fleming, Mingo, & Chen, 2005; Fleming *et al.*, 2007; Freeman, 1979; Klein *et al.*, 2004; Liu & Ipe, 2010; Obstfeld, 2005; Oh & Kilduff, 2008; Perry-Smith, 2006; Scott & Judge, 2009).

Assessing multiple networking variables in combination with the earlier discussed individual difference characteristics (*i.e.* proactivity and CSE) is consistent with the ongoing calls for more comprehensive creativity research (Mehra, Kilduff, & Brass, 2001; Mumford, 2003; Shalley *et al.*, 2004; Zhou *et al.*, 2009). This comprehensive approach is also reflected in the study aims which will be outlined along with the study design next.

1.4   Study Aims and Design

This research aims to clarify individual creativity as well as the relationship between individual differences (*i.e.* proactivity and creative self-efficacy) and individual creativity. Social networking theory will be used to explore the mechanisms through which these relationships potentially occur. In doing so, creativity and networking research will be

integrated in a multi-method analysis. In order to strengthen the validity of the findings in this integrative research, individual employees and their supervisors will be surveyed. This multi-method approach will allow individual ratings of creative capabilities to be matched with supervisor ratings of employee creativity. In this way, many inconsistencies in existing research will be addressed while also responding to the calls for more integrative, multi-method and comprehensive research in this field (Mehra *et al.*, 2001; Mumford, 2003; Shalley *et al.*, 2004; Zhou *et al.*, 2009).

An integrative approach to research is clearly required so that the largely inconsistent findings pertaining to the relationship between individual differences and creativity, as well as the relatively limited nature of the networking perspective on creativity can be addressed (Shalley *et al.*, 2004). The fact that contemporary organisations are moving away from traditional organisational structures, operating in rapidly changing environments as well as being increasingly reliant on social networking for the successful execution of creative work tasks provides further justification for the adoption of an integrative approach (Agars *et al.*, 2008; Unsworth & Parker, 2003; Woodman *et al.*, 1993; Yuan & Woodman, 2010).

The integrative approach employed in this study will also enable clarification of the creativity concept and will identify the specific networking strategies and structures that collaboratively enhance creative outputs. Findings from this study will thus provide important information for management academics and practitioners alike about the types of individuals that are likely to be more creative and under what networking specifications creativity is enhanced. Furthermore, the present research will make significant strides in

counteracting what Anderson *et al.* (2004) refer to as the systematic routinisation of innovation/creativity research.

Existing creativity research samples have been deemed too routine and limited in scope, with the majority being limited to non-Western individuals (Anderson *et al.*, 2004). The present research will utilise a Western sample. More specifically, the study sample will be drawn from a large Australian based Information Technology (IT) organisation. Examination of creativity in individualistic and high-tech contexts is consistent with the recommendations of many scholars in the creativity field (Amabile, 1998; Oldham & Cummings, 1996; Perry-Smith, 2006; Tierney & Farmer, 2011).

1.5   Thesis Overview

The key features of the subsequent chapters of this thesis will be outlined next, beginning with Chapter Two, the Literature Review.

Chapter Two

This chapter provides a detailed review of the relevant literature and explains the theoretical framework as well as the hypotheses to be tested. First the creativity concept is defined and current conceptualisations are expounded. The individual difference perspective on creativity is then covered, emphasising the individual differences of proactivity and creative self-efficacy. This will be followed by a review of the less developed networking perspective on creativity, emphasising networking parameters (*i.e.* weak and outside ties) and roles (*i.e.* brokerage and centrality). The integration of these perspectives allows for networking variables to be assessed as the mechanisms through which different individuals are creative at work and the mediating potential of networking

is considered. Ten theory driven hypotheses are provided throughout these sections. The significance of the integrative framework is also highlighted, prior to presenting the conceptual model to be tested. Finally, the hypotheses to be tested are summarised.

Chapter Three

This chapter provides detailed information on the context for the research. First, creativity research that has been conducted in Australia is reviewed as is existing creativity research which has been based in the Information Technology (IT) industry. The IT industry in Australia is then described before the limited nature of creativity research in the Australian based IT context is discussed. Collectively, these sections are designed to show the viability of the Australian IT industry for creativity research, while also highlighting how this context has thus far been neglected. Finally, details are provided in relation to the organisation used for this study.

Chapter Four

This chapter details the methodology employed to collect and analyse the data. First, the study design is detailed with justification provided for the cross-sectional and quantitative nature of the research. The method employed to recruit participants is then discussed, with the collection of matched supervisor and employee data highlighted. The characteristics of the study's sample will be detailed before the specific measures used to operationalise each of the constructs are outlined. The reliability and validity of each of the measures used is also highlighted. The importance of control variables is also emphasised in this chapter, with the specific controls used in this research explained. Finally, the data analysis methods used are described.

Chapter Five

Results from the analyses are provided in this chapter. First the data is assessed in terms of non-response bias, sample size, missing data, outliers and normality. Descriptive data is then provided before the psychometric soundness of the measures is reiterated in terms of reliability and validity. Results of the hypothesis testing, specifically social network analysis (SNA), confirmatory factor analysis (CFA), and structural equation modelling (SEM) are provided. Finally, the findings in relation to each of the ten hypotheses are summarised.

Chapter Six

This chapter discusses the findings in light of the existing literature and with reference to the ten hypotheses. First, a summary of the significant findings is provided before discussing the specific relationships between individual differences (*i.e.* proactivity and CSE) and individual creativity. The findings pertaining to the mediation hypotheses are then addressed with the relationships between the networking variables and individual creativity discussed first, followed by the relationships between the individual difference and networking antecedents to creativity. The theoretical implications of the direct and indirect effects observed are highlighted throughout these sections prior to presenting a new conceptual model on individual differences, networking and creativity based on the study's findings. Specific practical implications of the findings are subsequently expounded. Finally, limitations of the research are considered before potential directions for future creativity research are provided.

Chapter Seven

This final chapter will conclude the thesis by reinforcing the significant relationships found, with a model depicting these relationships presented. This final chapter also emphasises the importance of the research, the implications of the findings including the need for more similar research on creativity. Finally, the main contributions of the research are reiterated.

1.6   Conclusion

This chapter provided the background for the current research in terms of key considerations and relevant perspectives. Individual creativity is at the core of the present research, with the individual difference and networking perspectives on creativity being leveraged in an integrative way. The current research was designed to comprehensively assess the antecedents to individual creativity in order to answer important questions about this construct and provide a solid platform for future creativity research.

As was highlighted, multiple individual difference and networking antecedents to creativity will be considered in the present research. In terms of individual differences, proactivity and CSE will be examined. Networking parameters and roles will also be considered, with weak and outside ties accounting for the former and brokerage and centrality accounting for the latter. Ultimately, the potential for networking variables to mediate the relationship between individual differences and creativity will be explored.

The next chapter will provide an extensive review of existing research undertaken on individual creativity. Both the individual difference and networking perspectives on creativity will be detailed with arguments provided on how these two perspectives can be

effectively integrated. Ten theory driven hypotheses will be proposed and the conceptual model to be tested presented.

2 REVIEW OF THE LITERATURE ON CREATIVITY, INDIVIDUAL DIFFERENCES AND SOCIAL NETWORKING

2.1 Introduction

The significance of creativity in organisations and society more broadly was discussed in Chapter One. It was highlighted that ensuring maximisation of creative potential in employees and their creative output is vital for the survival and success of contemporary organisations (Chong & Ma, 2010; Florida, 2002; Rietzschel *et al.*, 2009). Research in the management domain shows creativity is a driving force behind sustained organisational success and competitiveness (Bains & Tran, 2006; Carayannis & Wang, 2008; McAdam & McClelland, 2002; Oldham & Cummings, 1996; Pirola-Merlo & Mann, 2004; Shalley *et al.*, 2000; Woodman *et al.*, 1993). Indeed, Egan (2005, p. 160) claimed that "the presence and performance of creative people is essential to every organization whether in the public or private sector". Therefore, it is important to further our understanding in relation to the conditions under which workplace creativity is enhanced.

Historically, research on creativity was largely limited to the fine arts, whereas today it is recognised as being important across a wide variety of work domains (Amabile, 1998; Fischer, 2000; McAdam & McClelland, 2002; Mumford, 2003; Oldham & Cummings, 1996; Pirola-Merlo & Mann, 2004; Simonton, 2000). As we progress further into the 'creative age', the demand for creativity across disciplines continues to rise (Florida, 2002; Runco, 2004). In light of this, a plethora of creativity research has been conducted, spanning different disciplines - including behavioural psychology, sociology, economics

and management, with some progress toward the formulation of a coherent conceptualisation of creativity having been made (Mumford, 2003).

The past decade in particular has witnessed a burgeoning of interest in creativity, as the central role it plays in organisations attaining and sustaining success is increasingly recognised (Agars *et al.*, 2008; Bains & Tran, 2006; Chong & Ma, 2010; Nonaka, 1991; Shalley *et al.*, 2000). Considering the increasingly turbulent times besetting organisations, creativity may in fact prove to be a key mechanism via which organisations can achieve and maintain competitive advantage. Egan (2005) explained that dynamic work environments encourage organisations to seek out creative thinkers to occupy a wide range of positions. Reiter-Palmon (2011) further attested to the fact that globalisation has increased competition and this together with rapid advances in technology, necessitate creativity in organisations. Nevertheless, creativity research in the management domain has generated as much controversy as it has insight, with many questions in relation to the antecedents and consequences of creativity remaining unanswered (Miller & Osborn, 2008; Shalley *et al.*, 2004).

Debate surrounding the antecedents to creativity at work continues to intensify (Miller & Osborn, 2008; Mumford, 2003; Shalley *et al.*, 2004) and considering the importance of creativity in organisations, more research is still needed to understand the conditions that promote creativity. The need for additional creativity research has been recognised and stressed by several authors in the field (Anderson *et al.*, 2004; McAdam & McClelland, 2002; Mumford, 2003; Shalley *et al.*, 2004). More specifically, research designs which incorporate multiple potential antecedents to creativity are a necessary step towards establishing a more detailed understanding of creativity in organisations (Runco, 2004;

Shalley *et al.*, 2004). Thus, the present research will examine multiple individual difference and networking variables in relation to creativity.

Many individual attributes have been studied in relation to creativity, but this research has resulted in more questions being raised than answered. This is particularly true of studies on the relationship between individual differences and creativity (Shalley *et al.*, 2004). This is in part due to an over-reliance on personality characteristics and/or single individual difference constructs in creativity research. The present research will avoid such over-utilised constructs and approaches by examining two distinct individual difference variables (*i.e.* proactivity and creative self-efficacy) and therefore advance our understanding on creativity.

Zhou *et al.* (2009) acknowledged that researchers need to look beyond individual cognitive processes and recognise the social sources of creative ideas. Therefore the networking perspective on creativity (*i.e.* the relationship between networking and creativity) has been receiving increasing attention. However, this growing body of research is yet to fully explain how individual networking patterns and practices influence creativity. Zhou *et al.* (2009) utilised social networking analysis to understand the interactions between networks, employee values and creativity; however, the network considerations were limited to assessment of the strength of ties (*i.e.* strong versus weak ties between individuals). The present research aims to advance the networking perspective on creativity by comprehensively considering a variety of network parameters and individual networking roles in relation to individual creativity. More specifically, the potential mediating effects of weak ties, outside ties, brokerage and centrality roles on the relationship between individual differences and creativity will be examined.

Neither the individual difference nor the networking perspectives on their own have fully explained the intricacies of individual creativity (Mehra *et al.*, 2001; Mumford, 2003; Shalley *et al.*, 2004), thus an integrative approach is needed. Integrating the assessment of individual difference variables with that of the effects of networks on creativity will constitute a significant contribution to the creativity literature. Indeed, scholars continue to advocate the need for more such advanced and integrative perspectives on creativity (Mehra *et al.*, 2001; Mumford, 2003; Zhou *et al.*, 2009). The present research therefore integrates the individual difference and networking perspectives on creativity to determine the most significant antecedents to individual creativity. Importantly, the present research will allow for an in-depth understanding of the intricacies of individual creativity by assessing the potential for networking variables to mediate the relationship between individual differences and creativity. This will in turn allow many important questions about individual creativity to be answered. The following flow diagram broadly depicts the relationships under investigation.

Individual Differences → Social Networking → Individual Creativity

Figure 1: Networking variables as mediators in the relationship between individual differences and creativity

The remainder of this chapter will provide a comprehensive review of the literature on creativity and networks, as well as the relevant literature on individual differences. In doing so, specific gaps, inconsistencies and ambiguities in extant studies, from which the

hypothesised relationships for the present study are derived, will be highlighted. The next section of this chapter defines and reviews relevant conceptualisations of creativity. This is followed by a description and discussion of the individual difference variables to be examined in this research, namely proactivity and creative self-efficacy, and their proposed relationships with creativity. Next, the various aspects of individual networks will be detailed along with a review of the current conceptualisations of social networking. Following this the existing research on the relationship between networking and creativity including the more specific relationships between networking parameters and roles with creativity will be detailed. The relationships between individual differences and social networking will also be expounded. In turn, the potential for the networking variables to mediate the relationship between individual differences and creativity will be discussed. The hypotheses proposed throughout this chapter will then be summarised before the overall contributions of the research are highlighted at the conclusion of the chapter.

2.2   Creativity

This section will define creativity and will provide an overview of the widely accepted conceptualisations of this construct. Limitations pertaining to extant creativity research will subsequently be expounded.

Definitions and Conceptualisations of Creativity

Creativity can be expressed in many different ways (Albert & Runco, 1989; MacKinnon, 1965; Mumford & Gustafson, 1988). It is a phenomenon that involves individuals doing things for the first time, creating new knowledge, producing works that are novel and solving problems in new ways (Amabile, 1996, 1998; Bains & Tran, 2006; Kerr & Gagliardi, 2003; Oldham & Cummings, 1996; Rank, Pace, & Frese, 2004; Woodman *et al.*,

1993). To be considered creative, novel developments and ideas must be useful as well as influential (Amabile, 1996, 1998; Amabile *et al.*, 1996; Oldham & Cummings, 1996; Woodman *et al.*, 1993). Furthermore, creativity enables individuals to invent, dream, problem solve, craft, and correspond in fresh, new ways which is vital for organisational success (Egan, 2005). These definitions of creativity point to its multifaceted nature, with the concept of creativity subsuming characteristics such as idea generation, problem solving and implementation strategies. In line with these definitions the present research will consider multiple antecedents to more accurately explain the multifaceted creativity phenomenon.

Creativity can be achieved through enhanced cognitive flexibility, set breaking (*i.e.* breaking away from norms) and cognitive restructuring (*i.e.* modifying thoughts in order to accurately view situations); and it can also be achieved through enhanced persistence and perseverance (Boden, 1998; Dietrich, 2004; Nijstad, Stroebe, & Lodewijkx, 2002; Rietzschel *et al.*, 2009; Simonton, 1997). These multiple paths that can be taken to achieve and sustain creativity reaffirm the multifaceted nature of creativity. Furthermore, creativity is not necessarily just an innate phenomenon, it can also be inculcated, encouraged and trained (Bharadwaj & Menon, 2000; DiLiello & Houghton, 2008; Woodman *et al.*, 1993). This therefore points to the potential for individual creativity to be managed.

Creative actions can be characterised as affectively charged events (Amabile, Barsade, Mueller, & Staw, 2005). As such creativity occurs when complex cognitive processes are shaped by, co-occur with, and shape emotional experiences. This facet of creativity reflects a particularly challenging area of creativity assessment. Little is known about how naturally occurring affective experiences in individuals' daily working lives impact upon

their creativity (Amabile *et al.*, 2005). Assessing creativity as an assemblage of novel combinations of different perspectives and approaches may help to elucidate matters in this area.

It is noteworthy that creativity is also recognised as a risky endeavour, due to the inherently challenging nature of the thinking which underlies subsequent creative actions (George & Zhou, 2007; Nakamura, 2000; Perry-Smith, 2006; Yuan & Woodman, 2010; Zhou & George, 2003). These risks can materialise when the costs of creative initiatives outweigh the benefits. Moreover, the nature of creativity is such that it also requires individuals to defy norms and conventions, as it is strongly tied to originality (and original behaviour is always contrary to norms), and so "creativity is a kind of deviance" (Runco, 2004, p. 677). Zibarras, Port, and Woods (2008) referred to this as the 'dark side of creativity' with creative characteristics found to relate to dysfunctional personality traits including arrogance and manipulation and lower levels of cautiousness, perfectionism and dependence. This notion reinforces the importance of learning to effectively manage the creativity of employees, in order to leverage potential advantages and offset potential disadvantages associated with creative behaviour.

Creativity (*i.e.* novel idea generation) and innovation (*i.e.* actual implementation of ideas) are commonly confused despite being conceptually distinct. While it may be commonplace for the words 'creativity' and 'innovation' to be used interchangeably, theory has been well established to distinguish between these two constructs. Specifically, creativity precedes innovation, such that innovation cannot exist without underlying creativity (Amabile, 1996; Miller & Osborn, 2008). Therefore, creative thought and action is necessary before innovation processes and idea implementation can take place. Anderson *et al.* (2004) have

also emphasised that while creativity can refer to idea generation alone, innovation includes both idea generation and implementation. In order to strengthen creativity and innovation research, the creativity construct needs to be clarified, which is the focus of this research.

The potential for creativity to be confused with divergent thinking needs to also be acknowledged. While divergent thinking represents the ability to think laterally it cannot completely explain individuals' creative potential (Runco, 2008). Furthermore, divergent thinking may provide individuals with novel ideas that underlie creative actions, but this ability cannot constitute creativity alone. Runco (2008) asserts that divergent thinking tests are best viewed as estimates of creative potential rather than mistakenly being considered as synonymous with creativity. Reitzschel *et al.* (2009) concur, claiming that creativity can be viewed in many different ways, all of which should involve component parts (*i.e.* multiple facets for consideration). The multifaceted and complex nature of individual creativity requires similarly multifaceted and complex investigative approaches to be employed for clarification and advances in relation to creativity to be attained.

The complexity associated with theorising in relation to creativity can to some extent be explained by the diverse areas that have been pursued by researchers. This complexity notwithstanding, creativity researchers continue to make progress in understanding creativity at the individual, team and system levels (Rietzschel *et al.*, 2009). However, until extant gaps, inconsistencies and tensions in the individual level research are addressed, further progress in the field may be hindered (Shalley *et al.*, 2004). The present research therefore aims to explore the complexities of individual creativity. Some of the limitations of existing creativity research will be outlined next.

Overview of Limitations of Existing Creativity Research

Despite the breadth of creativity research, many limitations persist in the field. Unsworth (2001) argued that a limitation of most existing creativity research is that it conceptualises creativity as a unitary construct, precluding a comprehensive understanding of the phenomenon. Runco (2008) further attests that many of the ambiguities within creativity research are due to an overreliance on objective considerations which fail to completely capture the processes underlying individual creativity, such as affect and intuition. Overall, these research issues can be attributed to the tendency of researchers to adopt either an over-analytical or an under-analytical approach. The focus of over-analytical research is on isolated stages of creativity (*e.g.* idea generation, problem solving, implementation strategies), ignoring any interrelations between various components of the creative process; while the under-analytical approach is evident in research that focuses on creativity as a unitary/monolithic phenomenon, rather than a collection of various components (Rietzschel *et al.*, 2009). Both of these approaches have been deemed inappropriate as they ignore the multifaceted nature of creativity and the fact that there are a variety of important factors to generating creativity that are specific to the individual, team and organisational levels of analysis (Rietzschel *et al.*, 2009). To address this limitation and highlight the importance of studying a variety of factors that potentially influence creativity the present research will assess multiple antecedents to creativity.

Many authors in the creativity field claim that numerous important and relevant questions remain unanswered (Florida, 2002; Hunter, Bedell, & Mumford, 2007; Michalko, 2001; Miller & Osborn, 2008; Shalley *et al.*, 2004). For example, while human creativity is virtually a limitless resource, some people are more creative than others and some contexts are more likely to induce creativity than others. However, what constitutes a prototypical

creative individual and what equates to the perfect context for creativity is still unclear. Therefore, while we know that certain personality traits are more likely to be linked to individual creativity, it is not yet known what combinations of other individual difference characteristics are likely to also influence individual creativity (Shalley *et al.*, 2004). To address this limitation some authors in the field have advocated concurrent considerations of potential predictors of individual creativity, to enable the most significant predictors to be identified (Barron & Harrington, 1981; Rank *et al.*, 2004; Runco, 2004; Shalley *et al.*, 2004).

The present research will therefore adopt this approach by examining individual difference and social networking variables concurrently as potential antecedents of creativity. It is expected that assessing multiple potential predictors of creativity will enable more comprehensive and accurate conclusions pertaining to individual creativity to be made (Rietzschel *et al.*, 2009; Shalley *et al.*, 2004). Furthermore, this approach is anticipated to generate findings in relation to the potential for social networking to act as an important mechanism through which different individuals are creative at work. Additional limitations of existing creativity research will be identified throughout the subsequent sections of this chapter, with particular attention paid to the limited research on the relationships creativity may have with other key behavioural and organisational constructs.

Summary of Creativity

This section has defined individual creativity and reviewed the most common conceptualisations of this construct. The importance of creativity in contemporary business climates was acknowledged before the expansive nature of extant creativity research and associated limitations were highlighted. Specifically, the need for more comprehensive and

integrative approaches to examine individual creativity was emphasised. The following section will review the two individual differences that will be the focus of this research, proactivity and creative self-efficacy (CSE), and the existing research in relation to creativity and these constructs in detail.

2.3   Individual Differences

This section of the chapter will detail the dominant definitions and conceptualisations of individual differences before progressing to discuss the relationships between various individual differences and creativity. More specifically, the over-relied upon personality perspective on creativity (*i.e.* how the Big Five Model and Creative Personality Scale are associated with individual creativity) will be expounded for the purpose of highlighting the need for the adoption of a different and more practically applicable individual difference perspective on creativity. Subsequently, the specific relationships between the individual difference variables of interest, proactivity and creative self-efficacy, and creativity will be reviewed. Limitations pertaining to extant studies on these relationships will also be discussed prior to postulating a set of hypotheses to be empirically tested.

Definitions and Conceptualisations of Individual Differences

Individuals differ across many continuums. The very term 'individual' implies distinction and difference. As such, differences in individual attributes influence the differing behaviours of individuals and more specifically, can either enhance or stifle individual creativity (Shalley *et al.*, 2004). The most commonly assessed individual differences in relation to creativity pertain to specific personality types. Nevertheless, a wide range of additional individual differences have also been identified and assessed in order to better

explain individual creativity. This line of research represents the individual difference perspective on creativity and is a major focus of the present research.

The individual difference characteristics examined in creativity research to date range from stable to malleable dispositions and behaviours. Characteristics such as personality traits and cognitive style are classified as stable (Barron & Harrington, 1981; Shalley *et al.*, 2004; Woodman *et al.*, 1993), while proactivity and creative self-efficacy tend to be considered more malleable (Gong *et al.*, 2009; Mathisen & Bronnick, 2009). This indicates that the proactivity and CSE of individuals can be altered which makes these variables particularly relevant for examination in the management domain. The literature on the individual difference perspective on creativity will be expounded in more detail next.

Individual Differences and Creativity

Personality is the most extensively studied individual difference variable in relation to individual creativity (Shalley *et al.*, 2004). The Five Factor or Big Five Model has been the most widely used model in the assessment of the 'creative personality'. This model assesses personality traits hierarchically, specifically emphasising the five traits of conscientiousness, openness to experience, extraversion, neuroticism, and agreeableness (Egan, 2005; Feist, 1998). Studies on creativity that have utilised the Five Factor Model (FFM) of personality have found that each of the five traits (and some sub-traits) are related to creativity, with openness to experience, conscientiousness, self-acceptance, hostility and impulsivity demonstrating the strongest relationships with individual creativity (Feist, 1998). For example, Feist (1998) found that individuals who scored highly on the openness to experience dimension tended to be more broad minded and curious which in turn lead to greater creativity, with the reverse being true for individuals

who had low openness to experience scores. Indeed, of the different personality traits, 'openness to experience' has been shown to be the personality dimension (from the Five Factor Model) that is most consistently related to individual creativity (Feist, 1998; McCrae, 1987; Shalley *et al.*, 2004).

In addition to the FFM, research on personality correlates of creativity has also involved the use of Gough's (1979) Creative Personality Scale (CPS) (Shalley *et al.*, 2004). The CPS was developed as a 30-item measure, providing an index of an individual's overall creative potential. The items are adjectives, 18 of which have been found to be most consistent with creative personalities and 12 of which have been found to be common features of less creative individuals (Gough, 1979). Respondents are required to select from the 30 adjectives those that best describe them. According to Barron and Harrington (1981) individuals who score high on the CPS can be expected to demonstrate higher levels of creativity than those who score low on the measure. Research has supported this predicted relationship (Feist, 1998; Oldham & Cummings, 1996; Zhou & Oldham, 2001). The openness to experience trait of the FFM has also been found to be positively correlated with the CPS (McCrae, 1987; Piedmont *et al.*, 1991). However, the practical applications that can be developed based on these findings are limited given the particular focus on personality traits (as opposed to alternative individual difference constructs).

FFM and CPS studies have focussed exclusively on personality traits in relation to individual creativity, while neglecting other, more practical individual difference considerations. George and Zhou (2001) are critical of the assertion that some personalities are 'better' when it comes to creativity, with findings from their research suggesting that individuals with less prototypical creative personalities also having the potential to exhibit

relatively high levels of creativity. This finding highlights the need for researchers to also examine other individual difference constructs in order to understand the predictors of creativity. Additionally, Woodman *et al.* (1993) claimed that the use of a personality inventory (such as the FFM or the CPS) to predict employee creativity levels in organisations was not likely to be useful. This is because managers are not able to change or alter individuals' personalities which are inherent and stable in nature (Woodman *et al.*, 1993). As such, Woodman *et al.* (1993) suggested scholars consider personality traits as only a partial explanation for creativity, with other individual difference characteristics likely to be more relevant in predicting creativity in complex social settings (such as organisations). Therefore, there is a need for creativity research to navigate away from the relatively common assessment of personality traits towards the assessment of alternative individual difference characteristics and their relationship with creativity.

Unlike personality traits, more behaviourally oriented individual differences (such as proactivity and creative self-efficacy) are malleable. Depending on specific individual characteristics, employees may either adhere to standard patterns and strategies that experience has shown are likely to work, in turn mitigating against creativity, or they may take on nonstandard tasks in which their experience is limited, which necessitates relatively random thinking and in turn promotes individual creativity (James *et al.*, 1992). According to this view, individual inclinations towards creativity are dependent upon specific individual characteristics which influence whether or not individuals are creative (*i.e.* engage in nonstandard work patterns) or not creative (*i.e.* engage in standard work patterns). It is therefore important to identify the specific individual difference characteristics that can change over time (*i.e.* are malleable) and in turn alter the extent to which an individual is creative.

Barron and Harrington (1981) asserted early on that the study of individual differences, as opposed to just personality, would produce a more meaningful and practically relevant understanding of creativity. Specifically, examining a combination of individual differences could potentially provide a wider breadth of practical applications. Managers cannot change individuals' personalities, but attitudes and difference characteristics, such as individual proactivity and creative self-efficacy can be managed and altered to ensure optimal levels of creativity (Gong *et al.*, 2009; James *et al.*, 1992; Mathisen & Bronnick, 2009). It is for these reasons that the present research will not consider personality traits but rather will focus on the individual difference characteristics of proactivity and creative self-efficacy.

In the move away from creative personality considerations, self-regulation or self-monitoring behaviours have been at the forefront of more recent creativity research on the individual difference perspective (Mehra *et al.*, 2001; Porath & Bateman, 2006; Zhou & Oldham, 2001). Self-regulation and self-monitoring involve individuals actively constructing and controlling their public selves for the purpose of achieving certain outcomes (Mehra *et al.*, 2001). Individuals can differ in terms of their self-monitoring behaviours. Self-monitoring behaviours have been associated with leadership and proactivity, such that proactivity has been deemed a self-monitoring behaviour which enhances the chances of an individual assuming leadership positions, with high self-monitors achieving more success at work than low self-monitors (Mehra *et al.*, 2001). As will be detailed further in the following section, proactivity is a specific type of self-monitoring behaviour, which involves individuals monitoring their levels of initiative at work.

Definitions and Conceptualisations of Proactivity

Proactivity and creativity are both performance related behaviours that are increasingly important in today's organisations (Griffin, Neal, & Parker, 2007; Pulakos, Arad, Donovan, & Plamondon, 2000). Proactivity directly involves altering the status quo and can be defined as an ability to overcome situational constraints and to affect changes in the environment (Bateman & Crant, 1993; Chan, 2006; Crant, 2000). In line with this definition, highly proactive people can be expected to stand out in organisations for their persistent pursuit of improvement and success. It needs to be acknowledged that proactive people can also stand out in organisations for all the wrong reasons. Individuals can be proactive in their pursuit of fulfilling either organisational objectives or personal agendas, with the latter being less desirable than the former (Chan, 2006). The present research however emphasises the positive side to individual proactivity.

Proactive behaviour can be described as self-starting and future-oriented (Crant, 2000; Frese & Fay, 2001; Unsworth & Parker, 2003) and can involve actively attacking problems, making suggestions and taking charge of issues (Ohly & Fritz, 2010). Proactivity therefore normally refers to individuals who actively make suggestions verbally or otherwise, for the purpose of improving efficiency, performance and overall success (Griffin *et al.*, 2007; Ohly & Fritz, 2010). More specifically, proactive behaviour refers to the actual in-role (context specific activities such as feedback seeking) and extra-role (general activities such as challenging the status quo) activities in which individuals engage (Crant, 2000). A proactive person can thus be described as someone who is able to identify opportunities and then act on them, show initiative freely, and persevere until they bring about successful change. In contrast, less proactive people tend to be passive and

reactive, preferring to adapt to circumstances rather than trying to proactively change them (Bateman & Crant, 1993; Crant, 1995, 2000; Seibert, Crant, & Kraimer, 1999).

In order to dispel any potential confusion, it is important to note that individuals with proactive personalities perform proactive behaviours. Therefore, while theorists refer to proactivity in terms of both 'personality' and 'behaviour', it is assessed in terms of behaviours which are driven by individual dispositions (*i.e.* aspects of individual personality). Hence, a proactive personality underlies proactive behaviour (Bateman & Crant, 1993). Like with other dispositions, proactive individuals are assumed to be differentially predisposed to behave proactively in various situations. In turn, an individual's disposition toward proactive behaviour differentiates the extent to which they take action to influence their environments (*i.e.* proactive people actively attempt to influence their environments while non-proactive people make no such attempts) (Crant, 1995). For the purpose of the present research, proactivity will be assessed in terms of individual dispositions toward behaving proactively.

Focussing purely on personal disposition allows for a more accurate assessment of proactive behaviour, uninhibited by the situational side to proactive behaviour (Crant, 2000). The present research will subscribe to this view, which is in line with ongoing scholarly calls for more focus on personal dispositions, as opposed to situational views of proactive behaviour (Bateman & Crant, 1993; Becherer & Maurer, 1999; Campbell, 2000). This is supported by the understanding that highly proactive individuals create their own environments (Bandura, 1986; Bateman & Crant, 1993) making it imperative to understand individual proactive dispositions, rather than the situations or environments which are amenable to alteration through proactivity.

Individual difference theorists have been moving away from personality considerations towards the study of malleable traits such as proactivity. Existing definitions of proactivity emphasise initiative taking as opposed to passivity at work, which represents behaviours that can be encouraged in individuals (Crant, 2000). For example, when people are provided with sales targets and/or bonus incentives, they are more likely to take initiative and be proactive in their work to achieve their goals and receive rewards. Encouraging an individual to be more 'open to experience', which is a significant personality correlate of creativity (Feist, 1998; McCrae, 1987; Shalley *et al.*, 2004), could present practical challenges. However, research has also shown that proactive employees are more actively engaged in the behaviours that have positive effects on their careers, such that proactivity can not only be encouraged by managers but even by the employees themselves (Seibert *et al.*, 2001). Therefore, the relationship between proactivity and creativity needs to be assessed and this will be detailed next.

Proactivity and Creativity

The usefulness of the proactivity construct for predicting behaviour is well established. Specifically, proactivity has been shown to predict innovation, job performance, political knowledge and career initiative (Bateman & Crant, 1993; Chan, 2006; Crant, 2000; Seibert *et al.*, 2001; Thompson, 2005). Nevertheless, literature on the relationship between proactivity and creativity remains relatively limited due to the dominance of research focusing on personality traits as predictors of creativity (Shalley *et al.*, 2004). Rank *et al.* (2004) have therefore argued that there is a need to also examine constructs such as proactivity, to broaden our understanding of the individual difference predictors of creativity.

Broadly, existing research on proactivity has linked this individual difference variable to a variety of positive work outcomes. For example, proactivity has been shown to be positively associated with career success (De Vos, Clippeleer, & Dewilde, 2009; Seibert *et al.*, 1999; Seibert *et al.*, 2001), entrepreneurship (Becherer & Maurer, 1999; Crant, 1995; Zampetakis, 2008), and team effectiveness (Becherer & Maurer, 1999). The majority of proactivity research has been aimed at using proactivity to explain enhanced job performance, with existing research findings indicating that highly proactive employees are more likely to perform successfully at work (Chan, 2006; Crant, 1995, 2000; Seibert *et al.*, 2001; Thomas, Whitman, & Viswesvaran, 2010; Thompson, 2005). Given that success at work is often also dependent on creativity (Chong & Ma, 2010; Runco, 2004; Shalley *et al.*, 2004) it is critical to also consider the relationship between proactivity and creativity at work.

The potential for proactivity to influence individual creativity has been attracting increasing research attention. Individual differences that relate to the self-regulation of behaviour provide the motivation and drive for individuals to acquire and develop skills and unique knowledge and therefore, potentially serve as potent antecedents for employee creativity (Burt, 2001, 2004; Tierney & Farmer, 2002; Zhou & Oldham, 2001).

A study by Seibert *et al.* (2001) found proactivity was positively related to innovation in a two year longitudinal study with a sample of 180 full time employees and their supervisors. Given this positive association between proactivity and innovation, individual proactivity can similarly be expected to influence individual creativity, since creativity (*i.e.* novel idea generation) precedes innovation (*i.e.* actual implementation of ideas) (Amabile, 1996; Miller & Osborn, 2008). Unsworth and Parker (2003) concurred, claiming that

individuals have to often be proactive in order to implement an idea (*i.e.* innovate) after an idea has been generated. Despite focusing on the relationship between proactivity and innovation (as opposed to proactivity and creativity), Unsworth and Parker (2003) also acknowledged that proactivity can lead to creativity, with highly proactive people being more likely to generate novel ideas as well as solutions to problems.

Some researchers have taken steps to explicitly examine the relationship between proactivity and creativity. Unsworth (Unsworth, 2001) proposed a link between proactivity and creativity through her identification of 'proactive creativity'. This type of creativity "occurs when individuals, driven by internal motivators, actively search for problems to solve" (Unsworth, 2001, p. 292). This implicates proactivity as being inherent in individual creative behaviour. Kaufmann (2003) similarly identified 'proactive creativity', in an endeavour to differentiate it from 'reactive creativity'. The former involves envisioning a future desired state and taking specific steps to achieve that state, while the latter refers to various external situations triggering the search for novel solutions and pathways to goal attainment (Kaufmann, 2003). It needs to be acknowledged that Unsworth (2001) and Kaufmann (2003) came to their complementary conclusions through theorising, with their propositions not being empirically tested. Nevertheless, growing interest in this field has seen increasing empirical examinations of the relationship between proactivity and creativity in recent years.

A study examining the combined effects of creativity and proactivity on entrepreneurial desirability and intent, among a student cohort, found evidence for a strong positive relationship between proactivity and creativity (Zampetakis, 2008). This study sampled 199 Engineering and Business university students from Greek Universities and found that

perceived desirability fully mediated the relationship between student creativity, and proactivity and entrepreneurial intent. The findings of this study demonstrated that proactive and creative people harbour higher levels of desirability (*i.e.* the degree to which individuals feel attracted towards certain behaviours), which in turn enhances their entrepreneurial intentions. Furthermore, Zampetakis (2008) found proactivity had a positive relationship with creativity. Although the positive relationship between proactivity and creativity was not the focus of this study, this supplementary finding provides evidence for the positive relationship between these two constructs.

A strong positive relationship between proactivity and creativity was also found by Kim, Hon and Crant, (2009) who conducted a three-wave longitudinal study utilising 146 employees from a variety of organisations in Hong Kong. Their research examined the relationship between proactivity, creativity and newcomer outcomes (*i.e.* career satisfaction and perceived insider status). Kim *et al.* (2009) found proactivity to have a strong positive relationship with employee creativity, which in turn positively affected the newcomer outcomes of career satisfaction and perceived insider status (Kim *et al.*, 2009). This study provides further evidence that individual proactivity is positively related to individual creativity.

The link between proactivity and individual creativity has been further corroborated by Kim, Hon and Lee (2010). In this study, research and development teams across organisations in South Korea were surveyed, with subordinates reporting on their proactivity levels and supervisors reporting on subordinate creativity levels. Analysis of data from 157 subordinate-supervisor pairs showed a significant, positive relationship between proactivity and creativity. Moreover, it was found that employees whose

supervisors identified them as being more proactive demonstrated higher levels of creativity (Kim *et al.*, 2010). These findings clearly demonstrate that proactive people are identifiable at work and more pertinently individuals who are more proactive at work are also more creative.

This review of the existing research on the relationship between proactivity and creativity obviates the limited nature of the studied samples, with the majority of extant empirical studies being limited to Asian-based samples. In order to substantiate the findings of this research, more needs to be done to further establish this relationship using non-Asian samples. The present research will address this limitation by using a sample consisting of Australian based IT workers (see Chapter Three). Another major limitation of existing research on the relationship between proactivity and creativity is that innovation based studies have attracted more empirical attention than studies focused specifically on creativity. Although this research allows useful deductions to be made regarding the potential relationship between proactivity and creativity, more specific investigations of this relationship are needed. Despite these limitations, the findings of existing research to date consistently point to a positive association between these two constructs. The following is therefore hypothesised:

   Hypothesis 1: *Proactivity will be positively related to individual creativity.*

The following section will discuss the second individual difference variable under investigation in the present research, creative self-efficacy.

Definitions and Conceptualisations of Creative Self-Efficacy (CSE)

The concept of creative self-efficacy (CSE) is a relatively new one, developed by Tierney and Farmer (2002, 2004) by integrating more general research findings on self-efficacy and creativity. In order to do this, they employed the self-efficacy model developed by Gist and Mitchell (1992). Broadly, self-efficacy is the extent to which individuals believe they have the ability to accomplish specific tasks and goals (Bandura, 1997; Gist & Mitchell, 1992). Based on this, CSE has been defined as an individual's belief in their own creative ability (Beghetto, 2006; Chong & Ma, 2010; Tierney & Farmer, 2002, 2004). According to Bandura (1997), self-efficacy affects task-related attraction, initiation and endurance. It can therefore be argued that CSE levels are likely to also influence the extent to which workers enjoy creative activities, initiate creative action, and maintain creativity in their work.

In light of complex organisational climates, individuals having high levels of CSE may be necessary for several reasons. First, at the core of the CSE construct is the notion that individuals with high CSE are able to recover quickly from any setbacks they experience in their jobs (Mathisen & Bronnick, 2009). Thus, CSE may be a particularly valuable attribute given the volatile nature of contemporary organisational environments. Second, and most pertinent to the present research, is that CSE and creativity are inherently linked (Tierney & Farmer, 2002, 2004, 2011). The name itself suggests that CSE implicates individual creativity and so assessing the strength and nature of the relationship between CSE and creativity is important.

Individual difference theorists have been assessing CSE as it relates to creativity in a move away from personality considerations. This move reflects the malleability of CSE as opposed to individual differences based on personality. Yang and Cheng (2009)

acknowledged the potential for training to help shape the creative beliefs of employees. Furthermore, Mathisen and Bronnick (2009) found that creativity training had a positive effect on CSE levels amongst a student sample. It would seem that training programs can improve CSE, so individual difference theorists need to focus more on this type of characteristic and less on personality traits which are not amenable to change.

Given that extant definitions and conceptualisations of CSE intuitively implicate individual creativity, researchers have been endeavouring to examine the specific relationship between these two constructs. Existing research on this relationship will be reviewed next.

CSE and Creativity

It needs to be acknowledged that the very nature of CSE (as made clear by the aforementioned definitions) implicates creativity and so understanding the relationship between CSE and creativity is of critical importance. Given that individuals who believe they can perform a task well (*i.e.* possess a high level of self-efficacy) do better than those who do not (Gist & Mitchell, 1992), it can be similarly expected that individuals who believe they are more creatively capable (*i.e.* possess a high level of CSE) will exhibit more creativity than those who do not hold this belief. In an early review of creativity research, Barron and Harrington (1981, p. 453) identified the importance of individuals maintaining a "firm sense of self as creative" in order to maintain their individual creativity. More recently, Egan (2005) claimed that individuals' self-views of creative behaviour are immensely important for actual creative performance and advocated for more research specifically on CSE's relationship with individual creativity.

Tierney and Farmer (2002, 2004), as the originators of CSE, have conducted a number of studies examining CSE. First, Tierney and Farmer (2002) studied CSE in two firms, a consumer products company and the operations division of a high-tech firm, with the former consisting of blue collar workers and the latter consisting of white collar workers. Results from this study demonstrated that CSE was positively related to creative performance, beyond the predictive effects of job self-efficacy, with the relationship being particularly strong for the sub-sample of white-collar workers (Tierney & Farmer, 2002). Subsequently, Tierney and Farmer (2004) investigated CSE in a research and development unit in a chemical company. Results from this study indicated that CSE mediated the effects of supervisor expectations, supervisor behaviours, and employee views (*i.e.* the view that employees are expected to be creative in their work), on creativity. These results demonstrated that CSE is influenced by various contextual and personal factors which collectively influence individual creativity. For example, employee views on expectations that they be creative in their job aligned with efficacy levels, with participants who felt they were expected to be creative reporting higher levels of CSE which subsequently lead to higher levels of individual creativity. Importantly, those who reported higher levels of CSE were also the most creative performers, as rated by their supervisors (Tierney & Farmer, 2004).

More recently, Beghetto (2006) examined CSE using a sample of 1322 high school students. Results showed that students with higher levels of CSE were more likely to hold positive beliefs about their academic abilities across subject areas and were significantly more likely to indicate that they planned to attend college, than students with lower levels of CSE. Students with higher CSE also reported higher levels of participation in after-school activities (Beghetto, 2006). Pertinently, teacher feedback on individual student

creativity was positively linked to students' CSE (Beghetto, 2006). These results indicated that student CSE levels positively affected student creativity levels as well as other academic abilities and even social involvement.

Another student based study using a sample of undergraduate students found that CSE mediated the effects of individual and contextual factors on individual creative performance (Choi, 2004). In this study individual factors included extrinsic and intrinsic motivation, personality (*i.e.* creative or cautious) and creative ability, while contextual factors included supportive leadership and open group climate. The results demonstrated that individuals with creative personalities, who also experienced supportive and open climates, were more likely to have high levels of CSE and in turn be more creative. Importantly, Choi's (2004) findings demonstrated that individuals with high levels of CSE tended to exhibit more creativity. These findings therefore further affirm the positive relationship between CSE and individual creativity.

More recently, another student sample was employed to demonstrate the positive relationship between CSE and creativity (Beghetto *et al.*, 2011). This research involved two studies. In study one, students were surveyed in relation to their perceived CSE levels in relation to science. These student responses were then matched with teacher responses on the student's science ability and creativity. Findings showed CSE (as rated by students) significantly predicted teacher ratings of student creativity (in the science domain). In study two students were asked to rate their CSE in science and maths, with teachers once again rating students' creative abilities, this time in science and maths. Results from this second study replicated the findings of study one, with student CSE ratings found to be a significant predictor of the teacher ratings of student creativity (in maths and science). A

novel contribution of this study was to demonstrate that individuals (*i.e.* students) can distinguish between their creative ability across domains, such as maths and science (Beghetto *et al.*, 2011). Furthermore, these findings also reaffirmed the relationship between CSE and creativity with higher levels of CSE once again found to be related to higher levels of individual creativity.

In order to examine the effects of creativity training on CSE Mathisen and Bronnick (2009) sampled four groups of individuals; a group of undergraduate students, a group of municipal employees, a group of special education teachers, and a control group of undergraduate students. The findings from this study demonstrated that CSE was an individual attribute that was amenable to change, with creativity training having a positive effect on CSE, when compared to a training course on statistics and mathematics (Mathisen & Bronnick, 2009). This link between CSE and creativity training highlights that CSE is an individual difference that can be fostered and changed in individuals, in order to enhance individuals' creative performance.

Gong *et al.* (2009) have also contributed to the research on CSE and individual creativity, by studying a sample of 277 insurance agents in a Taiwanese company. Findings from this study showed that CSE mediated the positive relationship between employee creativity and employee sales and supervisor-rated job performance; as well as between employee creativity and employee learning orientation and transformational leadership. CSE was found to be influenced by an individual's creativity-related knowledge and skills (Gong *et al.*, 2009). These findings attest to the relationship between CSE and creativity while once again highlighting the potential for creativity training and general skills training to improve an individual's CSE and in turn creativity (Mathisen & Bronnick, 2009).

Recently, Tierney and Farmer (2011) endeavoured to extend the literature on CSE by focussing on the positive effect high CSE has on individual creativity. Their study investigated the development of CSE and individual creative performance longitudinally (*i.e.* over a six month period) using employees from a state-sponsored provider of social services. Results revealed that individual creative performance levels increased over the six-month period, as employees' sense of CSE became stronger (Tierney & Farmer, 2011). Given the novel context and longitudinal nature of this research, these findings highlight the potential for a positive relationship between CSE and creativity to hold across a variety of contexts and over time.

Karwowski (2011) further corroborated the positive association between CSE and creativity by examining the CSE levels of a large sample of Polish school students. While focussing on uncovering the antecedents to CSE, this research found a strong relationship between CSE and creative ability. This relationship was moderated by socioeconomic status (SES), such that stronger associations between CSE and creative ability were found in high SES groups.

Given the relative infancy of the CSE construct, many researchers continue to use the broader self-efficacy construct, as opposed to CSE, in research. The current research aims to counter this trend by focussing specifically on CSE. As has already been highlighted, since the pioneering work of Tierney and Farmer (2002, 2004) only a few studies have assessed the association between CSE and creativity (Beghetto *et al.*, 2011; Gong *et al.*, 2009; Tierney & Farmer, 2011; Yang & Cheng, 2009), most of which have utilised student samples. Further exploration of the potential for CSE to influence individual creativity among non-student samples is therefore warranted. The present research will address this

limitation by using a sample consisting of Australian based IT workers (see Chapter Three). Despite the limitations of extant research on the relationship between CSE and creativity, support for a positive relationship between these two constructs is evident. The following is therefore hypothesised:

Hypothesis 2: *CSE will be positively related to individual creativity.*

The following section will summarise individual differences and how they relate to individual creativity before the literature on social networking is reviewed.

Summary of Individual Differences and Creativity

This section of the chapter has discussed individual differences as they relate to creativity with a specific focus on proactivity and CSE. Definitions of both of these constructs were provided, followed by discussions of how these two constructs have been conceptualised in the literature. Furthermore, extant literature on the relationships that both proactivity and CSE have with creativity was reviewed. Based on the findings of this existing research, hypotheses which predicted positive relationships between both proactivity and CSE with creativity were proposed.

The next section of this chapter will outline existing theory and research on social networking, including networking parameters (*i.e.* weak and outside ties) and roles (*i.e.* brokerage and centrality). The relationships that these variables have with creativity along with the relationships that individual differences have with these variables will be reviewed, highlighting the potential for networking parameters and roles to mediate the

relationship between individual differences (*i.e.* proactivity and CSE) and individual creativity.

2.4   Social Networking

In addition to the preceding individual difference perspective on creativity, the networking perspective on creativity will also be incorporated into the current research. This section of the chapter will therefore detail existing definitions and conceptualisations of the networking parameters and roles of interest in the present research. Specifically, the networking parameters of weak and outside ties along with the networking roles of brokerage and centrality will be detailed. The relationship that each of these variables potentially has with individual creativity will then be discussed. The relationships that proactivity and CSE have with each of the networking parameters and roles will also be reviewed to highlight the mediation potential of networking in the relationship between individual differences and creativity. Limitations of the relevant research will be discussed throughout.

Definitions and Conceptualisations of Social Networking

A network has been defined as a set of nodes and ties representing a relationship, or lack of relationship between the nodes, where a node is an actor (*i.e.* individual, work unit or organisation) (Balkundi & Harrison, 2006; Borgatti & Everett, 1997; Borgatti & Halgin, 2011; Brass, Galaskiewicz, Greve, & Tsai, 2004; Emirbayer & Goodwin, 1994). For the purpose of the present research, only individual actors will be considered (*i.e.* individual level relationships). From a practical perspective, networks depend on individuals interacting with people for different purposes (*e.g.* for friendship through friendship ties and for advice through advice ties) and to differing extents (*i.e.* regular interactions

represent strong ties and infrequent interactions represent weak ties) (Borgatti & Halgin, 2011; Granovetter, 1973; Zhou *et al.*, 2009). There are a variety of ways to assess the different types of interactions that an individual may have, of which Granovetter's (1973) tie strength approach (*i.e.* strong versus weak ties) is considered a sound characterisation of social relationships (Baer, 2010; Borgatti & Halgin, 2011; Perry-Smith, 2006; Zhou *et al.*, 2009).

Networks are fluid in nature, with their composition changing continuously as people move between various networks (Brass *et al.*, 2004). Informal networks (such as lunch groups or friendship networks) may be easier to move away from than formal ones (such as organisational departments or quality circles), making them more fluid and dynamic in nature, and as such more difficult to measure and monitor (Chan & Liebowitz, 2006; Emirbayer & Goodwin, 1994; Krackhardt, 1990). More fluid networks are also ever-emerging, where network characteristics continuously change and are never completely confirmed. The nature of networks and social network analysis is therefore highly complex.

Research has assessed individual (egocentric) and whole (bounded) networks (Borgatti & Halgin, 2011; Burt, 2004; Cross & Cummings, 2004). These network structures explain how an individual networks across social/structural divides and how network groupings interact across social/structural divides respectively. Moreover, egocentric networks are concerned with social interactions emanating from a focal individual whereas bounded networks are concerned with spatially bounded units including departments or divisions. These considerations are valuable for setting the scene in any network study. However, emphasis has been gradually moving away from a purely structural perspective on social

networking to considerations centred on networking parameters and roles that can be observed within egocentric and bounded networks (Burt, 2001, 2004; Shalley *et al.*, 2004).

Interest in social networking spans the social sciences, while being particularly popular in management research (Borgatti & Halgin, 2011). Management research has relied on social networking to understand job performance (Mehra *et al.*, 2001; Sparrowe, Liden, & Kraimer, 2001), team viability and performance (Balkundi & Harrison, 2006), organisational culture (Krackhardt & Kilduff, 2002), turnover (Kilduff & Krackhardt, 1994), unethical behaviour (Brass, Butterfield, & Skaggs, 1998), and innovation (Obstfeld, 2005). The current research will utilise the networking perspective on creativity, specifically exploring the relationships between networking parameters and roles with individual creativity.

Organisations are social systems by nature and design (Woodman *et al.*, 1993), thus organisational based studies should endeavour to account for the social side of various aspects of work. Recently, there has been growing interest in networking theory as a result of the increasing pace of business, which has necessitated high levels of cooperation amongst individuals and cohorts (Amabile, 1998; Burger & Buskens, 2009; Camarinha-Matos, Afsarmanesh, Galeano, & Molina, 2009; Perry-Smith, 2006). In turn social networking can be seen to influence individual creativity at work.

Social Networking and Creativity

Social networks have been deemed integral to creativity and innovation (Baer, 2012; Carayannis & Wang, 2008; Fischer, Giaccardi, Eden, Sugimoto, & Ye, 2005; Kratzer & Lettl, 2008; Perry-Smith, 2006; Staber, 2004; Zhou *et al.*, 2009). Research into the

networking perspective on creativity is thus gaining momentum (Baer, 2012; Shalley *et al.*, 2004; Zhou *et al.*, 2009). Zhou *et al.* (2009) emphasised that creativity involves the synthesis of different ideas and perspectives which cannot be completely accounted for by individual differences and cognitive processes and therefore requires the assessment of additional social processes. In terms of the present research, networks are of central importance, providing the basis upon which to unite and extend the creativity literature. As such, social network analysis will be used to explore the potential for networking parameters and roles to mediate the relationship between individual differences and creativity.

Specific hypotheses pertaining to the relationships between networking variables and creativity will not be proposed as they would be redundant given the joint effects nature of this study. Therefore, the upcoming sections exploring these relationships will highlight the positive relationships expected, which will in part corroborate the mediation hypotheses to be tested. Some of the limitations of existing networking research will be outlined next, before a review of the relevant literature on networking parameters and roles as well as the specific relationships that each networking variable has with creativity.

Overview of Limitations of Existing Social Networking Research

Given the growing importance of social networks in the management sphere, more comprehensive considerations of the networking phenomena are required. One reason for this is because studies on network parameters and roles tend to be conducted in isolation from one another with few studies having considered multiple parameter and role variables concurrently. Furthermore, the majority of social networking research has been heavily

grounded in Granovetter's (1973) strength of ties approach, excluding other viable alternative approaches.

While networking scholars continue to focus predominantly on system level networking, organisational behaviour theorists (Perry-Smith, 2006; Perry-Smith & Shalley, 2003; Reagans & McEvily, 2008) have been endeavouring to explain the implications of individual networking patterns and practices. Reagans and McEvily (2008) argue social networking at the individual level plays an integral role in knowledge sharing, and allows for the maintenance of competitive advantage. Given the limited nature of individual level networking studies, inconsistencies in findings exist which stand to also potentially compromise the validity of team and system level networking studies. Therefore, further individual level networking analysis is required.

Most of the extant social networking research has also been limited because of a focus on contextual characteristics that are associated with the organisation or workplace setting, whilst ignoring the conditions outside of an employee's department or organisational boundaries (*i.e.* ignoring more complex network structures) (Shalley *et al.*, 2004). More complex network structures may consist of ties inside as well as outside of the organisation. This lack of examination of complex network structures limits our understanding of individual employee influences and responses in the workplace. In order to overcome this limitation the present research will consider a combination of inside and outside ties.

In focusing on network structures researchers have somewhat neglected important features associated with the ties or relationships within networks (Adler & Kwon, 2002; Cross &

Cummings, 2004). More specifically, research on networking parameters has tended to ignored the importance of individual networking roles for creativity (Cross & Cummings, 2004). Network structures alone have not proven to be sufficient in terms of capturing the effects that different ties have on information acquisition and performance at work, so different types of ties need to be considered (Cross & Cummings, 2004). Therefore, networking parameters and roles should be studied together, which will be the case in this research. The following section will review in detail existing research on the two networking parameters which will be the focus of this research, weak and outside ties, as well as the relationship between creativity and these constructs.

Definitions and Conceptualisations of Networking Parameters

Different configurations of networks constitute network parameters. Parameters of interest in the present research are weak ties (*i.e.* from the strength of ties theory), as pioneered by Granovetter (1973); and, the number of outside ties (*i.e.* ties to people and entities outside of the immediate workplace) as popularised by Perry-Smith and Shalley (2003). It is important to note that weak ties are inherently linked to diverse ties, which were explored by Polzer, Milton, and Swann (2002). That is, weak ties tend to be associated with diverse sources of information (*i.e.* diverse contacts/ties) whereas strong ties tend to be associated with homogenous ideas (*i.e.* not diverse contacts/ties) (Perry-Smith, 2006).

Network parameters have been attributed with facilitating access to information about business opportunities (Shipilov & Li, 2008), and collaboration (Camarinha-Matos *et al.*, 2009), with findings pointing to the potential for social networking parameters to influence individual creativity. Therefore, the effect of network parameters on individual creativity is a key focus of the present research and will be discussed next.

Networking Parameters in Relation to Creativity

Several studies have attested to the inherently social nature of creativity (Adler & Kwon, 2002; Carayannis & Wang, 2008; Fischer, 2000; Fischer *et al.*, 2005; McElroy, Jorna, & van Engelen, 2006; Perry-Smith & Shalley, 2003; Watson, 2007). There have also been empirical studies which have explicitly investigated the effects of networking on creativity (Baer, 2010; Bain, Mann, & Pirola-Merlo, 2001; Burt, 2001, 2004; Perry-Smith, 2006), with these studies constituting the network perspective on creativity. To date, this research has predominantly focused on the effect of tie strength (*i.e.* weak versus strong ties) on creativity, with particular emphasis on the effects of weak ties (Baer, 2010; Granovetter, 1973; Madjar *et al.*, 2002; Zhou *et al.*, 2009). The present research will delve deeper into explaining the potential for social networking parameters to affect individual creativity by considering not only weak ties (inside the studied organisation), but also outside ties.

Scholars have begun to identify the social network parameters that shape individual creativity at work (Burt, 2004; Fleming *et al.*, 2007; Rodan & Galunic, 2004; Uzzi & Spiro, 2005). More specifically, network scholars have identified an array of informal workplace networks (such as friendship and advice networks) but have yet to clarify the relationship that each of these network types have with creativity (Klein *et al.*, 2004; Perry-Smith & Shalley, 2003). This means that the social side of creativity remains unclear, with research yet to uncover whether individuals seek out or maintain specific types of ties and how this in turn affects their creativity.

Literature on team diversity and diversity networks offers important insights into the social network perspective on creativity. There has been extensive debate in the literature in relation to the benefits of diverse versus homogenous teams and networks. For example,

findings indicate that diversity improves the creative performance of teams characterised by high interpersonal congruence (*i.e.* the degree to which people see others as others see themselves), but diminishes the creative performance of teams that are characterised by low interpersonal congruence (Polzer *et al.*, 2002). Furthermore, exchanges among team members who are deeply similar have been found to foster incremental creative potential, while exchanges among team members who are deeply dissimilar have been found to foster radical creative potential (Kratzer & Lettl, 2008; Polzer *et al.*, 2002).

Individuals who are therefore involved in networks comprised of deeply similar others are not likely to be as creative as those who are members of diverse networks (Burt, 2000, 2004; Fleming *et al.*, 2007). Attraction trends, however, are such that individuals are most likely to interact with those who are least likely to facilitate creativity (*i.e.* with similar others) thus precluding the exchange of information among deep-level diverse network members to optimally increase creativity (Ziebro & Northcraft, 2009).

Attraction trends can in part be explained by the literature on 'homophily'. The nature of homophily, involves the tendency to link with individuals that confirm rather than test our core beliefs; which can be more broadly identified as a love of the same (McPherson, Smith-Lovin, & Cook, 2001; Retica, 2006; Ruef, Aldrich, & Carter, 2003). This preference for interacting with similar others has been demonstrated with respect to a variety of demographic differences, including age, gender, race, education, and occupation (McPherson *et al.*, 2001). Thus, while diverse interactions may be beneficial to creativity they contravene humans' homophilic nature. Despite this evident tension, there is a growing body of research which has investigated the specific social networking parameters

that can heighten individual creativity. Granovetter's (1973) thesis on the strength of ties (*i.e.* strong versus weak ties) revolutionised the field and will be discussed next.

Strength of Ties (Weak vs. Strong Ties) and Creativity

As previously highlighted the majority of research to date which has utilised the network perspective on creativity has focused on the benefit of weak versus strong ties on creative outcomes. According to Granovetter (1973), weak ties (those involving comparatively lower levels of closeness and interaction such as acquaintances) are most beneficial to creativity because they expose individuals to different types of ideas and ways of thinking. Support for the positive relationship between weak ties and creativity is based on the understanding that individuals who rely primarily on their strong ties (*i.e.* talk to the same people on a regular basis) expose themselves to homogenous ideas, while those who access weak ties (*i.e.* talk to less familiar people) are likely to glean new perspectives and ideas (Burt, 2004, 2007; Fleming *et al.*, 2005; Kratzer & Lettl, 2008; Perry-Smith, 2014; Perry-Smith & Shalley, 2003; Vedres & Stark, 2008), and in turn be more creative.

Madjar *et al.* (2002) contradicted Granovetter's (1973) theory by suggesting that strong ties (those involving more frequent and close interactions) provide personal support that enhances creativity. Recent research however tends to corroborate Granovetter's (1973) original thesis and has found evidence in support of the benefits of weak ties because they allow for diversified interactions which in turn lead to the diverse thoughts and actions which underlie creativity (Baer, 2010; Perry-Smith, 2006; Perry-Smith & Shalley, 2003; West, 2002). Indeed, research suggests that weak ties are generally better than strong ties in terms of enhancing creativity and that more weak ties are generally better than fewer, so

long as individuals do not retain so many weak ties that it becomes a constraint (Baer, 2010; Perry-Smith & Shalley, 2003; Uzzi & Spiro, 2005).

Perry-Smith and Shalley (2003) have considered the strength of ties hypothesis at the individual level, deducing that weaker ties may be more beneficial for individual creativity than stronger ties, because novel and non-redundant information from diverse social circles (or heterogenous social circles) is more likely to be communicated through weak ties (as opposed to strong ties). Perry-Smith (2006, p. 87) has offered further clarification by explaining that the "heterogeneity and nonredundancy expected of weak ties are two intervening variables that help explain why weak ties are associated with enhanced creativity." Unlike the purely theoretical work by Perry-Smith and Shalley (2003), Perry-Smith's (2006) later work was empirical. In order to determine each participant's set of contacts Perry-Smith (2006) employed a combination of web-based surveys, third-party ratings and archival records. Findings demonstrated that weaker ties were more influential on individual creativity whereas stronger ties tended to have a neutral impact on creativity (Perry-Smith, 2006).

In a relatively recent study, Baer (2010) explored the joint effects of network strength, size and diversity on individual creativity. This study utilised a sample of 238 employees and 98 supervisors from multiple divisions (*i.e.* Accounting, Finance, and R&D) of a large global agricultural firm. Information on individuals' idea networks (*i.e.* networks that provide access to novel insights and that are imperative in delivering informational resources) and personalities was attained via self-report surveys and information on creativity was obtained via supervisor reports. Baer (2010) found that individuals were most creative when their idea networks were of an optimal size, their ties were weak in

strength and highly diverse. This finding corroborates the strength of ties argument that weak ties are better than strong ties for individual creativity while highlighting that network size and diversity are potentially also important. There is a growing consensus therefore that weak ties, as opposed to strong ties, are most beneficial to individual creativity (Baer, 2010; Granovetter, 1973; Perry-Smith, 2006; Perry-Smith & Shalley, 2003; Staber, 2004). As such, this study will examine the impact of weak ties on individual creativity.

It needs to be acknowledged that the strength of ties literature has been largely limited to system and team level considerations with the individual level remaining relatively neglected. The present study will thus address this limitation by focusing on the individual level of social network analysis. Furthermore, as previously highlighted extant studies on network parameters have predominantly focused on inside ties, neglecting the potential effect of network ties extending to people/entities outside of the organisation. The present research will explore the impact of inside ties as well as outside ties on individual creativity. Despite these limitations, extant research overwhelmingly supports a positive relationship between weak ties and individual creativity (Baer, 2010; Perry-Smith, 2014; Perry-Smith & Shalley, 2003; Uzzi & Spiro, 2005). Next, the relevant research on the relationship between outside ties and creativity will be reviewed.

Outside Ties and Creativity

Ties that individuals have to others outside of their organisations need to also be considered when examining the effects of social networking on creativity. Perry-Smith and Shalley (2003) acknowledged the potential for connections developed by individuals beyond the borders of their organisation to significantly influence individual creativity.

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Existing research demonstrates that individuals, who maintain advice-type ties outside of their organisation, tend to exhibit enhanced performance (Cross & Cummings, 2004). Of particular interest is the potential for outside ties to increase the non-redundant and fresh information within work-related collaborations, which in turn may bolster individual creativity.

This notion of ties existing beyond the boundary of an organisation implicates the idea of a network range. Research indicates that individuals who rely on networks that range from inside to outside of the organisation are likely to be better performers at work (Cross & Cummings, 2004; Madjar *et al.*, 2002; Reagans & McEvily, 2003). Wong (2008) has found that the maintenance of a greater external network range is associated with less knowledge overlap. More specifically, less knowledge overlap leads to more creativity through the exchange of more non-redundant information.

Non-redundancy relates to tie diversity, which as with weak ties implicates the diversity literature. Diverse ties provide the novel and non-redundant information necessary for improved creativity (Burt, 2000, 2004; Fleming *et al.*, 2007), as such, diverse outside ties can prove to be particularly beneficial. The potential for outside ties to be more diverse than inside/organisational ties needs to be acknowledged, as networks beyond organisational borders are more likely to span different social spheres and thus provide individuals with broad reaching and useful information (Daly & Finnigan, 2011; Staber, 2004; Zhou *et al.*, 2009). How attraction trends or homophily affect individual networking efforts outside of organisations is unclear, but can potentially compromise the diversity of outside ties (McPherson *et al.*, 2001; Ziebro & Northcraft, 2009). Nevertheless, outside ties are likely to be diverse and in turn improve individual creativity.

In a relatively recent study Zhou *et al.*(2009) acknowledged that outside ties are likely to be a valuable source of divergent information which can greatly benefit individual creativity. While their study did not actually measure outside ties, Zhou et al. (2009) claimed that such ties would provide another valuable source of divergent information, other than weak and diverse ties inside the organisation, upon which individual creativity is dependent.

Staber (2004) specifically examined external networking and innovation in the case of project organisations. Managers from 17 German based internet consulting firms were interviewed and surveyed, with 92 questionnaires submitted for analysis. This study found that in project-based organisations, external social networks were important not only as sources and channels of task-related information but also as sources of social identity and continuity (Staber, 2004). As such, external ties were found to be particularly important for enhancing the creative potential of individual workers. Furthermore, it was shown that project-workers operated in two, not necessarily connected worlds, where an external network of relations allowed them to generate new knowledge and an internal organisational community allowed them to convert new knowledge into creative behaviour (Staber, 2004).

Baer (2010) recently reinforced the importance of accounting for both inside and outside ties in relation to creativity. Baer argued that individuals are likely to discuss work-related matters not only with others inside the organisation (like colleagues and supervisors), but also with relevant individuals outside of the organisation (such as customers, suppliers, competitors, family members *etc.*). These discussions may result in individuals receiving intended or unintended new information or insights in relation to work-related matters, in

turn enhancing their creativity. In his study Baer (2010) emphasised the importance of the diversity of individual ties in relation to creativity, claiming that a combination of inside and outside ties would be optimal for the enhancement of individual creativity. While this study accounted for outside ties, this was done by considering outside ties as a component of tie diversity. As such, the number and type of outside ties (*i.e.* ties to family, suppliers, customers, competitors *etc.*) was considered in combination with whether they are affiliated to insiders in the organisation. While the findings of this study convincingly showed tie diversity (which incorporated outside ties) positively influenced individual creativity (Baer, 2010), more explicit investigations into the potential for outside ties to affect creativity need to be undertaken. Thus, research which focuses explicitly on outside ties as they relate to individual creativity, without anchoring assessments of individual creative outcomes on constructs such as tie diversity which incorporate many parameters (including outside ties) is needed.

It needs to be acknowledged that research on the networking perspective on creativity has largely revolved around considerations of the strength-of-ties or weak ties alone. Furthermore, research on weak ties greatly outnumbers that on outside ties. The current research seeks to redress this imbalance by assessing weak ties together with outside ties (as well as networking roles). Despite these limitations, outside ties have been found to be positively related to individual creativity (Baer, 2010; Staber, 2004). In line with the aim to produce a comprehensive study of creativity, networking parameters (of weak and outside ties) will be assessed along with networking roles, which will be discussed next.

Definitions and Conceptualisations of Networking Roles

In order to further advance the networking perspective on creativity, the networking parameters previously discussed will be assessed in combination with networking roles. Networking roles represent the types of positions that individuals can occupy within and across networks (Borgatti *et al.*, 2009). Specifically, the brokerage and centrality roles that can be occupied within networks will be considered in this research. Individuals who occupy brokerage roles in social networks tend to connect people who are themselves unconnected (Burt, 2001, 2004; Fleming *et al.*, 2005, 2007; Obstfeld, 2005; Oh & Kilduff, 2008), while individuals are deemed to be central in social networks when they are tied to many others in their network (Ahuja *et al.*, 2003; Borgatti, 2005; Borgatti & Everett, 1997; Borgatti *et al.*, 2009; Chan & Liebowitz, 2006; Freeman, 1979; Klein *et al.*, 2004; Liu & Ipe, 2010; Perry-Smith, 2006; Scott & Judge, 2009).

In early research these roles were both deemed to represent a type of centrality, with Freeman (Freeman, 1979) identifying brokerage to represent 'betweenness centrality' and centrality to represent 'degree centrality'. Despite being ascribed these different names, the meanings of both brokerage and centrality roles have remained unchanged. Brokerage or betweenness centrality represents bridging links in network clusters, while centrality or degree centrality represents direct contacts between nodes embedded in network clusters (Freeman, 1979; Kratzer & Lettl, 2008). More precise definitions of brokerage and centrality relate to specific bounded or identified networks, where ties have been mapped across a set of actors/nodes. In such networks brokerage or betweenness centrality can be identified by the number of shortest paths that pass through a given actor, while centrality or degree centrality can be identified by the number of nodes directly connected to another network node (Freeman, 1979; Kratzer & Lettl, 2008). Moreover, the most central actor in

a network must also be the most active actor in that network, in the sense that this actor must have the largest number of direct ties to others in the identified network (Freeman, 1979).

The following figures illustrate ego networks (*i.e.* networks depicting the ties associated with a single node or actor), where the red circles represent the individuals of interest (*i.e.* either a central player or broker). Figure 2 depicts a broker who brings individuals and groups together. Figure 3 shows a central player who is tied to all the peripheral members in their network.
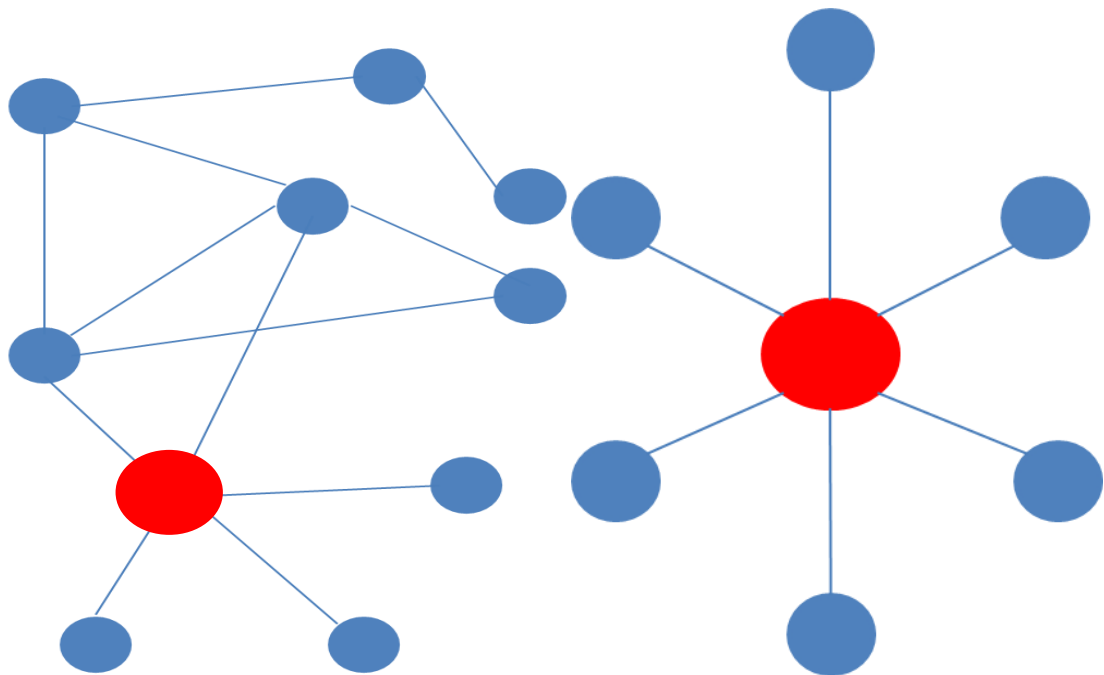
Figure 2: Brokerage role   *Figure 3:* Central role

Benefits to both brokerage and centrality have been identified in existing theoretical and empirical research, with the former enabling exposure to diverse ideas and the latter allowing individuals to be central in the flow of information (Burt, 2005; Kratzer & Lettl, 2008; Perry-Smith, 2006). It should be noted that these roles are not mutually exclusive,

and an individual can be both central in a network while also demonstrating brokerage behaviour within and across networks (Pryke, 2012). The specific relationships that these networking roles have with individual creativity will be explored next.

Networking Roles and Creativity

Research on the relationships between networking roles and individual creativity further constitute the networking perspective on creativity. Baer (2010) asserted that creative ideas result from a combination of different perspectives and approaches which individuals are exposed to via social interactions. These interactions not only implicate networking parameters, but also networking roles. The present research aims to specifically investigate the effects of brokerage and centrality roles on individual creativity.

Network positioning dictates access to, quality and diversity of, as well as the quantity of information individuals can gather (Burt, 2001, 2004; Cross & Cummings, 2004; Fleming *et al.*, 2005; Kratzer & Lettl, 2008). As such, the types of roles an individual assumes are likely to influence the quality of individual outputs, creative or otherwise. Cross and Cummings (2004) have recognised that there are important links between network positions/roles and individual performance. Similar links can therefore be expected between network positions and individual creativity. In a study that sampled U.S. utility patents, Fleming *et al.* (2005) also implicated network positions in their investigation of collaborative creativity, where they identified network positions/roles to be important for individual performance and creativity.

Burt (2000, 2001, 2004, 2005) has pioneered investigations into the relationship between networking roles and creativity. Collating anecdotal and aggregate data on managerial

activities and networks, Burt (2004) identified the importance of social convenience. This implies that managers/individuals have their most important work-related discussions with socially convenient colleagues, such as those closest to them in their networks. Such behaviour precludes brokerage and yet brokerage has been deemed integral for creative ideation (Burt, 2004). Convenient colleagues could however be those that are centrally located within a network, with centrality also been shown to benefit individual creativity (Burt, 2004). It seems logical that the roles that individuals assume and pursue in their networks will influence their creative output, however, this needs to be explicitly empirically tested. The existing literature on the relationship between brokerage and creativity will be reviewed next.

Brokerage and Creativity

Analysis of brokerage behaviour (Oh & Kilduff, 2008) may help to explain the relationship between networking and individual creativity. The individual level social networking literature largely provides support for a positive relationship between brokerage and creative outcomes (Burt, 2001, 2005; Fleming *et al.*, 2005, 2007). In his earlier work, Burt (2001) demonstrated that brokerage benefited individual work performance by examining the benefits of brokerage across structural holes. Structural holes are gaps in social structures (*i.e.* between different networks and groups). Burt (2004) later consolidated these earlier findings by demonstrating that brokerage across structural holes empowers individuals with non-redundant and novel information which leads to heightened idea generation. Idea generation is a key characteristic of individual creativity and so the brokerage of ties across groups can be expected to positively influence individual creativity. Subsequent research has specifically assessed the relationship between brokerage and creativity, with Burt (2005, p. 62) concluding that brokers are critical to

creativity, because individuals whose networks span structural holes have "early access to diverse, often contradictory, information and interpretations which gives them a competitive advantage in seeing good ideas."

A study that sampled U.S. utility patents via an archival data search, found significant evidence of a positive association between brokerage and creativity (Fleming *et al.*, 2005). By sampling utility patents, Fleming *et al.* (2005) were able to assess the impact of brokerage on the creativity of U.S. inventors, a cohort known to rely on creative thought and action. This study revealed the importance of brokerage to creativity within-person (*i.e.* to the individual actor) and across-person (*i.e.* to associated actors), indicating that all parties in brokered relationships benefit from the brokered associations. More specifically, individuals that networked as brokers were more likely to be creative than those who did not assume brokerage roles (Fleming *et al.*, 2005).

Other research has investigated the relationship between social networking, creativity and lead userness (*i.e.* innovative members of a user population at the leading edge of marketplace trends), amongst randomly sampled students from across seven schools in the Netherlands (Kratzer & Lettl, 2008). At the core of the social networking considerations of this study was the notion of brokerage (or betweenness centrality), which was assessed in terms of "the number of times that an actor needs a given actor to reach another actor or is reached by this actor" (Kratzer & Lettl, 2008, p. 30). Findings from this study showed individual creativity was stimulated by informational diversity, structural holes and the minimisation of communication barriers, all of which are associated with brokerage behaviour. Students who occupied brokerage positions in their networks also demonstrated

high levels of lead userness and more specifically creativity (Kratzer & Lettl, 2008). Therefore brokerage influenced the creativity levels of students in this study.

Individuals that occupy the role of a broker have also been found to play people off against each other for their own creative benefit (Fleming *et al.*, 2005; Obstfeld, 2005). For example, a broker who has developed a diverse range of ties can introduce and/or rely on collaborators in instances which serve to benefit their individual creativity and/or work agenda. Brokers therefore tend to assert the need for a greater range of ties (Burt, 2001, 2004; Fleming *et al.*, 2005, 2007). In brokered relationships competitive advantage comes from information access and control, where networks that span structural holes provide broad and timely access to, and control over information (Burt, 2001, 2004). Individuals in peripheral network positions, and with many connections outside of their primary networks (*i.e.* networks comprising immediate colleagues and common contacts), are exposed to more new ideas and perspectives that in turn positively influence their creativity (Kratzer & Lettl, 2008; Perry-Smith & Shalley, 2003).

Moreover, individuals that function on, or around, structural divides can be expected to broker extensive ties across social structures, in turn accessing extensive information and other resources which bolster their creative potential. Brokerage behaviour can therefore be expected to increase individual creativity (Burt, 2004; Kratzer & Lettl, 2008). Overall however, the literature on the relationship between brokerage and creativity remains limited because of the purely theoretical nature of most of the work in this area. The present research will address this limitation by empirically assessing the relationship between brokerage and individual creativity. Despite these limitations, brokerage has been found to positively affect individual creativity (Burt, 2004; Kratzer & Lettl, 2008). In line

with the comprehensive nature of this research, brokerage will be considered along with centrality to more fully understand the effects of networking roles on individual creativity. The relationship between centrality and creativity will be reviewed next.

Centrality and Creativity

Analysis of centrality can also help to explain the relationship between networking and creativity (Klein *et al.*, 2004). The individual level social networking literature largely provides support for a positive relationship between centrality and creative outcomes (Ibarra & Andrews, 1993; Kratzer & Lettl, 2008; Sparrowe *et al.*, 2001). For example, Perry-Smith (2006) empirically tested the effect of centrality on individual creativity at work and found a significant positive relationship. This relationship was however dependent on the number of ties an individual had outside of the organisational network, such that when the number of outside ties was high, centrality had little effect on creativity (Perry-Smith, 2006). Assessing a virtual work group that spanned 27 different locations, Ahuja *et al.* (2003) found centrality was significantly related to individual performance, more so than various other individual role characteristics. Centrality might therefore be similarly expected to positively affect individual creativity, since creative performance has been found to underlie overall performance and workplace success (Chong & Ma, 2010; Runco, 2004; Shalley *et al.*, 2004).

Individuals who are central to their work groups' advice networks tend to exhibit higher levels of in-role and extra-role performance than individuals who are not central in such networks (Ibarra & Andrews, 1993; Sparrowe *et al.*, 2001). Advice network centrality has also been found to regulate access to information and resources amongst individuals at work, which in turn influences individual creativity and performance (Ibarra & Andrews,

1993). Furthermore, Ibarra and Andrews (1993) conducted a series of interviews designed to elicit employees' views with regard to factors influencing individual creativity at an advertising firm and found five dimensions emerging as significant, including information access. This dimension implicates centrality, as central players can access greater flows of information in a network in turn positively influencing creativity. A similar pattern of findings has emerged in research on broader network centrality (*i.e.* not specifically limited to advice network centrality) in relation to creativity.

As discussed previously, research by Kratzer and Lettl, (2008) has assessed the link between network centrality, creativity and lead userness. This study assessed centrality (or degree centrality) as "the number of units directly connected to the unit under scrutiny" (Kratzer & Lettl, 2008, p. 30). Although the main findings in this research pertained to the relationship between brokerage (*i.e.* betweenness centrality) and creativity, a significant positive correlation between centrality and creativity was also found. Individuals who were more central in the identified network were more likely to be lead users as well as more creative (Kratzer & Lettl, 2008).

Perry-Smith and Shalley (2003) argued that people in central network positions not only have the benefit of centrality in the flow of information but also the propensity to feel more comfortable taking informed risks. Given the inherently risky nature of creative behaviour (George & Zhou, 2007; Nakamura, 2000; Perry-Smith, 2006; Yuan & Woodman, 2010; Zhou & George, 2003), being comfortable taking risks could be expected to enhance creativity. Therefore, with centrality allowing individuals both ample access to information and easier risk taking options, this networking role should serve to benefit individual creativity.

Like the literature on the relationship between brokerage and creativity, the literature on the relationship between centrality and creativity is also limited by the fact that theoretical considerations vastly outnumber empirical examinations. Despite these limitations, the literature supports a positive relationship between centrality and individual creativity (Ibarra & Andrews, 1993; Kratzer & Lettl, 2008). Adding to the limited nature of existing research is the fact that empirical examinations have yet to be conducted where different aspects of an individual's social network in relation to creativity are examined concurrently (Shalley *et al.*, 2004). The present research aims to address this limitation by assessing brokerage and centrality roles concurrently, along with the aforementioned network parameters (*i.e.* weak and outside ties). Research on the relationships between networking and creativity will be summarised next before reviewing the literature on the relationships between individual differences and networking.

Summary of Social Networking and Creativity

The social networking perspective on creativity clearly continues to grow in importance. However, our understanding of the potential effects of different networking parameters and roles on creativity remains limited. Extending research to incorporate inside as well as outside ties in organisational based studies is a necessary next step (Perry-Smith & Shalley, 2003; Zhou *et al.*, 2009). Shalley *et al*. (2004) also stressed the need for research to go beyond simply assessing the strength of ties and types of ties to also incorporate assessments of network positions or roles.

There remain many unanswered questions in terms of the relationships that brokerage and centrality roles have with creativity. Specifically, it is unclear whether creativity is more likely to benefit from brokerage or centrality (Shalley *et al.*, 2004). The present research

aims to answer such important questions by examining the effects of both of these networking roles on individual creativity, something existing research has failed to do. Furthermore, the assessment of multiple networking parameters (*i.e.* weak and outside ties) and roles (*i.e.* brokerage and centrality) will answer calls put forward by previous researchers for comprehensive and concurrent considerations of networking phenomena as they relate to creativity (Perry-Smith, 2006; Shalley *et al.*, 2004).

Given the expected relationships between social networking and individual creativity, the relationships that individual differences have with these networking variables need to also be explored in order to establish the potential for aspects of an individual's social network to mediate the relationship between individual differences and creativity. The following section of this chapter will therefore review the literature on the relationship between the previously discussed individual differences (*i.e.* proactivity and CSE) and networking.

Individual Differences and Networking

Given the important role both individual differences and social networking play in influencing creativity, it seems germane to examine how these antecedents to creativity relate to one another. Furthermore, exploring these relationships establishes cause for examining networking variables as potential mediators in the relationship between individual differences and creativity.

Specific hypotheses pertaining to the relationships between individual differences and networking variables will not be proposed as they would be redundant given the joint effects nature of this study. Therefore, the upcoming sections exploring these relationships will highlight the positive relationships expected, which will in part (*i.e.* along with the

previously explained relationships between networking variables and creativity) corroborate the mediation hypotheses to be tested. This next section of the chapter begins by examining the relationships between proactivity and social networking before exploring the relationships between CSE and social networking.

Proactivity and Social Networking

Given the importance of proactivity and networking in modern workplaces, research has examined the proposition that proactivity may be related to increased social networking (Thomas *et al.*, 2010). This proposition is underpinned by the belief that proactive people may be particularly skilled at networking (Thomas *et al.*, 2010; Thompson, 2005). For example, proactive people may possess the drive and inclination necessary to assert themselves across groups and cohorts that span several social divides, and thus accumulate extensive ties. Thompson (2005, p. 1012) in fact found that "proactive people are likely to seek ways to construct a social environment conducive to their own success on the job".

Thomas *et al.* (2010) investigated proactivity at work in order to test four emergent proactivity constructs (*i.e.* proactive personality, personal initiative, voice and taking charge) in relation to organisational variables (*i.e.* job performance), personality variables (*i.e.* the Big Five Factors), and individual variables (*i.e.* work experience). The results from a meta-analysis of 103 independent samples revealed that proactivity was related to a number of variables, including social networking (Thomas *et al.*, 2010). However, this work only assessed social networking in terms of network building and development.

O'Donnell (2004) has affirmed the relationship between proactivity and networking and established that proactive networking requires planned and structured networking efforts.

O'Donnell (2004) studied proactive networking in an attempt to understand the nature of networking processes that owner-managers of small firms engaged in. Three semi-structured interviews were conducted with seven owner-managers from different small firms from various industries such as engineering, construction and distribution. Key insights yielded from this series of interviews were that most owner-managers proactively networked with customers, potential customers, suppliers and employees (O'Donnell, 2004). Their connections were diverse in nature and related to entities/nodes that were both internal and external to the firm. Based on these results, O'Donnell (2004) asserted that individuals need to be proactive (as opposed to reactive) in their networking in order to establish and maintain networks advantageous to their firms. Next, the specific relationship between proactivity and weak ties will be discussed.

Proactivity and Weak Ties

There is evidence to suggest that proactive behaviour is related to the strength and intensity of ties in an individual's network. Using a sample of 146 white-collar workers who had just completed job searches after being laid off (from across the US financial services sector), Lambert, Eby, and Reeves (2006) investigated predictors of network intensity. Proactivity was found to be positively related to networking intensity. Supplementary analysis showed that network intensity related to higher quality of information (sources, content, resources), but was negatively related to network diversity (Lambert *et al.*, 2006). Given that diverse ties can be considered weak ties (Perry-Smith, 2006), this finding can be extended to understand the potential relationship between proactivity and the strength of ties. Thus, individuals should proactively maintain a networking intensity which allows them to effectively develop an optimal number of weak/diverse (as opposed to

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strong/homogenous) ties. This will in turn ensure the accumulation of quality information, as opposed to redundant information.

Explicit examination of the relationship between proactivity and weak ties is clearly lacking and so the present research aims to address this limitation. Nevertheless, proactive people can be expected to go out of their way to accumulate weak ties to diverse others, as they typically take initiative and go out of their way to control their environments for the purpose of achieving work tasks (Bateman & Crant, 1993; Chan, 2006; Crant, 2000; Frese & Fay, 2001; Ohly & Fritz, 2010; Unsworth & Parker, 2003). The limited theory therefore supports the notion of a potentially positive relationship between proactivity and weak ties. The relationship between proactivity and outside ties will be explored next.

Proactivity and Outside Ties

In the previously discussed study by O'Donnell (2004), outside ties were also implicated because some network nodes, including suppliers and customers, were external to the firm and were imperative for firm survival and success. O'Donnell (2004) found that extensive networking with suppliers outside of the firm tended to be proactive (as opposed to reactive) and led to the development of ties which enabled a reliance on supplier market knowledge, expertise and brand name. Customer networks also existed beyond the borders of the organisation and constituted important outside ties (O'Donnell, 2004). This research highlighted the advantageous position of those owner-managers that managed extensive supplier and customer networks through proactive networking. Proactive networking with other outside ties such as competitors, Government agencies and friends were also identified by O'Donnell (2004) as being important for small firm success. The specific

relationship between proactivity and outside ties was however not explicitly tested due to the qualitative nature of the study.

Research on the relationship between proactivity and outside ties is clearly lacking with only O'Donnell (2004) identifying this relationship as an aside in his study. The present research therefore aims to explicitly examine the relationship between proactivity and outside ties as a key relationship. Despite the limitations of existing research, it is expected that proactive individuals will be more likely to network with nodes and actors outside of their organisation and thus acquire more extensive outside ties than non-proactive individuals. This can be explained further in terms of the propensity for proactive people to be more skilled at networking (than non-proactive people) and therefore be more capable of building connections beyond organisational borders (Thomas *et al.*, 2010; Thompson, 2005). Therefore this limited research offers support for a positive relationship between proactivity and outside ties. The relationship between proactivity and brokerage will be explored next.

Proactivity and Brokerage

O'Donnell's (2004) notion of proactive networking, as opposed to reactive networking, implicated brokerage. When individuals go out of their way to achieve a goal, they are being proactive and when they go out of their way to make connections that would otherwise be non-existent they are behaving as brokers. The small business owners who networked extensively with suppliers and/or customers in O'Donnell's (2004) study in order to improve their business performance, most likely relied on brokerage behaviour.

Thompson (2005) collected data from 126 alumni and their work supervisors in order to test the relationships between proactive personality, network building, initiative taking and job performance. Results indicated that proactive individuals were likely to reap performance benefits by means of developing extensive social networks that provided them with the resources and scope to pursue important initiatives (Thompson, 2005). Since brokers typically develop extensive ties (Burt, 2005; Fleming *et al.*, 2007), this finding can be used to argue that proactive people are more likely to act as brokers.

A relatively recent study found that proactive individuals tend to prepare themselves with resources in anticipation of effecting change (Gong, Cheung, Wang, & Huang, 2012). As part of this preparation individuals actively seek out sources of information, which may involve brokerage behaviour (*i.e.* making connections across networks). In this recent research, data from 375 employees of a chain store in Taiwan revealed that proactive employees engaged in more networking behaviour, by way of information exchange (Gong *et al.*, 2012). It is conceivable that the more widely information was exchanged the more likely a person was brokering relationships with diverse others for the purpose of information and resource accumulation. Although this research did not explicitly examine brokerage, it clearly alluded to it by examining the extensiveness of information exchange. Collectively, existing research findings indicate that it is logical to suggest that proactivity will be positively related to brokerage.

This review highlights the limited nature of research on the relationship between proactivity and brokerage. While this relationship has mainly been alluded to, implied and theorised; explicit/empirical or quantitative tests remain lacking. The present research therefore aims to address this limitation by explicitly examining the relationship between

proactivity and brokerage. Despite these limitations, extant research supports a positive relationship between proactivity and brokerage (Gong *et al.*, 2012; O'Donnell, 2004). The relationship between proactivity and centrality will be explored next.

Proactivity and Centrality

The previously discussed work by Gong *et al.* (2012) alludes to centrality as much as it does brokerage, in relation to proactivity, because proactive people tend to seek out key resources and as such, secure an optimal network position in anticipation of effecting change. A central network position is associated with increased access to the flow of information in a network and so can be considered an optimal one. Therefore, in line with Gong *et al.'s* (2012) finding, proactive people may seek out specific resources in an effort to secure a central position in a network. This gives rise to the potential for a positive association between proactivity and centrality. Nevertheless, despite alluding to centrality in terms of resource gathering and optimal network position, Gong *et al.'s* (2012) study did not explicitly examine the relationship between proactivity and centrality.

Mehra *et al.* (2001) have examined the social networks of high and low self-monitors, with proactivity being deemed a type of self-monitoring behaviour. This study drew on employees from a small, high-tech company involved in chemical analysis of complex compounds. Networking and personality data were obtained via questionnaires from 92 of the company's employees. Results indicated that high self-monitors tended to occupy positions of high centrality. This finding also demonstrates the potential for proactive behaviour, which is a type of self-monitoring behaviour, to be positively linked to centrality.

Research on the relationship between proactivity and centrality is more limited than that on proactivity and brokerage. Furthermore, explicit empirical or quantitative assessments of this relationship remain scant. The present research aims to address this limitation by explicitly examining the relationship between proactivity and centrality. Despite these limitations, extant research supports a positive relationship between proactivity and centrality (Gong *et al.*, 2012; Mehra *et al.*, 2001). The relationship that CSE has with each of the networking parameters and roles being examined will be outlined next.

CSE and Social Networking

CSE has evolved from within the creativity field and remains a relatively new construct that has yet to be adapted across research domains. Given the importance of understanding how CSE influences individual creativity, further research is needed to uncover other important constructs that CSE may relate to. The present research therefore aims to explore the effect that CSE has on social networking parameters and roles.

Tierney and Farmer (2011) recently acknowledged that employees' sense of capacity for creative work is malleable and can fluctuate with changes in social circumstances (*i.e.* changes in leaders'/supervisors' expectations in relation to creativity). Specifically, Tierney and Farmer (2011) found that members of the social context such as leaders, influenced employees' CSE views. There is thus the potential for CSE levels to change in relation to other variables associated with the social context.

Changes in CSE levels can be expected to have significant effects on individual networking patterns (*i.e.* networking parameters and roles). For example, an individual's CSE may decrease under certain social circumstances. Yang and Cheng (2009) have

shown that an individual's position in a network is a more significant predictor of CSE than the strength of their ties, which reinforces the importance of considering networking parameters as well as roles in relation to individual CSE. The following section discusses the relationship between CSE and the weak ties parameter.

CSE and Weak Ties

In the previously discussed study by Beghetto (2006), students who demonstrated high levels of CSE also engaged in more organised social activities. Additionally, it was found that while creatively efficacious students reported negative experiences in relation to their teachers, they indicated they had more frequent connections with potentially supportive social networks (*e.g.* organised groups, teams and clubs) than less creatively efficacious students (Beghetto, 2006). This research demonstrates that creatively efficacious students were more likely to network extensively, potentially involving the accumulation of a variety of weak ties. The findings of this study therefore point to the potential for CSE to positively influence weak ties.

Using a sample of systems analysts and programmers from a Taiwanese software firm Yang and Cheng (2009) examined CSE in relation to social networking. In their study, the effect of the strength of ties on CSE was found to be greater for systems analysts than programmers. Furthermore, in the wholistic model examining all 94 of the surveyed information systems (IS) developers, the strength of ties was found to positively influence individual CSE. This research explained that weak ties can carry the explicit knowledge that IS developers (programmers more than systems analysts) need, and that can effectively shape their creative beliefs.

Overall, research on the relationship between CSE and weak ties remains limited by a lack of explicit examination. The present research aims to address this limitation by explicitly examining the relationship between CSE and weak ties. Despite research limitations, CSE has been found to positively relate to weak ties (Beghetto, 2006). The relationship between CSE and the outside ties parameter will be explored next.

CSE and Outside Ties

Beghetto (2006) found that highly efficacious students socialised/networked with groups outside of their school (*i.e.* with social teams and clubs). Extrapolating from this it therefore seems plausible that individuals high on CSE will be more likely to network extensively outside of the organisation. Furthermore, Beghetto (2006) claimed that highly efficacious students are likely to go out of their way to develop and maintain network ties to supportive social networks. Such networks may extend beyond the borders of an individual's organisation, demonstrating the potentially positive link between CSE and outside ties.

Overall however, research on the relationship between CSE and outside ties is particularly scant. The present research aims to address this limitation by explicitly examining the relationship between CSE and outside ties. Despite research limitations, CSE can be expected to have a positive relationship with outside ties (Beghetto, 2006). The relationship between CSE and brokerage will be explored next.

CSE and Brokerage

Although research has yet to explicitly examine the relationship between CSE and brokerage, some research has endeavoured to explain the link between CSE and engaging

in socialising activities. For example, as highlighted previously Beghetto (2006) found students with high CSE levels were more engaged in organised social activities. It is therefore expected that individuals high on CSE are more likely to go out of their way to broker relationships with others across a variety of different social activities and networks.

The benefits that accrue for brokers are limited by network boundaries which are prone to change (Guler & Guillen, 2010). Perhaps being more creatively efficacious may enable individuals to minimise limitations and foster more benefits from brokerage. For example, brokerage benefits through accessing, relaying or withholding information may be limited when individuals are low on creative efficacy and do not pursue new relationships, while the opposite could be expected for creatively efficacious individuals who constantly strive for creative success. Furthermore, an individual with a high value for brokerage behaviour (or betweenness centrality) is likely to have a high level of control over the information flowing through to them (Pryke, 2012). Creatively efficacious people can therefore be expected to control the types of relationships they broker in order to control the type of information they have access to.

Research on the relationship between CSE and brokerage is very limited given that researchers have only alluded to either brokerage (Beghetto, 2006) or CSE (Guler & Guillen, 2010; Pryke, 2012) and have not explicitly examined this relationship. The present research will therefore address this limitation be explicitly examining the relationship between CSE and brokerage. Despite a lack of explicit examination of this relationship, the potential for CSE to positively relate to brokerage is clear. The relationship between CSE and centrality will be explored next.

CSE and Centrality

When an individual possesses high levels of CSE, they are more likely to secure many direct ties that are particularly relevant to their work. Furthermore, when an individual is high on CSE, they are more likely to be confident in their work and so are likely to align themselves with relevant others (Yang & Cheng, 2009), in turn making them central in the flow of relevant information.

CSE levels can influence the extent to which individuals network, as well as the specific type of networking that individuals engage in (*e.g.* extensive networking and assuming a central position in networks versus maintaining homogenous ties and ineffectual periphery positions). The more creatively efficacious an individual is, the more likely they are to surround themselves with meaningful connections and so secure a central position in a network (Vardaman, Amis, Dyson, Wright, & Randolph, 2012). CSE can therefore be expected to have a positive relationship with centrality. A recent study has shown centrality to be positively linked to change related self-efficacy (as opposed to CSE) amongst a sample of US public school teachers (Vardaman *et al.*, 2012). This directly points to the potential positive link between CSE and centrality.

Given the relative infancy of the CSE construct and the over-reliance on brokerage in isolation from centrality by social networking researchers, the relationship between CSE and centrality has been particularly neglected in the literature. The present research therefore aims to confirm and clarify the relationship between CSE and centrality. Despite research limitations, support has been offered for the positive relationship between CSE and centrality (Vardaman *et al.*, 2012; Yang & Cheng, 2009). The relationship between

individual differences and networking will be summarised next before the proposed mediating effects are detailed.

Summary of Individual Differences and Networking

In reviewing extant research on the relationships between individual differences (*i.e.* proactivity and creative self-efficacy) and networking parameters (*i.e.* weak and outside ties) and roles (*i.e.* brokerage and centrality) it becomes apparent that research is somewhat scant. Most of the existing research has neglected to explicitly or empirically assess these relationships of interest. The need for research to investigate the relationships between specific individual differences (*i.e.* proactivity and creative self-efficacy) and networking parameters (*i.e.* weak and outside ties) and roles (*i.e.* brokerage and centrality) is thus evident.

Overall despite the limited nature of the existing research, proactivity is expected to be positively related to social networking parameters and roles. Given that proactive people go out of their way to achieve goals (Bateman & Crant, 1993; Crant, 2000; Ohly & Fritz, 2010), it is expected they will go out of their way to network for the specific purpose of goal attainment.

Despite the particularly limited nature of the research examining the relationships between CSE and networking, CSE is expected to be positively related to both the networking parameters and roles under examination. Given that creatively efficacious people tend to be socially skilled inside their organisations (Beghetto, 2006; Yang & Cheng, 2009), it is also expected that they will rely on weak and outside ties, while maintaining brokerage and

central network positions. The potential for networking to mediate the relationships between individual differences and creativity will be explored next.

2.5 Networking Mediators of the Relationship between Individual Differences and Creativity

The present research integrates the individual difference and networking perspectives on creativity. This is done in recognition of the fact that social networking scholars have seldom studied how individual characteristics/differences may influence social structures and how social structures may subsequently affect individual creativity (Mehra *et al.*, 2001; Zhou *et al.*, 2009). This research will thus adopt a more comprehensive approach to understanding individual creativity.

Given the relationships between individual differences and creativity, networking and creativity, as well as between individual differences and networking; the potential for social networking to mediate the relationship between individual differences and creativity needs to be explored. Specifically, the relationships between proactivity, networking (*i.e.* weak ties, outside ties, brokerage and centrality) and creativity, as well as those between CSE, networking (*i.e.* weak ties, outside ties, brokerage and centrality) and creativity will be explored. First, the mediating potential of networking in the relationship between proactivity and creativity will be discussed.

Proactivity, Networking and Creativity

Given the previously discussed relationships between proactivity and creativity (Kaufmann, 2003; Kim *et al.*, 2009; Seibert *et al.*, 2001; Unsworth, 2001; Unsworth & Parker, 2003; Zampetakis, 2008), proactivity and networking (O'Donnell, 2004; Thomas *et*

al., 2010; Thompson, 2005) and between networking and creativity (Baer, 2010; Burt, 2004, 2005, 2007; Perry-Smith, 2006), it is also necessary to discuss the potential for networking to mediate the relationship between proactivity and creativity. Despite the established nature of the relationship between proactivity and creativity, researchers have neglected to examine the mechanisms through which this relationship has its effect. By examining the potential mediating role of different elements of an individual's social network in the relationship between proactivity and creativity, the present research will make an important contribution to the field.

Gong *et al.* (2012) conducted three waves of surveys across a chain of speciality retail stores in Taiwan to investigate the relationships between proactivity processes, information exchange (*i.e.* networking) and individual creativity. Information exchange was operationalised in terms of how individuals across the sample exchanged different information including ideas. Store managers rated employee creativity while employees reported on their proactivity (along with other variables such as openness to experience). A total of 201 matched responses were obtained with results showing that proactive employees engaged in more information exchange (*i.e.* networking), which in turn led to them building trusting relationships, and was associated with enhanced individual creativity (Gong *et al.*, 2012). The findings of this study clearly show that proactive individuals engage extensively in information gathering in order to gain access to resources and information and this in turn bolsters individual creativity. However, given the network considerations in Gong *et al.'s* (2012) study were restricted to assessments of information exchange, the specific networking parameters and roles that influence the relationship between individual proactivity and creativity remain unclear.

As previously highlighted, proactivity has a relatively well documented positive effect on creativity (Kaufmann, 2003; Kim *et al.*, 2009; Seibert *et al.*, 2001; Unsworth, 2001; Unsworth & Parker, 2003; Zampetakis, 2008) and proactive people are also known to network extensively (Lambert *et al.*, 2006; O'Donnell, 2004; Thomas *et al.*, 2010; Thompson, 2005) both inside and outside of the organisation. Through their extensive networking, proactive people are likely to develop a large number of weak and outside ties (O'Donnell, 2004; Thomas *et al.*, 2010; Thompson, 2005) as well as secure either brokerage and/or central roles in networks (Gong *et al.*, 2012; Mehra *et al.*, 2001). Furthermore, each of these aforementioned network parameters and roles are known to have a positive relationship with creativity (Baer, 2010; Bain *et al.*, 2001; Burt, 2001, 2004; Granovetter, 1973; Perry-Smith, 2006). These existing relationships point to the potential for social networking (*i.e.* weak ties, outside ties, brokerage and centrality) to mediate the relationship between proactivity and creativity.

Specifically, this research proposes that proactive individuals (as compared to non-proactive individuals) are likely to engage in extensive networking with diverse others (*i.e.* develop weak ties) which in turn will strengthen their creativity. Proactive people are also predicted to extensively network outside of their organisations exposing them to more original information, in turn enhancing their creativity. Proactive people are also likely to broker many ties between otherwise unconnected nodes in order to increase their sources of information, in turn enhancing their creativity. Finally, proactive people are also more likely to secure central positions in knowledge networks enhancing their creativity. The following four hypotheses have been developed to test these relationships:

***Hypothesis 3:** Weak ties will mediate the positive relationship between proactivity and creativity.*

***Hypothesis 4:** Number of outside ties will mediate the positive relationship between proactivity and creativity.*

***Hypothesis 5:** The brokerage role will mediate the positive relationship between proactivity and creativity.*

***Hypothesis 6:** Network centrality will mediate the positive relationship between proactivity and creativity.*

Testing these hypotheses will provide important insights into the relationship between proactivity and creativity by uncovering the networking mechanisms through which this relationship takes place. Next, the mediating potential of networking on the relationship between CSE and creativity will be explored, with hypotheses in relation to these proposed relationships presented.

CSE, Networking and Creativity

Given the established relationships between CSE and creativity (Beghetto, 2006; Beghetto *et al.*, 2011; Choi, 2004; Gong *et al.*, 2009; Mathisen & Bronnick, 2009; Tierney & Farmer, 2002, 2004, 2011), CSE and networking (Beghetto, 2006; Choi, 2004; Yang & Cheng, 2009) and between networking and creativity (Baer, 2010; Burt, 2004, 2005, 2007; Perry-Smith, 2006), it is logical to explore the potential for networking to mediate the relationship between CSE and creativity. Despite the established nature of the relationship between CSE and creativity, researchers have neglected to examine the mechanisms through which this relationship has its effect. Therefore, examining networking variables

as potential mediators in the relationship between CSE and creativity will represent an important contribution of the current research.

CSE was examined in Choi's (2004) study on the individual and contextual conditions that promote creative performance. This study demonstrated that CSE fully mediated the effect of individual factors (such as ability and personality) and contextual factors (*i.e.* social influences from leaders and peers, in other words social networking at work), on the creative performance of individuals. This finding highlights that CSE plays an important role in explaining how and why specific individual and contextual variables are related to creative performance. Moreover, the findings from Choi's (2004) study clearly illustrate the potential for CSE to relate to both social networking and creativity. However, this study neglected to explicitly examine the potential for networking to mediate the relationship between CSE and creativity, which will form a major focus of the present research.

Indeed, empirical research is still needed to examine whether someone who is high on CSE is also more social and whether this in turn influences their levels of individual creativity. It has however been found that individuals who are highly efficacious in terms of creativity are also likely to develop a large number of weak and outside ties (Beghetto, 2006) as well as secure either brokerage and/or central roles in networks (Yang & Cheng, 2009). Furthermore, each of these aforementioned network parameters (*i.e.* weak and outside ties) and roles (*i.e.* brokerage and centrality) are known to have a positive relationship with creativity (Baer, 2010; Bain *et al.*, 2001; Burt, 2001, 2004; Granovetter, 1973; Perry-Smith, 2006). These existing relationships point to the potential for social networking to mediate the relationship between CSE and creativity.

Specifically, it is proposed that creatively efficacious people will engage in extensive networking with diverse others (*i.e.* develop weak ties) which in turn will increase their creativity. It is also proposed that creatively efficacious people will network extensively outside of their organisation providing them with more original information aiding their creativity. Creatively efficacious people will also broker many ties between otherwise unconnected nodes increasing their sources of information and in turn their creativity. Finally it is predicted that creatively efficacious people will secure central positions in knowledge networks enhancing their creativity. The following four hypotheses have been designed to test these proposed relationships:

> ***Hypothesis 7:*** *Weak ties will mediate the positive relationship between CSE and creativity.*
>
> ***Hypothesis 8:*** *Number of outside ties will mediate the positive relationship between CSE and creativity.*
>
> ***Hypothesis 9:*** *The brokerage role will mediate the positive relationship between CSE and creativity.*
>
> ***Hypothesis 10:*** *Network centrality will mediate the positive relationship between CSE and creativity.*

Testing these hypotheses will provide important insights into the relationship between CSE and creativity by uncovering the mechanisms through which CSE has its effect on creativity. The mediation effects to be tested will be summarised next.

Summary of Proposed Mediated Relationships

This section explored the potential for networking variables to mediate the relationships between individual differences and creativity. Specifically, weak and outside ties along with brokerage and centrality roles were proposed to mediate the relationship between individual differences (*i.e.* proactivity and CSE) and individual creativity. These propositions mirrored existing research which has shown more proactive and creatively efficacious individuals tend to go out of their way to secure optimal types of ties (*i.e.* weak and outside ties) and roles (*i.e.* brokerage and centrality) and in turn demonstrate greater individual creativity. The specific hypotheses in relation to the proposed relationships were presented. Key aspects of the current study will be reviewed next.

2.6 The Current Study

This literature review has covered the wide expanse of literature on individual creativity, including both the individual difference and networking perspectives on creativity. While the literature on each of these perspectives is vast, studies need to now integrate these perspectives in order to provide for a more comprehensive understanding of individual creativity (Shalley *et al.*, 2004). The present study is therefore motivated by these and other identified gaps in the literature and will hence examine the effects of individual differences and social networking on creativity concurrently. Furthermore, assessing multiple individual difference and networking antecedents to creativity concurrently, will allow for many important questions about individual creativity to be answered (Miller & Osborn, 2008; Rietzschel *et al.*, 2009; Shalley *et al.*, 2004).

The hypotheses postulated throughout this chapter are aimed at addressing the limitations of existing creativity research, which will enable the fulfilment of the current study aim, to

clarify the individual creativity construct and the relationship between individual differences and creativity. To this end, the relationship between individual differences and networking is recognised in this study in order to highlight the potential for networking to mediate the relationship between individual differences and creativity. Accounting for this potential mediation will thus enhance our understanding of the intricacies of individual creativity. The rationale for the proposed integrative framework will be provided next.

Integrative Framework

As has been detailed, the present research is designed to explore the relationships between individual differences, networking and subsequent creative outcomes, thereby integrating the individual difference and networking perspectives on creativity and also the creativity and networking fields. Despite scholars actively endorsing the need for such integrative approaches in the creativity field (Anderson *et al.*, 2004; McAdam & McClelland, 2002; Mumford, 2003; Shalley *et al.*, 2004; Sternberg & Lubart, 1996; West, 2002), most existing research has neglected to employ them. In fact, scholars have seldom studied how individual characteristics/differences along with social structures affect individual creativity (Mehra *et al.*, 2001; Zhou *et al.*, 2009). Therefore the present research addresses this existing void in the field, in order to provide an in-depth perspective on creativity.

While the individual difference and networking perspectives on creativity continue to attract academic attention, contemporary findings continue to point to the importance of integrating these perspectives (Agars *et al.*, 2008; Shalley *et al.*, 2004). Social networking techniques accurately describe individual communication patterns as well as highlighting the presence of different sub-groups. The integrative approach used in this study recognises this and therefore, combines considerations of individual differences and social

networking in relation to creativity. More specifically, proactivity and creative self-efficacy are accounted for as the individual difference variables of interest, in relation to networking parameters (*i.e.* weak and outside ties) and roles (*i.e.* brokerage and centrality) and subsequent individual creativity.

In examining how individual differences relate to individual creativity, a key methodological contribution will be to examine how social networking mediates the relationship between individual differences and creativity. To date, only one other study has considered networks in terms of creativity and individual differences, however in their study Zhou *et al.* (2009) considered personal values (as the sole individual difference characteristic of interest) in relation to networks and creativity with the findings reported being inconclusive. Furthermore, their research provided a relatively limited perspective on networking and creativity, examining only weak ties. The present research aims to build on the initial work undertaken by Zhou *et al.* (2009) and employs a similarly integrative approach that incorporates a more comprehensive assessment of both individual differences and networking variables. The conceptual model used to empirically test the proposed hypotheses is detailed next.

2.7   Conceptual Model

This chapter has shown that the prototypical creative individual along with the social networking strategies and patterns that enhance creativity remain unclear (Agars *et al.*, 2008). The present conceptual model has therefore been designed to integrate the individual difference and networking perspectives on creativity and in turn elucidate the joint effects of these potentially important antecedents on creativity. Furthermore, to ensure a comprehensive understanding of individual creativity is achieved, multiple

individual difference and networking predictors will be considered concurrently. Figure 4 below depicts the conceptual model which will be tested in the current research.
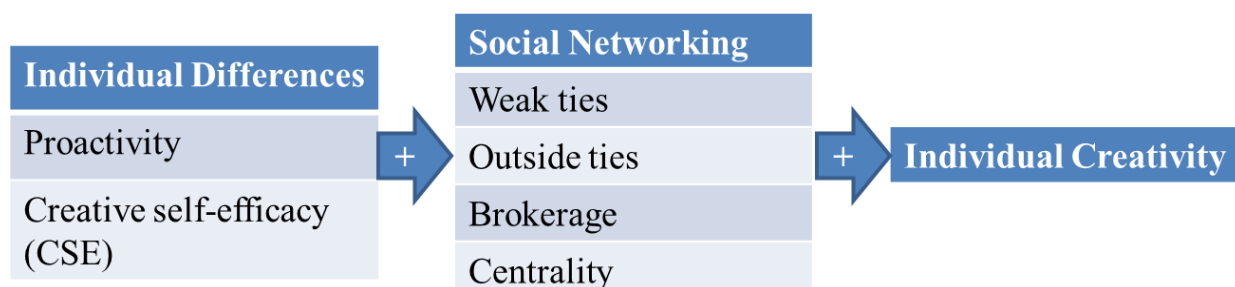
Figure 4: Conceptual model of individual differences and creativity, mediated by social networking

The specific hypotheses to be tested in this conceptual model are summarised next.

2.8 Summary of Hypotheses

The preceding literature review led to the development of ten hypotheses to be tested in the present research. Two of these assess direct effects of individual differences on creativity, while the remaining eight focus on the mediating effects of networking variables on this relationship. These hypotheses reflect the ongoing scholarly calls for concurrent considerations of the antecedents of creativity to be undertaken (Barron & Harrington, 1981; Rank *et al.*, 2004; Shalley *et al.*, 2004). Additionally, these hypotheses recognise the potential for social networking variables to mediate the relationship between individual differences and creativity. Collectively the testing of these hypotheses will unite and extend the research on creativity and answer many important questions pertaining to the relationships between individual differences, networking parameters and roles, and creativity. The following ten hypotheses outlined in Table 1 will be empirically tested and results reported in Chapter Five.

Table 1: Summary of hypotheses

Hypothesis 1	Proactivity will be positively related to individual creativity.
Hypothesis 2	CSE will be positively related to individual creativity.
Hypothesis 3	Weak ties will mediate the positive relationship between proactivity and creativity.
Hypothesis 4	Number of outside ties will mediate the positive relationship between proactivity and creativity.
Hypothesis 5	The brokerage role will mediate the positive relationship between proactivity and creativity.
Hypothesis 6	Network centrality will mediate the positive relationship between proactivity and creativity.
Hypothesis 7	Weak ties will mediate the positive relationship between CSE and creativity.
Hypothesis 8	Number of outside ties will mediate the positive relationship between CSE and creativity.
Hypothesis 9	The brokerage role will mediate the positive relationship between CSE and creativity.
Hypothesis 10	Network centrality will mediate the positive relationship between CSE and creativity.

2.9   Conclusion

The extensive literature review undertaken in this chapter indicates that whilst our existing knowledge on networking and creativity is considerable, it is also limited due to the paucity of concurrent considerations of the predictors of creativity. Indeed, Shalley *et al.* (2004) have argued that concurrent considerations of the potential precursors to creativity are of paramount importance. More specifically, individual difference and social networking characteristics need to be considered concurrently in creativity research. By doing so, the present research aims to address many important questions about individual creativity that remain unanswered within extant research.

In terms of individual differences, proactivity and CSE were discussed as established predictors of creativity. It was therefore proposed that highly proactive and creatively efficacious individuals are more likely to be creative at work. This chapter also discussed the role of social networking in influencing the creativity of individuals. Specifically, weak and outside ties constitute the network parameters of interest, while brokerage and centrality exemplify the networking roles of interest. The expected relationships between individual differences and networking were also reviewed. In line with the previously discussed contributions of this research, the assessment of multiple networking variables will be a major contribution of this research with the majority of existing research assessing only the strength-of-ties.

Furthermore, researchers have also advocated considerations of how different individuals network and how this may influence their levels of creativity (Mehra *et al.*, 2001; Shalley *et al.*, 2004; Zhou *et al.*, 2009). Therefore, it was proposed that proactive and creatively efficacious individuals would maintain more extensive weak and outside ties, as well as securing brokerage and central network positions, which in turn would bolster their creative performance at work.

The following chapter provides a discussion of the research context. Extant research on creativity in the Australian context is reviewed before the existing research on creativity in the Information Technology (IT) industry is detailed. An overview of the IT industry in Australia is then provided before the paucity of creativity research in the Australian IT industry is highlighted. Finally, the specific context for the current study is detailed.

3   RESEARCH CONTEXT

3.1   Introduction

The existing research on creativity, together with how individual difference and social networking constructs relate to creativity were comprehensively reviewed in Chapter Two. Furthermore, the preceding chapter covered the proposed integrative approach, incorporating both the individual difference and networking perspectives on creativity for the purpose of clarifying and advancing existing knowledge. This approach reflects the need to avoid further routinisation of creativity and innovation research (Anderson *et al.*, 2004). Hypotheses were put forward to assess this integrative framework. The research context for the study will now be detailed in this chapter.

The preceding literature review highlighted contextual limitations of extant research, which this study aims to address. The majority of existing research on creativity (discussed in the previous chapter) has utilised student samples. Research using the personality and individual difference perspectives on creativity has largely been limited to US samples (Shalley *et al.*, 2004), while studies on social networks and the networking perspective on creativity have been predominantly limited to Asian samples (Borgatti & Halgin, 2011; Borgatti *et al.*, 2009; Shalley *et al.*, 2004). In contrast to this, the present research will employ an Australian, professional sample consisting of Information Technology (IT) workers from within an Australian IT organisation. This provides a novel context in which to examine creativity given the relatively limited number of creativity studies which have used non-student and Western samples. Extending the context in which creativity research is conducted will allow for an assessment of the extent to which existing theories are

applicable in different contexts, while also broadening our knowledge of the relevant constructs and relationships.

High-technology industries (*e.g.* IT, software and pharmaceuticals) are known to rely on creativity and innovation for organisational success, thus making these industries particularly appropriate for assessing creativity at work (Im & Workman, 2004; Lapierre & Giroux, 2003; Mehra *et al.*, 2001; Smith, Collins, & Clark, 2005; Tierney & Farmer, 2002; Zhou *et al.*, 2009). It has been acknowledged that creative ideas are integral to the development of new products/technologies in high-technology industries (Im & Workman, 2004). Subsumed within the high-technology industry are IT businesses, which are increasingly attracting academic attention, given their heavy reliance on innovation and continuous creativity for business sustainability and success (Cooper, 2000; Mitchell, Inouye, & Blumenthal, 2003). Moreover, on-going technological advancements in the IT industry necessitate on-going creativity.

This chapter will review the importance of extending the contexts in which creativity is studied. More specifically, the novel and interesting nature of the Australian IT industry which constitutes the context for the present study will be expounded. First, the need for creativity research in Australia, along with extant Australian-based creativity studies will be discussed. Then, the importance of creativity in the IT industry will be highlighted. The importance of the IT industry in Australia will then be outlined before emphasising the need for specific studies of creativity in the Australian IT industry. Finally, details of the present study context will be provided.

3.2   Creativity Research in Australia

It is important to acknowledge that none of the existing research reviewed in the preceding literature review chapter utilised Australian samples. This can be deemed a limitation of extant creativity research given that significant new clusters of creative industries continue to develop in Australia (Mitchell *et al.*, 2003). Therefore, unlike the majority of extant research, this study recognises the importance of these Australian based creativity clusters.

In reviewing creativity research, Shalley *et al.* (2004) highlighted the importance of considering international contexts. This review highlighted the potential for different contexts, specifically Western versus non-Western contexts, to pose potentially different implications for individual creative outcomes. As such, the extent to which specific individual difference variables affect individual creativity may vary across cultural contexts (Shalley *et al.*, 2004). Individualistic contexts, such as Australia, are characterised by the pursuit of individual goals and rewards, whereas collectivist contexts, such as Asian countries, are characterised by the pursuit of collective/group goals and rewards (Hofstede, 1980). Therefore, individuals from collectivist cultures may respond differently to organisational conditions than individuals from individualistic cultures, with the former typically associated with non-Western contexts and the latter mainly associated with Western contexts (Hofstede, 1980). For example, Farmer, Tierney, and Kung-McIntyre (2003) examined creative role identity in Taiwan, which has a more collectivist culture, and found that creative role identity was predicted by perceived co-worker creativity expectations, self-views of creative behaviours, and high levels of exposure to US culture. This finding may not hold true in a Western/individualistic context which is why more creativity research is called for in such contexts.

Australia is deemed to have an individualistic culture (Gudykunst *et al.*, 1989; Hofstede, 1980; Triandis, Bontempo, Villareal, Asai, & Lucca, 1988) but it has received far less research attention in terms of creativity than other individualist countries, specifically the US and UK. The present research aims to assess this relatively untapped context in order to generate greater insight into creativity in individualistic contexts. Mitchell *et al.* (2003) have acknowledged that Australia is a particularly fertile context for creativity research given the ongoing boom across creative industries in Australia. Nevertheless, to date, very few creativity studies have used Australian samples.

Foxall and Hackett (1994) compared styles of managerial creativity across Australian, US and UK samples of mid-career MBA students. This study found that individuals in managerial roles which were more externally oriented (such as marketing and strategic planning) had higher innovation scores than individuals in more internally oriented managerial roles (such as accounting and quality control). Furthermore, adaption-innovation was very important for engineering managers across the countries, equally so between Australia and the UK and only slightly more so in in the US.

Marceau (1999) assessed innovation networks in the biomedical and toolmaking industries in Australia. It was deduced that companies in these industries are involved in different kinds of networks (formal and informal), the success of which depends on the structure of the industry. Relationships between principal clients and small firm suppliers (*i.e.* external networks) were found to be more integral in shaping the success of these organisations than the personal relationships between organisational members (*i.e.* internal networks) (Marceau, 1999). Despite the focus on innovation at the organisational level, as opposed to individual creativity, the networking perspective on creativity was clearly relied on here.

More recently Gibson and Klocker (2005) employed the creativity construct to investigate regional economic development in Australia. This study concluded that variations in creativity between Australia's regions were inevitable due to divergent local council policy directions. As a consequence, Gibson and Klocker (2005) argued that regions where councils implement tokenistic cultural plans will continue to lag on the creative index, while regions where councils implement comprehensive cultural plans will thrive as 'innovation hubs'. This was however a theoretical paper and the proposed relationships were not empirically tested.

Hyland, Marceau and Sloan (2006) sampled Information and Communication Technology (ICT) companies across Australia to determine the sources of information and ideas that organisations utilised to sustain their competitive position through innovation. Findings indicated that sales forces, customers and suppliers across Australian ICT firms were the most important sources of innovation related ideas.

It needs to be acknowledged that Australian policymakers have also recognised the importance of creativity and creativity research. Atkinson and Easthope (2007) focussed on the notion of 'creative cities' which implicates the 'creative class' and economic development. These authors argued that creative cities are increasingly important in Australia for ensuring survival and capitalising on changing conditions in the global economy; as well as the growing importance of the creative economy over other economic sectors. The importance of creativity and 'creative cities' in Australia is therefore gaining increased prominence amongst urban planners, policy makers as well as academic researchers (Atkinson & Easthope, 2007).

It is evident from the limited research that has been conducted in Australia that the focus has mainly been on innovation with individual creativity being particularly neglected. This can be attributed to the organisational/industry level focus of relevant research. Furthermore, despite the limited nature of Australian based creativity/innovation research, several studies acknowledged the need for such research to be carried out in a high-tech context (Hyland *et al.*, 2006; Marceau, 1999), which will be the focus of the present research. It is well established that high-technology industries, in particular the IT industry, are important contexts in which to assess creativity (Cooper, 2000; Im & Workman, 2004; Lapierre & Giroux, 2003; Mitchell *et al.*, 2003; Smith *et al.*, 2005) and this will be discussed next.

3.3   Creativity Research in the High-Tech Information Technology (IT) Industry

The types of organisations that are studied in creativity research need to be carefully selected. This is because studying an organisation that does not promote creativity throughout its ranks, or that does not rely on creativity for much of its success would be considered a redundant and irrelevant site for a creativity study (Perry-Smith, 2006). Therefore, studying organisations that rely on creativity, for example organisations that place great importance on workers being able to solve problems in creative ways (Tierney & Farmer, 2011), make for the most viable samples in creativity research. Perry-Smith (2006) recognised this and consequently studied an organisation that placed great value on the creativity of its employees in order to determine how the social side of the organisation affected individual creative outputs.

The specific tasks that employees undertake need to involve some level of creativity or else their involvement in a creativity study would be problematic. Consistent with this, much of

the creativity research to date has relied on samples of individuals from occupations where creativity is central. For example, applied research laboratory technicians (Perry-Smith, 2006), research and development teams (Baer, 2010), IT service workers, computer system developers, furniture design and chemical instruments developers (Yuan & Woodman, 2010). Consistent with this Perry-Smith (2006) recruited two laboratories at an applied research institute, while excluding from the creativity study all administrative staff along with temporary personnel (such as student assistants), on the basis that their work did not involve creativity.

Staber (2004) promoted the importance of studying creativity in project-based organisations and other knowledge-intensive organisations, such as those throughout the high-tech IT industry. According to Staber (2004, p. 30) such organisations can be categorised as those that "operate in highly volatile environments, where innovation depends significantly on the ability to integrate different but interrelated knowledge bases, co-ordinate knowledge processes that are difficult to specify in advance and meet deadlines that may shift over time with changing needs and resource constraints." Such a context also clearly implicates networking in relation to creativity and innovation through the identification of integration and co-ordination issues. Thus, this reinforces the appropriateness of using an IT organisation in the present research.

Recently, creativity researchers have increasingly focused on high-tech contexts. Im and Workman (2004) surveyed high-tech manufacturing firms in the US to determine whether the level of creativity in new products and marketing programs mediated the relationship between market orientation and new product success. Support was found for this proposed relationship with creativity being key to the studied organisations maintaining success in

the high-tech industry (Im & Workman, 2004). Smith *et al*. (2005) surveyed top management teams and interviewed CEOs from across 72 technology firms to determine the rate of new product and service introductions in relation to the ability of employees to combine and exchange knowledge. This study identified a significant relationship between static knowledge and knowledge creation capability, finding that hiring and training well-educated employees with varying functional expertise is important in increasing the likelihood that employees will combine and exchange their ideas (*i.e.* be creative through networking) to form new knowledge (Smith *et al.*, 2005).

More research focus is however still needed to study creativity specifically in the high-tech IT context. According to Dewett and Jones (2001, p. 335), "the pace of IT change that has swept through the economy has left the academic community behind and that the definition, meaning, and current significance of many of the basic building blocks and theories of organizational studies need to be reexamined." The IT industry has therefore been deemed a particularly important part of the high-tech context for creativity research.

The IT industry has also increasingly been attracting research attention because it can be distinguished from other industries by its unparalleled need for continuous improvement and innovation (Cooper, 2000; Lapierre & Giroux, 2003; Mitchell *et al.*, 2003). Lapierre and Giroux (2003) sampled ten high-tech organisations in the IT industry from across Canada to determine the ways in which creativity is fostered in such organisations. Six dimensions were determined to be significant predictors of creativity in the IT industry: work atmosphere; vertical collaboration; autonomy/freedom; respect; alignment; and lateral collaboration (Lapierre & Giroux, 2003). These findings reinforce the integral importance of creativity in the IT industry.

IT professionals perform heuristic tasks that allow for creative thinking as part of their work; much like the tasks described by Amabile (1998) as well as Oldham and Cummings (1996). For example, heuristic tasks may include ongoing problem solving, new product/technology development, updating technology, and computer/systems networking solutions - all of which require creative thinking and input (Mitchell *et al.*, 2003). These specific tasks further reinforce the viability of targeting IT professionals for creativity studies.

Cooper (2000) investigated the factors affecting creative IT requirements and logical design. This study was developed in light of the increasing competitiveness and hostility of organisational environments which Cooper (2000) argued necessitated radical organisational change. According to Cooper (2000, p. 270), the success of such change depends on "successful IT-enabled reengineering (which) can only result with the existence of creativity." Creativity is therefore argued to be necessary for any significant organisational redesign via IT to occur.

IT has also been described as a type of innovation that can be effectively related to other innovations, which in turn enables organisational change and ultimately success (Bresnahan, Brynjolfsson, & Hitt, 2002). While Bresnahan *et al.* (2002) assessed system level data; it was asserted that complementarities exist between three innovations: IT, workplace reorganisation, and new products and services. In this study data were collected from across 300 large US firms and Bresnahan *et al.* (2002, p. 371) concluded that "as information technology grows cheaper and more powerful, it induces more and more complementary investment" which in turn necessitates ongoing creativity and innovation. Creativity is therefore the key to managing the competitiveness and demands of the IT

industry, where technological advancements persist along with increasing accessibility to such advancements.

There is also some evidence to indicate that the relationship between IT and creativity is bidirectional (Mitchell *et al.*, 2003). In other words, IT practices can be advanced through creativity and creativity can be advanced through IT. Mitchell *et al.* (2003) identified that from the beginning of the 21st century, IT started forming a powerful alliance with creative practices, with the two areas mutually reinforcing each other. Therefore, as much as creativity can lead to enhancements in IT, advancements in IT can support the formation of creative clusters (Mitchell *et al.*, 2003).

The importance of problem solving is ancillary to the importance of creativity in the IT industry and needs to be recognised. Many theorists have acknowledged the importance of problem solving in business, identifying creativity as a key source of novel decision making and problem solving methods (Amabile, 1998; Bains & Tran, 2006; Kerr & Gagliardi, 2003; Oldham & Cummings, 1996; Rank *et al.*, 2004; Tierney & Farmer, 2011; Woodman *et al.*, 1993). This is particularly crucial in the context of the IT industry where technical issues and pressures from competitors are likely to be a constant issue, for which novel and timely solutions are needed. Creativity is therefore very important in IT settings and warrants specific attention. Furthermore, Florida (2002) has deemed technological creativity to be integral to the 'creative economy', highlighting the inherent importance of creativity in technological domains. The present research will focus specifically on the IT industry in Australia, which will be detailed next.

3.4   The IT Industry in Australia

The Australian IT industry impacts on national productivity and economic growth (Brynjolfsson & Yang, 1996; Colecchia & Schreyer, 2001; Dedrick, Gurbaxani, & Kraemer, 2003; Dewan & Kraemer, 2000). Indeed, IT is a linchpin to countries achieving and sustaining economic growth and stability (Ayres & Zuscovitch, 1990; Colecchia & Schreyer, 2001; Dedrick *et al.*, 2003) and Australia is no exception to this. According to Hyland *et al.* (2006) Australia is a viable context in which to consider IT businesses yet it remains neglected.

The establishment of the Information Technology Industry Innovation Council (ITIIC) in 2005 was direct recognition of the integral role IT plays across all sectors of the Australian economy. This council consists of 24 senior industry representatives including the Chief Executive Officer of Microsoft Australia and political advisors including the Deputy Secretary of the Department of Innovation (DIISRTE, 2012). The Council was enacted to execute a wide agenda including innovation within the domestic IT industry. More specifically, this council plays an advocacy role, champions innovation, and seeks to establish links with other Industry Innovation Councils (DIISRTE, 2012).

Senator Kim Carr's (2009) official media release explained that the establishment of the ITIIC was necessitated by the booming Australian IT industry which has been increasingly influential over national economic affairs. At the time of its inception, this council stood to support a 98 billion dollar IT industry which employed over 400, 000 Australians (Carr, 2009). These figures have since risen and continue to rise in line with demand for ongoing technological advancements (DIISRTE, 2012). The Chair of this council, Mr John Grant asserts the importance of promoting and protecting the Australian IT industry which is an

enormous enabler of innovation, productivity and sustainable development for the economy as a whole (Carr, 2009).

IT development and investment has been linked to improved productivity and economic growth (Brynjolfsson & Yang, 1996; Colecchia & Schreyer, 2001; Dedrick *et al.*, 2003; Dewan & Kraemer, 2000). As a result, the IT industry has been attracting ongoing academic attention. Nevertheless, a disproportionate amount of IT related research has been based specifically on the US and Chinese IT industries (Colecchia & Schreyer, 2001). More needs to be done to account for the importance of IT industries in other countries such as Australia, where IT investment and development continues to grow (Carr, 2009; Colecchia & Schreyer, 2001).

Australia has been identified as an advanced IT/ICT user with the average expenditure on related goods and services by Australian businesses and households having increased significantly since the 1990s (Banks, 2001). ICT expenditure as a percentage of GDP increased from just under 7 percent in 1992 to just over 8 percent in 1997 - well above the OECD average and comparable to that of the US (7.8 percent) (Banks, 2001). Furthermore, the IT industry has been deemed integrally important for economic growth in Australia, with IT and ICT said to have directly contributed up to 85 percent of productivity growth in the Australian manufacturing sector over the 17 years to 2001-02 (Coonan, 2006). These figures demonstrate that academic attention in the context of the Australian IT industry is viable and warranted.

A Comparison of IT investment and economic growth across nine OECD countries along with Australia and Finland has demonstrated Australia to be prominent on a number of

accounts (Colecchia & Schreyer, 2001). In particular, the growth of investment in software has been significant in Australia over the period between 1980 and 2000 (Colecchia & Schreyer, 2001). Software investment has in fact contributed up to 25-40 percent of overall investment growth in the economy as a whole (Colecchia & Schreyer, 2001). This significant investment in software presents further justification for examining the Australian IT context instead of other contexts which have invested less in this integral aspect of the IT industry. It should be acknowledged that the rapid growth in IT investment across these countries has been significant due to a steady decline in its relative price (Colecchia & Schreyer, 2001). The dearth of research in the Australian IT industry is therefore surprising given the prominence of this context since 1980.

Colecchia and Schreyer (2001) have also found Australian output growth (*i.e.* economic growth or the production of goods and services) to be significantly impacted by ICT. One explanation of this significant impact revolves around the complementarity between micro-economic reforms (*i.e.* policies designed to improve economic efficiency) and ICT, such that software investment is complementary to IT capital goods. Moreover, economic reforms are increasingly associated with ICT initiatives and advancements, whereby economic efficiency is increasingly dependent upon ICT and vice versa. This is demonstrated by the fact that the development of general purpose technology, such as the Internet, depends on investment in communication infrastructure followed by investment in applications/software (Colecchia & Schreyer, 2001). Given the significance of software investment in Australia, IT development can be forecast to persist accordingly; making the Australian IT industry an attractive context for IT based research.

It should be acknowledged that the IT industry has a significant impact across industries such that businesses are increasingly relying on IT for development and success. In 2010-11 91.2 percent of Australian businesses were relying on internet access (for general business operations); 43.1 percent of Australian businesses had a web presence; 99.1 percent of all Australian business internet access was via a broadband connection; 50.8 percent of Australian businesses placed orders via the internet; and, 28 percent of Australian businesses were receiving orders via the internet (ABS, 2010-2011). Furthermore, sources of IT support have also been seen to be instrumental in the success of Australian businesses. In 2009-10 five dominant sources of IT support were identified to have a significant presence across Australian industries (ABS, 2009-2010). These sources included IT specialists, suppliers of software or hardware, and contractors or consultants (ABS, 2009-2010). Statistics also show that the percentage of IT support increased along with the size of the organisation (ABS, 2009-2010).

With IT affecting all Australian businesses to various extents, this industry is directly bolstering the strength of the national economy as well as Australia's economic position in the global economy. This has been demonstrated with Australia successfully overcoming the most recent Global Financial Crisis (GFC) (Australian Government: Australian Trade Commission, 2010). In light of the recent GFC the Australian Government announced six industry innovation councils in recognition of the integral role each industry plays in strengthening the economy. One of these councils centres on Information Technology (The Parliament of the Commonwealth of Australia, 2009). The emphasis on IT symbolises the important role this industry plays in stabilising and developing the economy. Given the importance of the IT industry in Australia it should serve as a productive context for creativity research, which will be discussed next.

3.5 Creativity Research in the Australian IT Industry

This chapter has considered creativity research in Australia, creativity research in the IT industry and the IT industry in Australia, with the lack of overlap between these considerations demonstrating the need for research to investigate creativity in Australian based IT organisations.

To date, only Hyland *et al.* (2006) have recognised this need and sampled 120 Information and Communication Technology (ICT) companies in Australia, from across a range of product and service providers in New South Wales for their study. This study demonstrated that ICT companies in Australia saw their sales force, customers and suppliers as the most important sources of innovation and creative ideas (Hyland *et al.*, 2006). It needs to be recognised that this is the only known research on creativity in the Australian IT context.

The decision to draw the sample for the present study from an Australian IT organisation was ultimately based on the limited number of Australian based creativity studies, the important and inherent link between creativity and IT, as well as the integral nature of the IT industry to the Australian economy. The present study context will be expounded next.

3.6 Present Study Context

The present research utilised a sample of IT workers from an IT organisation operating within a large Australian university. To preserve the anonymity of the participating organisation, this organisation will be referred to using the 'Technical Services Group' (TSG) pseudonym. This publically owned organisation formed in 2010 through the amalgamation of two previously independent IT entities (which were operating

successfully for over three decades). This new organisation was formed for the purpose of streamlining operations and procedures within the merged organisations.

Operating throughout Victoria, this organisation outperforms the IT organisations of other universities across Australia and is acclaimed as an industry leader, setting a high standard for IT practices and innovations (Taylor, 2012). Following the merger all quasi-casual staff were either made permanent or rendered redundant, investment in training was tripled, and the organisational structure was redesigned (Taylor, 2012). The new organisation was designed to operate with greater efficiency through a new and improved streamlined structure.

This organisation is characterised by a hybrid organisational structure, combining functional divisions (*i.e.* Research and Development, Finance, Helpdesk *etc.*) and management groups (see Appendix A for a copy of the organisational chart). A hierarchy has been built into this structure, with the most senior member of the organisation being the Chief Information Officer (CIO). All members of this organisation primarily work in teams, where inter-team cooperation and collaboration is often required. At the time of the study the organisation had 610 employees spanning across 12 different divisions with numerous subdivisions under each. Participants for this study were recruited from all the different divisions with the exception of the 'eResearch IT Team' division. This division was excluded due to its structural and procedural segregation from the remainder of the organisation.

The core business of the TSG centres around IT development and support, with a specific focus on developing university specific software and web-based services as well as

providing technical support and equipment. The former focus of the business involves software developers and e-research teams, while the latter focus of the business involves helpdesk teams and project managers. The importance of creativity across the organisational work domains is heavily emphasised at this organisation, making it consistent with research contexts advocated by prior creativity researchers (Amabile, 1998; Oldham & Cummings, 1996; Perry-Smith, 2006; Tierney & Farmer, 2011).

It should be noted that at the time of the data collection the TSG was undergoing system-wide structural change as a result of the appointment of a new CIO. These changes created uncertainty and were accompanied with increased workloads for individuals and teams in the organisation. Work at the TSG is characterised by high time pressures, regular revision of goals, a constant need to learn and improve skills, and a reliance on social networking to complete work tasks. The turbulent times associated with the ongoing changes at the TSG and the nature of the work being conducted was particularly well suited to the creativity and social networking aspects of the present research. Specifically, turbulent times have been shown to motivate individuals to be more creative, in order to ensure that adverse environmental factors do not compromise their productivity (Amabile, 1998; Bullinger, 1999; Hunter *et al.*, 2007; Oldham & Cummings, 1996).

3.7   Conclusion

This chapter has provided justification for the study's context. First, the limitations of Australian based creativity research along with the viability and importance of increasing creativity considerations across countries/cultural contexts was discussed. More specifically, it was highlighted that conclusions drawn from studies conducted in collectivist cultural contexts may not be applicable to individualistic cultural contexts

(Farmer *et al.*, 2003; Hofstede, 1980). Furthermore, Australia was highlighted as an individualistic cultural context historically neglected by creativity researchers, when compared to other individualistic cultural contexts such as the US and UK.

The importance of creativity for the IT industry was then discussed, establishing that IT is a major driver of productivity and economic growth. Creativity, constant improvement and innovation were all highlighted as integral to the IT industry. The particular importance of the IT industry in Australia was subsequently expounded, establishing Australia as a thus far neglected and yet very viable context for IT based creativity research (Colecchia & Schreyer, 2001; Hyland *et al.*, 2006). The importance of IT to Australian businesses and the national economy was highlighted. Furthermore, Australia's particular strength in investment in software was stressed. Collectively, these considerations demonstrated the need for creativity research to be conducted in the context of the Australian IT industry. Finally, details of the specific Australian IT organisation, the TSG, used in the current research were provided.

Next, the methodology employed in this study will be discussed. This chapter will cover the research design, recruitment of participants, issues of common method variance, ethical clearance, sample specifics, and details of the measures and control variables employed. The methods of analysis for testing the proposed hypotheses will also be detailed.

4 METHODOLOGY

4.1 Introduction

In Chapter One, the importance of creativity at work was discussed and the need for more creativity based studies established. Having established the significance of creativity in contemporary business, Chapter Two then sought to review the research pertaining to both the individual difference and networking perspectives on creativity. Hypotheses were developed as part of this review. The context in which these hypotheses were to be tested was then expounded in Chapter Three, where the limited nature of Australian based creativity research was highlighted. Additionally, sampling from the IT industry was justified based on the inherent importance of creativity in IT work (Cooper, 2000; Dewett & Jones, 2001; Lapierre & Giroux, 2003; Mitchell *et al.*, 2003). Overall, the aim of this chapter is to provide an overview of the study design, the specific sample characteristics, the study's measures and methods employed to analyse the data.

First, key aspects of the study design, including the cross-sectional and quantitative characteristics will be detailed. Subsequently, the specific procedures employed to recruit participants and collect data will be covered. The characteristics of the studied sample, including demographic details pertaining to the individual employees and supervisors sampled will then be detailed before a description of the measures used in the employee and supervisor surveys is provided. The importance of control variables and the specific controls employed in this study will also be expounded. The method of analysis employed to test the proposed hypotheses will then be discussed prior to concluding the chapter.

4.2   Research Design

An integrative, individual level design was adopted in this study. As was discussed in prior chapters, integrating theory on networking and creativity is expected to allow for a better understanding of individual level creativity. Extant creativity literature whilst being expansive is not entirely conclusive (Runco, 2004; Shalley *et al.*, 2004; Unsworth, 2001; Woodman *et al.*, 1993). It was therefore anticipated that utilising the individual difference perspective in conjunction with the networking perspective would significantly advance our existing understanding of individual creativity. In order to accomplish this aim a cross-sectional study design was adopted.

In a cross-sectional study design data are collected at a single point in time (Bryman & Bell, 2007). Cross-sectional studies are also referred to as population studies and are attributed with being economical, time-saving, and having good external validity or generalisability (Bryman & Bell, 2007). According to Peat, Mellis, Williams, and Xuan (2002), a cross-sectional survey is fast and easy to conduct, can provide accurate estimates of prevalence, and provides initial information on associations. Particularly pertinent is the last noted advantage. It is argued that cross-sectional surveys are ideal for collecting initial information about relationships among variables or for making an initial investigation into hypotheses about causal pathways. Given that the hypotheses developed in Chapter Two of this study are testing the significance of specific causal pathways/relationships, a cross-sectional study design is warranted.

The cross-sectional design demonstrates several advantages that cannot be attributed to alternative research designs (Bryman & Bell, 2007; Peat *et al.*, 2002). For example, cross-sectional research is both time-saving and cost-saving when compared to longitudinal

studies. Additionally, unlike with longitudinal studies there is no need for long term cooperation between participants and researchers in cross-sectional studies, so researchers need not worry about participants discontinuing during the course of the study. Nevertheless, cross-sectional studies also have limitations (Bryman & Bell, 2007; Peat *et al.*, 2002), the main one being that they cannot be used to identify causal relationships between variables (Peat *et al.*, 2002; Tharenou, Donohue, & Cooper, 2007). Further discussion on the limitations of this research design will be presented in the Discussion Chapter (Chapter Six), in light of the findings of the research.

This study adopted a multi-method design that involved data being collected from employees and supervisors in an Australian IT organisation. Data from individual employees and their respective supervisors could in turn be matched. Data from individual employees was collected in relation to their perceived levels of proactivity, CSE and characteristics of their social networks. Supervisors were asked to indicate how creative each individual employee in their team was. This reflects the fact that self-reports alone are not always entirely accurate, so combining them with supervisor reports in a multi-method approach is key for improving the accuracy of findings (Chang, Witteloostuijn, & Eden, 2010; Millsap, 1990; Mitchell, 1985; Podsakoff & Organ, 1986; Williams, Cote, & Buckley, 1989). Furthermore, creativity researchers have deemed findings to be more valid when some of the data is collected from supervisors not simply just from employees (Baer, 2010; Baer & Oldham, 2006; Gong *et al.*, 2012; Shalley *et al.*, 2004; Tierney & Farmer, 2004). Using matched employee-supervisor data represents an advance on the methodologies which have been used in existing creativity studies.

A quantitative, as opposed to a qualitative, approach was adopted as part of the study design. There are many differences between quantitative and qualitative research, in terms of the assumptions upon which these approaches are based, the purpose, actual approach and researcher roles. Under a quantitative approach, assumptions tend to centre on a positivist philosophy which assumes that there are social facts with an objective reality apart from the beliefs' of individuals (Firestone, 1987). As such, quantitative approaches tend to be used to explain the causes of changes in social facts through objective measurement and typically employ experimental or correlational designs (Firestone, 1987; Peat *et al.*, 2002). This approach was therefore chosen for the present research, as it enabled relationships to be empirically tested in an effort to confirm as well as broaden our understanding of individual creativity.

A qualitative approach was deemed less suitable for the present research. Qualitative approaches tend to centre on a phenomenological paradigm which holds that reality is socially constructed through individual/collective definitions of the situation (Firestone, 1987). Qualitative approaches tend to be concerned with understanding the social phenomenon from the individual/collective perspectives through direct participation/interaction (Firestone, 1987). Research conducted using qualitative designs tends to be more exploratory with researchers typically immersing themselves in the phenomenon of interest (Firestone, 1987; Peat *et al.*, 2002). Qualitative methods are regarded as being inappropriate when the researcher seeks to test specific relationships in a well-established field of research. A qualitative approach was therefore deemed unsuitable for the current research as it would not have allowed for hypothesis testing.

The data in this quantitative study were gathered using self-administered, web-based electronic surveys. This was the most appropriate form of data collection for a number of reasons. First, the use of self-administered surveys was favoured because it is the least expensive form of data collection, particularly in the case of web-based surveys (Singleton & Straits, 2005). Second, and more importantly, the use of surveys provided a number of important methodological advantages that are not associated with alternate methods. For example, surveys provide greater accessibility to a larger number of potential participants than other methods such as focus groups or one-on-one interviews, thus ensuring wider coverage of the sample population (Singleton & Straits, 2005). The greater assurance of anonymity and privacy associated with the administration of a survey instrument has also been found to encourage respondents to provide more honest information, which is not always true of the face-to-face modes of data collection (Chadwick, Bahr, & Albrecht, 1984). Finally, the inclusion of established measures within a survey allows for improved comparability with the findings from other related research, enabling an assessment of whether there is consensus on a particular set of issues (Tharenou *et al.*, 2007).

Given the present study design, a specific procedure needed to be employed to collect the supervisor and employee data required. The following section will detail the process through which participants were recruited to participate in the research, as well as the procedure followed for the collection of data. The critical challenges experienced during this process and how they were addressed, to ensure an adequate sample was achieved, both in terms of size and comparability, will also be explained.

4.3 Recruitment of Participants and Data Collection Procedure

Data were collected from an IT organisation, the Technical Services Group (TSG), operating within a leading Australian University. Following an initial approach to the TSG via a senior employee known to the student researcher, permission was gained from the General Manager to conduct meetings with teams across the organisation and then distribute surveys to the teams who were interested in participating in the research. Meetings were conducted with every team throughout the organisation, excluding only those in the 'eResearch IT Team' division which were not eligible to participate on account of the teams in this division being structurally and procedurally segregated from the rest of the organisation. All other teams agreed to participate in the research.

Consultation meetings were held with teams where the broad goal of the research, to investigate how different individuals are social and creative in a high-tech context was explained. It was also made clear to prospective participants that the researcher would need to identify the responses from each respondent in order to match employees' responses to the corresponding responses from their supervisor. Furthermore, potential participants were assured that this identifying information (*i.e.* their name and work email address) would only be accessible to the research team (*i.e.* the student researcher and project supervisors). Clarifying these issues via face-to-face consultations was intended to stymie any concerns on the part of prospective participants, thereby increasing potential supervisor and employee response rates. These face-to-face consultations also enabled prospective participants to voice any concerns or ask any questions they had in relation to the research. On average these meetings lasted approximately 30 minutes.

At the conclusion of these meetings the student researcher was provided with the names of supervisors and employees who would be included in the personnel roster (for the networking section of the employee survey) and who would ultimately complete individual surveys. The complete list of names (of participating employees and supervisors) was then compiled and used to furnish the networking section of the employee survey. This list along with the other survey materials were then vetted by senior staff at the TSG.

The organisation was invited to provide feedback on a draft of the employee and supervisor surveys to ensure any ambiguity in terms used could be rectified prior to the surveys being distributed. This process resulted in certain adaptations being made to the employee survey to account for specific organisational characteristics. For example, the organisation requested extra statements (*i.e.* name options) to be included in the section measuring outside ties. Originally a maximum of ten outside ties were allowed but at the organisation's request this was doubled. Given the nature of employees' jobs often required them to collaborate with actors outside of the organisation this amendment was aimed at maximising the applicability of the survey to the study sample.

In addition to allowing for more outside ties, the organisation also requested that specific organisational members (including senior members of staff) who were not members of the targeted sample of teams be included in the personnel roster. These organisational members were deemed to be of particular interest and so were included in the roster to allow for specific organisational circumstances to be accounted for and reported. Provided directly to the appropriate organisational staff, these reports extended beyond the purview of this research. The personnel roster in the employee survey therefore included some names of organisational members who would not be contributing to the networking data

through survey completion. Making these additions to the personnel roster was unlikely to compromise the utility of this tool given that the number of names on these rosters tends to vary across research contexts (Hansen, 1999; Marsden, 1990; Perry-Smith, 2006).

In line with the present multi-method approach, the study involved separate surveys for supervisors (assessing the individual creativity of their employees) and employees (assessing individual attributes along with individual networking patterns and capacities for creativity). The surveys for this study were distributed to supervisors and employees via email. These emails provided participants with a hyperlink via which they could access the web-based surveys. These emails also specified the timeframe within which the surveys needed to be completed (see Appendix B for the employee survey email template and Appendix C for the supervisor survey email template). Before proceeding to the first survey question, participants were presented with an explanatory statement, which outlined the purpose of the study, provided an assurance of participant confidentiality and explained how participants could access further information or voice their concerns about the study (see Appendix D for the explanatory statement).

In accordance with the number of interested teams a total of 60 electronic surveys were developed via Qualtrics. One version of these surveys was developed for completion by all employee participants, while the other 59 surveys were specifically tailored to individual supervisors, allowing them to assess the creativity of the specific members of their teams. Supervisors were first invited to complete their surveys which were emailed to them independently via the student researcher's email account. Subsequently, employees received their survey (which was uniform across all employee participants) in emails that were generated by the Qualtrics system.

Data collection was conducted over a three week period. To maximise the response rate, a reminder email was sent out to all of the potential participants that had yet to complete a survey one week after the initial electronic survey was sent. Two weeks into the data collection an additional reminder email was sent to the supervisors and employees who had yet to complete a survey. Following each reminder, far fewer prospective participants remained unresponsive, so this process proved effective.

The potential for Common Method Variance (CMV) to inflate the magnitude of the relationships measured in these surveys will be discussed next. As will be discussed, the use of a self-report survey in conjunction with a supervisor-report survey means that CMV related issues are unlikely to confound the study's results.

4.4   Common Method Variance (CMV)

Common method variance (CMV), otherwise referred to as mono-method bias, is the notion that the relationship between variables measured with the same method can be inflated (Lindell & Whitney, 2001; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Podsakoff & Organ, 1986). Accounting for CMV is particularly important in cross-sectional study designs since all the data are collected at a single point in time (Lindell & Whitney, 2001). CMV can be problematic in research because it implies variance that is attributable to the measurement method rather than to the actual constructs the measures represent (Podsakoff *et al.*, 2003). Therefore, when the method variance component is shared or is common across variables assessed within a given method, inaccurate inflation in relationships can occur. Method variance is one of the main sources of measurement error and it can lead to confounded results and potentially misleading conclusions being made.

Measurement methods can vary in a variety of ways, so the more diverse the methodology (*i.e.* the greater the variety of measurement methods employed) the less likely CMV will have an effect (Lindell & Whitney, 2001). To address potential CMV, several multi-method approaches have been suggested. One common approach is to measure dependent and independent variables from different sources (Chang *et al.*, 2010). This strategy has been deemed appropriate when the variables are behavioural in nature or can be directly observed. This is true for the present research variables of proactivity (Bateman & Crant, 1993; Chan & Liebowitz, 2006; Crant, 2000; Griffin *et al.*, 2007; Ohly & Fritz, 2010), CSE (Beghetto, 2006; Chong & Ma, 2010; Mathisen & Bronnick, 2009; Tierney & Farmer, 2002, 2004, 2011), and creativity (Burt, 2001, 2004; James *et al.*, 1992; Pulakos *et al.*, 2000). Moreover, proactivity and CSE represent independent variables while creativity represents the dependent variable in this research. Despite some debate surrounding the mono-method versus multi-method approaches, the latter continues to be regarded as a sound means of controlling CMV (Chang *et al.*, 2010; Millsap, 1990; Mitchell, 1985; Podsakoff & Organ, 1986; Williams *et al.*, 1989).

In the case of the present research a multi-method design was used whereby data for all predictor/independent variables (*i.e.* proactivity, CSE, networking parameters and roles) was reported on by employees, while the criterion/dependent variable (*i.e.* creativity) was assessed by employees' supervisors, thereby significantly reducing the issues associated with CMV. The merits of using multiple sources of data have been well documented even in creativity research; with findings showing individual creativity research to be more valid when based on a combination of employee and supervisor-reports, rather than employee self-reports alone (Baer, 2010; Baer & Oldham, 2006; Gong *et al.*, 2012; Shalley *et al.*, 2004; Tierney & Farmer, 2004). Thus, while the design of this study may not rule out

CMV entirely, CMV is unlikely to have significantly affected the study's results. The subsequent section will detail the process through which ethical clearance was attained for the present research.

4.5   Ethical Clearance

Prior to administering the surveys, ethical approval from the Monash University Human Research Ethics Committee (MUHREC) was obtained (refer to Appendix E). In order to obtain approval, a number of criteria had to be satisfied. These included ensuring that individual participants would not be identified in any published data from the study and demonstrating that participation in the research was entirely voluntary, with participants being free to withdraw at any time without consequence. Furthermore, an important condition of ethics approval was that every participant had to be able to give informed consent. This was achieved in the present research through the provision of a plain language statement explaining the research (refer to Appendix D for the explanatory statement) which accompanied the online surveys. Consent was then implied if individuals chose to complete and submit the survey online. The following section details the key characteristics of the study's sample.

4.6   Sample

Workers from the Australian high-tech, IT industry, were the target population for the present study. A large Australian IT organisation was therefore recruited to participate in the present research (refer to Chapter Three for context specifics). The present sample consisted of workers (*i.e.* supervisors and employees) from across a network of divisions and teams in this Australian based IT organisation.

Web-based surveys yielded a high response rate of 86.4 percent when individual employee data and supervisor data were matched. In terms of supervisors, 56 responded out of a potential 59 (response rate of 94.9 percent) while 180 out of the 226 employees that were invited to participate responded (response rate of 79.6 percent). After matching the employee and supervisor data, the total sample was reduced to 180 employees and their 51 supervisors. Sample size will be explained next.

Sample Size

The previously explained recruitment procedure was developed to ensure maximum response rates from across the target population. Securing a sample that was of adequate size for the desired level of precision and confidence was critical. A large sample size (relative to the number of parameters in the research) reduces the standard error of the mean and thereby gives more precision to the results (Kline, 2011; Sekaran, 2000; Tharenou *et al.*, 2007). A large sample size achieves this decrease in standard error, because the standard error varies inversely with the square mean root of the sample size, such that the larger the sample size the smaller the standard error (Sekaran, 2000; Tharenou *et al.*, 2007). Based on the central limit theorem, securing a sample that was of adequate size also meant that the sample was more likely to approximate the normal distribution (Clover & Balseley, 1984; Dupont & Plummer, 1990).

Different analytical methods require different minimum sample sizes to ensure the viability and accuracy of analyses and resultant findings. The 180 employees and their 51 supervisors that ultimately participated in this research constituted an adequate sample size for the analytical approaches used. The adequacy of the present sample size in terms of the data analysis approaches (*i.e.* social networking analysis, confirmatory factor analysis and

structural equation modelling) employed will be discussed in more detail in the next Chapter (*i.e.* Chapter Five). The specific characteristics of the sample will be outlined next.

Sample Characteristics for Employees

Males accounted for the majority (56.4 percent) of the employee participants. The majority of these participants occupied general IT roles (63 percent) and had attained an 'undergraduate degree or diploma' (35.4 percent) as their highest level of education. The employee participants ranged in age from 24 to 63 years with the average age being 37.7 years (SD = 11.4). On average, they had been working at the TSG for 7 years (SD = 7.2).

Sample Characteristics for Supervisors

Males accounted for the majority (78 percent) of the supervisor respondents. The majority of supervisors held 'middle management' positions (35 percent). In terms of education, the majority of supervisors had an 'undergraduate degree or diploma' (39.2 percent) or a 'post-graduate degree or diploma' (39.2 percent) as their highest level of education. Supervisors ranged in age from 30 to 59 years with the average age being 42.5 years (SD = 8.2). On average, they had been working at the TSG for 8.6 years (SD = 6.6) and had been in their current position for 4.6 years (SD = 5.1). The specific measures used in the employee and supervisor surveys will be detailed next.

4.7   Measures

The present study utilised two types of surveys; an employee survey and a supervisor survey. The employee survey contained a proactive behaviour scale (Porath & Bateman, 2006), creative self-efficacy scale (Tierney & Farmer, 2002), a social networking measure (Perry-Smith, 2006), as well as a section pertaining to demographic details (refer to

Appendix F for the complete employee survey). The supervisor survey consisted of an individual creativity scale (Baer & Oldham, 2006), as well as a section on demographic details (refer to Appendix G for the complete supervisor survey). Participants completed the surveys in their own time with each of the surveys taking approximately 20 minutes to complete.

For all variables multi-item scales were employed rather than single-item scales, with multi-item scales known to have improved content and construct validity and reliability compared to single-item measures (Hinkin, 1995). Furthermore, all of the measures employed in the present study were existing measures with well-established evidence of reliability and validity.

Descriptive data along with the Cronbach's alpha's for each measure are summarised in Table 2. A minimum Cronbach's alpha of .70 was achieved for all measures indicating that the measures had a high level of internal consistency (Hair, Anderson, Tatham, & Black, 2006; Hinkin, 1998; Nunnally, 1978). The reliability and validity of the scales used in this research will also be revisited in the subsequent Results Chapter.

Table 2: Psychometric data for variables

Variable name	No. of items	Response scale	Cronbach's alpha
Proactivity	5	1-7	.85
Creative self-efficacy	4	1-7	.89
Creativity	4	1-7	.95

The measures used in both the employee and supervisor surveys are discussed in more detail next.

Measures in Employee Survey

The employee survey consisted of the scales for the independent variables pertaining to both the individual differences (*i.e.* proactivity and CSE) and the mediating variables of social networking parameters (*i.e.* weak and outside ties) and roles (*i.e.* brokerage and centrality) explained in Chapter Two. The specific scales used to assess proactivity and CSE will be discussed next.

Individual Difference Measures

Individual proactivity was measured using Porath and Bateman's (2006) scale, which was adapted from Bateman and Crant (1993). This five item scale asked participants to rate their proactivity levels (*e.g.* 'I always look for better ways to do things') on a seven-point likert scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). Previously, this scale achieved a Cronbach's alpha of .80 (Porath & Bateman, 2006) and more recently .71 (Mathisen & Bronnick, 2009). In the current study the scale had a Cronbach's alpha of .85.

With regard to discriminant validity, confirmatory factor analysis has found this scale to be empirically distinct from measures of feedback seeking, emotional control and social competence (Porath & Bateman, 2006). In terms of convergent validity, the scale has been found to correlate with other related measures in the expected direction. For example, Porath and Bateman (2006) found it was positively correlated with measures of learning goal orientation, performance-prove goal orientation and feedback seeking, while being

negatively correlated with a performance-avoid goal orientation (Porath & Bateman, 2006).

Creative self-efficacy (CSE) was measured using Tierney and Farmer's (2002) extended scale. The original scale (Tierney & Farmer, 2002) consisted of only three items, whereas for improved robustness an additional fourth item was added to create the extended scale. This scale required participants to reflect on their level of CSE (*e.g.* 'I have confidence in my ability to solve problems creatively'). Participants recorded their responses using a seven-point likert scale, ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). Previously, this scale achieved a Cronbach's alpha of .87 (Tierney & Farmer, 2002) and more recently .81 (Tierney & Farmer, 2011). In the current study the scale demonstrated a Cronbach's alpha of .89.

The validity of this scale has also been established. In terms of discriminant validity, confirmatory factor analysis has found this scale to be empirically distinct from measures of creative role identity and job creativity requirement (Tierney & Farmer, 2011). In terms of convergent validity, the scale has been found to correlate with other related measures in the expected direction. For example, Tierney and Farmer (2011) found it was positively related to supervisor creative expectations and negatively related to job-required creativity. The networking measure employed will be discussed next.

Social Networking Measure

Social network analysis was conducted using the methodology developed by Perry-Smith (2006), which was designed to measure closeness, duration, and frequency of relationships inside as well as outside of the workplace. A personnel roster was developed to furnish the

networking section of the employee survey in order to enhance the recall of participants. This method for recall enhancement has been advocated by a number of researchers in order to ensure an accurate measure of individual networking patterns is attained (Hansen, 1999; Marsden, 1990; Perry-Smith, 2006). Therefore, the personnel roster was designed to prime participants to respond with maximum recall. The present study roster contained 293 names of employees from across the participating organisation, listed in alphabetical order.

In order to assess inside ties, participants were asked to answer the following question: 'think back over the past two years, with whom do you communicate about work related topics?'. In answering this question, participants responded to three follow-up questions in relation to each of the members in their networks: 'how frequently do you communicate with each person on average?'; 'how many years has each relationship been in existence?'; and 'how close are you with each person?'. Participants were instructed to scan the personnel roster and respond to these three questions only in relation to contacts in their individual network. Three different scales were used for participants to respond to these three items: a six-point scale was used for the first item (1 = less often, 2 = several times a year, 3 = once a month, 4 = several times a month, 5= several times a week, 6 = daily); a four-point scale was used for the second item (1= less than 2 years, 2 = 2 to 5 years, 3 = 5 to 10 years, 4 = more than 10 years); and, a five-point scale was used for the third item (1 = acquaintance, 2 = distant colleague, 3 = friendly colleague, 4 = good friend, 5 = very close friend).

In order to measure outside ties, participants were instructed to generate a list of their external/outside ties, with this list restricted to no more than 20 names. Participants then had to answer the following question: 'think back over the past year, who are the people

outside of your workplace with whom you discuss any range of work related matters?'. In answering this question, participants responded to the same three questions asked previously in relation to inside ties (using the same three scales), only this time they responded in relation to each of the outside ties they had listed.

This measure (and its adapted versions) has been used by many researchers, and has good psychometric properties (Baer, 2010; Borgatti & Halgin, 2011; Perry-Smith, 2006). The measures in the supervisor survey will be discussed next.

Measures in the Supervisor Survey

The supervisor survey was designed to collect data in relation to the dependent variable (*i.e.* individual creativity). The specific scale assessing individual creativity will be discussed next.

Individual Creativity Scale

Individual creativity was measured using Baer and Oldham's (2006) individual creativity scale. This scale consisted of four items and asked supervisors to reflect on how creative a specific employee was (*e.g.* 'suggests many creative ideas that might improve working conditions at the TSG'). Supervisors recorded their responses using a seven-point likert scale, ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). Previously, this scale achieved a Cronbach's alpha of .71 (Baer & Oldham, 2006), while in the present study a Cronbach's alpha of .95 was achieved.

The validity of this scale has also been established. With regard to discriminant validity, this scale has been shown to be empirically distinct from Zhou and George's (2001)

original innovation scale, from which this measure of creativity was adapted. In terms of convergent validity, the scale has been shown to correlate with other related measures in the expected direction. For example, it has demonstrated a positive correlation with measures of education, job complexity, experienced creative time pressure, openness to experience and support for creativity (Baer & Oldham, 2006).

In both the employee and supervisor surveys there were sections pertaining to participant demographics. The employee demographic information provided the data for the control variables used in the study. The inclusion of control variables helps to ensure that the significance of any observed relationships is attributable to the variables of interest, over and above any effects of control variables. The specific control variables used in this study will be expounded next.

4.8   Control Variables

Age, education, gender, function and tenure were controlled for in the present study. While demographic information was required from employees and supervisors, only the employee data were included as controls in the analyses. The effects that each of these aforementioned variables potentially have on creativity have been well documented (Abra, 1989; Gilson & Shalley, 2004; Runco, 2004; Ruth & Birren, 1985). For example, there is evidence to suggest that younger individuals are more creative and males are more creative than females (Abra, 1989; Ruth & Birren, 1985). Therefore these demographic characteristics were used as control variables in order to rule out alternative explanations for the hypothesised relationships.

The need for control variables in empirical research is well established. Atinc and Simmering (2008) attested to the fact that the use of statistical control variables in management research has become routine and widespread. Use of control variables is thought to yield more accurate estimates of relationships among variables of interest (Spector & Brannick, 2011). Furthermore, Lavenberg and Welch (1981) explained that control variables can be used to construct unbiased estimators of criterion constructs. Each of the specific control variables used in the study will be discussed in more detail next.

Age

In this study, age was assessed as a continuous numeric variable, whereby respondents specified their age in years.

Based on past research, age was expected to be related to individual creativity. Ruth and Birren (1985) empirically assessed the relationship between age and creativity by studying a sample of 150 well-educated participants across a variety of age groups (46 persons between 25-35, 54 persons between 45-55, and 50 persons between 65-75 years). This study found that as age increased, creativity declined. The authors argued this was due to lowered speed of information processing, a lower degree of complexity in the information processed, and a reduced willingness to risk unconventional solutions to encountered problems as individuals age (Ruth & Birren, 1985).

More recently, Wu, Cheng, Ip, and McBride-Chang (2010) also found evidence to suggest that different age groups are associated with greater creative performance when performing different creative tasks. A group of sixth grade students along with a group of university students from Hong Kong were assessed in terms of their real-world problem, figural and

verbal creativity. This study showed that university students significantly outperformed sixth graders in the real-world problem tasks, while the reverse was observed for the figural tasks (Wu *et al.*, 2010). Additionally, no significant difference in performance was observed between the two age groups when it came to performance on verbal creativity tasks. This research further reinforces the relationship between age and individual creativity. Given the established association between age and creativity, age was controlled for in the present study.

Education

Highest level of education in the present study was a categorical variable with respondents selecting from one of six options (completed secondary school (year 12); basic vocational qualifications; skilled vocational qualifications; undergraduate degree or diploma; post-graduate degree or diploma; other). The six categories were coded 1-6 respectively.

Existing research indicates that education is related to individual creativity. Guilford (1950, p. 446) stated that "a creative act is an instance of learning…(and that) a comprehensive learning theory must take into account both insight and creative activity." This seminal work on creativity clearly implicated education, through which learning takes place, and which in turn sparked further research on the potential association between education and individual creativity. Fasko (2000-2001) acknowledged that theories of learning have greatly influenced our understanding of creativity. In this theoretical paper, Fasko (2000-2001) emphasised the potential for education to aid in the development of creative abilities from childhood to adulthood. Furthermore, it has been observed that creative thinking abilities can be developed through direct instruction and education programs (Guilford, 1967; Karnes *et al.*, 1961; Torrance, 1963).

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Empirical evidence of the association between education and creativity continues to mount. Ruth and Birren (1985) found the relationship between age and creativity to be affected by a range of social factors including educational goals and achievements. More recently, Runco (2004) examined the relationship between education and individual creativity, finding that more diverse educational experiences lead to greater creative capacity. These findings are clearly indicative of an association between education and individual creativity. Baer and Oldham (2006) controlled for the effects of education on individual creativity in their creativity research, with education found to be positively correlated with individual creativity. Given the established association between education and individual creativity, education was controlled for in the present study.

Gender

Gender was a dichotomous variable in this research, where males and females were coded as 1 and 2 respectively.

The relationship between gender and creativity has been found to co-vary with age, in that the older an individual the less creative they tend to be, especially in the case of males (Abra, 1989). Ruth and Birren (1985) tested the creativity of 150 individuals (86 men and 64 women) and found that men had higher test scores. Closer examination revealed that the men in the sample were able to draw on their technical and practical knowledge for some of the items, which may have given them an advantage over the women in the sample. It should be acknowledged that earlier research found women to be outstanding creative contributors within the arts and sciences, because women appeared to be more interested in the creative process itself than in its end product (Lehman, 1953; Maslow, 1971).

Ai (1999) investigated the relationship between individual creativity and academic achievement, in order to uncover potential differences in this relationship across genders. A total of 2264 randomly selected students (38 percent were boys and 62 percent were girls) from 68 schools in Spain were surveyed in terms of their creativity and academic achievements. Results showed that creativity related to academic achievement for both boys and girls. However, for boys 'flexibility' was the dominant creativity factor that related to all of the subject areas under investigation. This was distinguishable from the girl cohort, for whom 'elaboration' and 'fluency' proved to be the dominant creativity factors that related to the different subject areas under investigation (Ai, 1999). These results demonstrate the relationship between gender and creativity, with the men and women seemingly differentially predisposed to displaying different creative factors/behaviours. Given the evident relationship between gender and individual creativity, gender was controlled for in the present study.

Function

Function was a categorical variable in this research, with five categories (Production/Operation; Research & Development; Information Technology; Engineering; Other). The five categories were coded 1-5 respectively.

The function an individual fulfilled in the organisation was expected to be related to individual creativity. Ruth and Birren (1985) identified occupational roles/functions as important social factors that modify creative ability throughout life. Furthermore, Amabile *et al.* (1996) emphasised the importance of a climate for creativity at work, in which perceived work environments (*i.e.* high-creativity projects versus low-creativity projects) tend to influence creativity. Therefore, individual creativity is likely to be influenced by

individual perceptions of their function, such that roles/functions that are perceived to be high-creativity roles/functions are more likely to attract heightened creativity than those that are perceived to be low-creativity roles/functions.

Empirical examinations of this relationship also exist. Amabile *et al.* (1996) showed challenging work to be associated with greater creativity scores. Oldham and Cummings (1996) have similarly shown that individuals are most creative at work when they work on complex and challenging tasks. These findings demonstrate that the more challenging the function an individual performs, the more likely that individual is to exhibit greater creativity in their work. More recently, Smith *et al.,* (2005) studied top management teams and knowledge workers from across technology firms and found that functional heterogeneity had a positive relationship with knowledge creation and therefore might be expected to have a similar relationship with creativity. The decision was therefore taken to include function as a control variable because of its potential to influence individual creativity.

Tenure

Tenure was a continuous numeric variable in this research, with respondents specifying the number of years they had spent working at the TSG.

Tenure was expected to be associated with individual creativity. Baer, Oldham and Cummings (2003) found organisational tenure had a significant positive relationship with creativity in their investigation of the relationship between extrinsic rewards and employee creativity. According to Gilson and Shalley (2004) tenure effects individual creativity because individuals need to have enough knowledge of their task and the organisation in

order to be able to contribute creative ideas. Therefore, individuals who have greater tenure in an organisation can be expected to have higher levels of creativity. However, it has also been found that high levels of tenure may lead individuals to adhere to strict routines rather than seeking out new ways of performing, which could contravene individual creativity (Gilson & Shalley, 2004). A curvilinear relationship between tenure and creativity has therefore been identified, with moderate levels of tenure deemed optimal in relation to individual creativity (Gilson & Shalley, 2004).

Indeed, tenure has increasingly been employed as a control variable in creativity research (Baer *et al.*, 2003; Oldham & Cummings, 1996; Zhou, 2003; Zhou *et al.*, 2009). Given the identified relationship between tenure and individual creativity, tenure was controlled for in the present study. The specific techniques employed to analyse the data and test the proposed hypotheses will be expounded next.

4.9   Hypothesis Testing Analysis

This section will outline the statistical methods employed to validate the measures and test the hypotheses proposed in Chapter Two. First, the specific method of analysis undertaken to assess the networking parameters and roles of interest will be expounded.

Social Network Analysis (SNA)

Social network analysis (SNA) is a relatively new analytical method, which involves the use of mathematical and graphical techniques to represent the descriptions of social networks (Pryke, 2012). SNA therefore allows for various networking phenomena to be identified, assessed and depicted. This method involves matrix building and mapping which in turn leads to complex calculations of types and strengths of connections. In terms

of the present project, SNA was employed to assess the existence and significance of specific networking parameters (*i.e.* weak and outside ties) and roles (*i.e.* brokerage and centrality).

SNA relies on matrix development for data entry, manipulation and assessment (Perry-Smith, 2006; Pryke, 2012). Relevant matrices can be either unidirectional or bidirectional. Unidirectional matrices were employed in the present study, as identified relationships were assumed to be reciprocal in nature. This was in line with the procedure adopted by Perry-Smith (2006), where the *N_N* matrix of relationships was symmetrised, assuming that a tie existed if one member of a pair of actors reported a relationship.

Figure 5 depicts egocentric unidirectional relationships, where nodes represent individual actors:
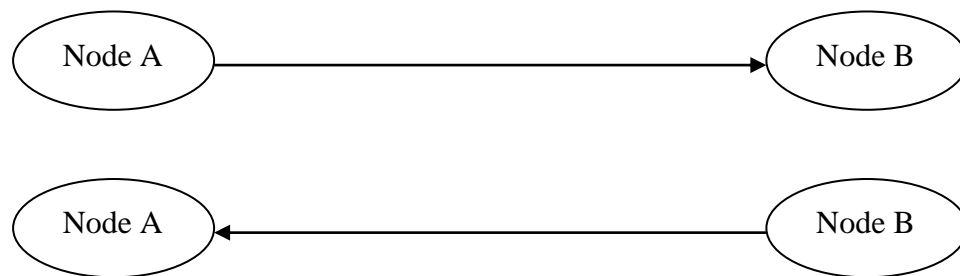
Figure 5: Unidirectional ties

Therefore, a unidirectional matrix consists of reciprocated ties, such that if Node A identifies a tie to Node B, then the reverse is automatically assumed. This differs from a bidirectional matrix which consists of the types of links depicted in Figure 6:
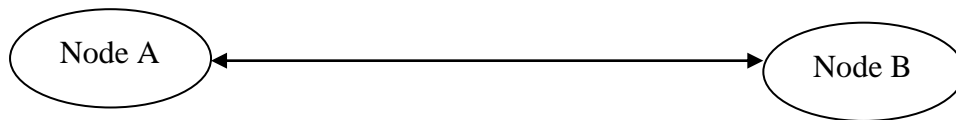
Figure 6: Bidirectional ties

A bidirectional matrix therefore consists of ties that may not be reciprocated or that may be reciprocated to varying degrees. The present application of unidirectional matrices, as opposed to such bidirectional matrices, reflects the established norm across management networking research (Burt, 2004, 2005; Perry-Smith, 2006).

Mapping ties across network matrices can highlight interesting clusters of data/ties which may warrant further investigation. Mapping unidirectional ties involves producing a bounded network/sociogram which depicts all of the ties identified in a studied network/matrix. While a bounded network map represents all of the connections identified amongst all of the nodes in a studied network, an egocentric network map (like those above representing unidirectional and bidirectional ties) represents the ties that an individual node has with others in their network (Burt, 2004; Marsden, 1990; Pryke, 2012). It should be acknowledged that such mapping efforts are undertaken both at the initial and latter stages of SNA for the purposes of screening/eye-balling and verifying findings respectively (Pryke, 2012). Figure 7 below clearly shows an individual node's egocentric network (*i.e.*

an individual actor's network ties) as well as a much more extensive bounded network (*i.e.* the full network within which the egocentric network is observed):
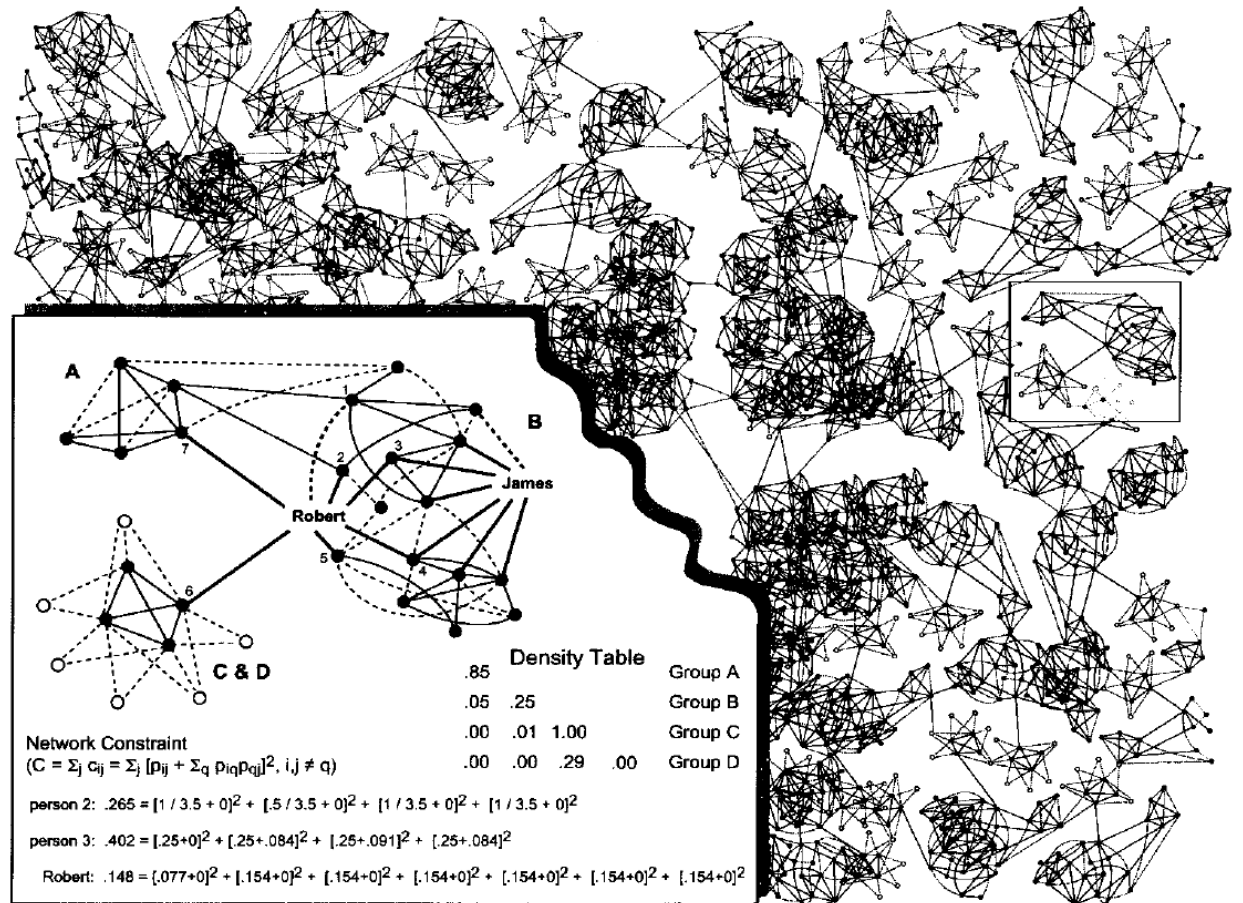
Figure 7: Example of an egocentric network within a bounded network (Burt, 2004, p. 352)

Reliability and validity have been well established for the SNA methodology, which has been widely employed across networking research (Borgatti *et al.*, 2009; Burt, 2004; Perry-Smith, 2006; Pryke, 2012; Zhou *et al.*, 2009). To bolster the psychometric soundness of SNA techniques in the present study, personnel rosters were employed (as detailed earlier). By providing participants with a roster of names to consider in relation to the networking items, participant recall was enhanced, which in turn improved the validity of

responses. The use of such rosters has long been heralded as an approach which improves both the accuracy and reliability of SNA research findings (Hansen, 1999; Marsden, 1990; Perry-Smith, 2006; Zhou *et al.*, 2009).

In order to conduct SNA to determine the number of weak ties, outside ties, brokerage and centrality three software programs were used. First, Excel and SPSS were employed to build the various network matrices from which the specific networking factors were assessed. These programs were also used to tally the total number of ties that individuals had in the studied network, the total number of outside ties they had identified, and the total number of either weak or strong ties (with only the weak ties used in subsequent analysis). UCINET (6 for Windows) software was then employed to determine the brokerage and centrality scores for each individual in the studied network. Pryke (2012) explained that centrality and betweenness centrality/brokerage could be calculated using the following equation:

$$C\frac{1}{D}(x) = \frac{in - degree\,(x) + out - degree\,(x)}{2(n-1)}$$

Here, $C\frac{1}{D}(x)$ represents the centrality value for network density (D), while in-degree refers to incoming relations and out-degree refers to outgoing relations. This equation implies an inevitable correlation between network density and centrality values for individual actors within an identified network. UCINET employs this equation to compute brokerage and centrality scores for each node/actor in the identified network.

UCINET also enabled the studied network to be mapped both in terms of the total bounded network and the individual egocentric networks of each network node. Pryke (2012) identified UCINET as a program which effectively allows the user to conduct a wide range of routines, produce a number of different outputs, as well as produce and manipulate diagrams through the 'NetDraw' function.

The focus of subsequent analysis was to validate the non-networking measures (*i.e.* creativity, proactivity and CSE) used in this study. This was done using confirmatory factor analysis (CFA), which will be explained next.

Confirmatory Factor Analysis (CFA)

As the measures employed in the present research had been validated in previous studies, confirmatory factor analysis (CFA) was used. According to Harris and Schaubroeck (1990, p. 338), CFA is "most appropriate for use with variables about which there has been a great deal of past empirical research and theory development" while exploratory factor analysis (EFA) is more appropriate for use in the initial stages of scale development (Kelloway, 1998). CFA was therefore ideal for validating the creativity, proactivity and CSE scales used in the present research as all of the scales had been used extensively in previous research.

CFA has several advantages over EFA. CFA allows more precision than EFA in evaluating the measurement model (Hinkin, 1995). This in turn ensures goodness-of-fit which bolsters the validity of identified factors. Additionally, CFA provides more flexibility than EFA, by way of allowing variation in the independence of error terms (DeVellis, 2003). These

advantages further reaffirm the appropriateness of CFA (as opposed to EFA) for the present research.

Kline (2011) explained that CFA analyses involve *a priori* measurement models, where both the number of factors and their correspondence with the indicators are explicitly specified. In this way, the validity of the factors/items that constitute the measures of interest can be confirmed via the corresponding loadings onto each indicator/scale. Factor loadings of .40 or above are considered 'significant' in defining a factor and this was the criterion used in the present study (Hair *et al.*, 2006; Hinkin, 1995).

The present research relied on the maximum likelihood estimation (MLE) method using AMOS 20 to perform CFA. This method allows the estimates of model parameters to be calculated all at once, thereby iteratively improving parameter estimates to minimise a specified fit function (Hair, Black, Babin, Anderson, & Tatham, 2010; Kline, 2011). As such, MLE is an effective alternative to the ordinary least squares method used in multiple regression and it is the most widely used approach in CFA (Kline, 2011). Furthermore, MLE performs well under a variety of less than optimal analytic conditions, including small sample size and moderate non-normality (Hair *et al.*, 2010; Hoyle & Panter, 1995; Myung, 2003). AMOS 20 also allows for full information maximum likelihood estimation (FIML).

In dealing with missing data for the CFA, full information maximum likelihood estimation (FIML) was employed. FIML is considered to be a superior technique for managing missing data and generally outperforms conventional methods including listwise and pairwise deletion, as well as the similar response pattern imputation method (Enders, 2001;

Enders & Bandalos, 2001; Kline, 2011). Put simply, FIML works by using all of the available information about the observed data, yielding unbiased parameter estimates (Enders, 2001; Enders & Bandalos, 2001). This technique will be discussed in more detail in the later section on structural equation modelling (SEM).

A number of fit indices have been reported in the management literature, which need to be considered here. Hair *et al.* (2006) recommended that multiple fit indices be used to assess a model's goodness-of-fit to the specified data. More specifically, fit indices should include: 1) The chi-square value and the related degrees of freedom (*df*); 2) an absolute fit index (*i.e.* GFI, RMSEA, or SRMR); 3) an incremental fit index (*i.e.* CFI or TLI); 4) one goodness-of-fit index (*i.e.* GFI, CFI, TLI); and, 5) one badness-of-fit index (*i.e.* RMSEA, SRMR). The current study therefore reports chi-squared, *df*, CFI and RMSEA in terms of the factor analyses.

First, the chi-squared statistic measures the difference between the observed and estimated covariance matrices (Hair *et al.*, 2006). The comparative fit index (CFI) is an incremental fit index that is an improved version of the normed fit index (NFI), where NFI is a ratio of the difference in the chi-square value for the fitted model and the null model divided by the chi-square value for the null model (Hair *et al.*, 2006). The possible range of CFI values is 0 to 1, where values greater than .90 represent reasonably good fit of the model to the data (Hair *et al.*, 2006). The Root Mean Square Error of Approximation (RMSEA) corrects for the tendency of the chi-square statistic to reject models with large samples or a large number of observed variables (Hair *et al.*, 2006). Browne and Cudeck (1993) suggested that RMSEA values of .05 or less indicate a close model fit, values between .05 and .08 signify a reasonable fit, and values equal to or greater than .10 indicate poor fit.

Reliability of the multi-item scales was also assessed, using Cronbach's alpha coefficients. According to Hair *et al.* (2006), a Cronbach's alpha of .70 is the acceptable lower limit required of established scales in order for them to be deemed reliable. An alpha of .70 was therefore used as the cut-off point for keeping a measure for further analysis in the present research. The earlier section on survey measures established that the present scales were all internally consistent, as all Cronbach's alphas exceeded .70 (refer to Table 2). Following the CFAs and the reliability analyses composite variables/composite scale scores were created to be inputted into subsequent SEM analysis. The SEM analyses conducted to test hypotheses will be discussed next.

Structural Equation Modelling (SEM)

Structural equation modelling (SEM) was used to test the hypothesised relationships between individual differences, networking and creativity. SEM is useful when testing direct effects because it corrects for measurement error which if left uncorrected would confound results (Kline, 2011). Therefore, SEM is a particularly powerful technique for mapping relationships. SEM has also been deemed an advantageous analytical technique in management development research because it enables the development of new relationships through theoretically accepted modification indexes (Cheng, 2001).

SEM allows for the assessment of observed as well as latent variables (*i.e.* unobserved variables). This renders the results more robust than would be the case with alterative analytical methods such as regression techniques which only allow for the assessment of observed variables (Kline, 2011; Tabachnick & Fidell, 2001). Furthermore, many types of structural models exist which are designed to assess different types and levels of associations, with varying degrees of complexity (Kline, 2011). This highlights the

relatively broad practical applications of SEM as compared to alternative measurement techniques.

The present research aimed to leverage several advantages associated with SEM, in the assessment of the hypothesised relationships. SEM allows for the assessment of multiple relationships simultaneously, whereas multiple regression is restricted to examining a single relationship at a time (Cheng, 2001). Multiple regression cannot directly propose potential relationships in a model and cannot ensure model-data fit, both of which are possible through SEM procedures (Cheng, 2001). The use of scales can cause reliability and validity issues as the indicators of a scale can have sizeable measurement errors. SEM takes measurement errors into consideration, allowing for scale validation and modification if necessary to improve the psychometric properties of the scale (Cheng, 2001). This unique characteristic of SEM means that once a model has been designed to test a number of hypothesised relationships, it must be vetted in terms of the psychometric properties of the scales and the model-data fit; this constitutes the measurement model (Kline, 2011). Therefore, prior to testing any of the hypothesised relationships, the measurement model must hold.

This technique is also particularly effective when testing for mediation (Preacher & Hayes, 2004), which was the case in the present study. SEM not only effectively controls measurement error but also offers interesting alternative ways to explore the mediation effect. In fact, the inherent capability of SEM to correct measurement error increases the likelihood that indirect effects, if present, will be discovered (Preacher & Hayes, 2004). Furthermore, SEM allows for the assessment of more complicated mediation models,

where there are several mediators operating in parallel and any combination of latent and observed variables (Kline, 2011; Preacher & Hayes, 2004).

The present SEM analysis involves multiple mediator models as opposed to separate single mediator models. Therefore, the dependent variable will be regressed on all of the potential mediators, rather than on one potential mediator at a time. To date, very few authors have focussed on simultaneously testing multiple indirect effects (as opposed to testing separate single mediation effects), despite the many advantages of this approach (Preacher & Hayes, 2008). A major advantage of this approach is that it allows different theories to be pitted against each other in a single model, because the mediation effect of a particular mediator can be determined with the presence of other mediators in the model. Moreover, assessing multiple pathways to an outcome means that multiple theories can be simultaneously assessed and compared. In comparison, just assessing a single pathway to an outcome means that a single theory may be assessed and subsequent comparisons can be tenuous (Hayes, 2009; Preacher & Hayes, 2008). Additional advantages include the reduced likelihood of parameter bias due to omitted variables since all mediators are included in a single model. The relative magnitudes of the specific indirect effects associated with all mediators can also be determined when all of the mediators are included in a single model (Preacher & Hayes, 2008). Therefore, through the use of multiple mediator analysis, the present study will assess multiple theories pertaining to the individual difference and networking perspectives on creativity simultaneously.

Multiple mediators will be examined by employing the joint effects mediation approach as part of the SEM analysis. This approach requires the path from the predictor to the mediator to be statistically significant, as well as the path from the mediator to the criterion

variable to be statistically significant (while controlling for the predictor), in order for mediation to be established (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Zhu, Cooper, Thomson, Cieri, & Zhao, 2013). The joint test differs from the more widely used method developed by Baron and Kenny (1986), where the criteria for establishing mediation also requires the independent variable to be a predictor of the dependent variable. The Baron and Kenny (1986) method has Type I error rates that are too low (across a variety of simulation conditions) and very low power unless the sample size is large (MacKinnon *et al.*, 2002). Conversely, the joint test is a particularly powerful mediation technique, which has been found to have the best balance of Type I error and statistical power when compared with 13 other methods of assessing mediation effects (MacKinnon *et al.*, 2002)

The Sobel technique provides another viable option for assessing mediation; however, it is less powerful than the joint effects test. Therefore, the present research employs the Sobel test to merely confirm the significance of the indirect effects found using the previously explained joint test. The Sobel test method defines the indirect effect of the predictor (*i.e.* *X*) on the criterion variable (*i.e.* *Y*), as the product of the path from the predictor to the mediator variable (*i.e.* path *a*) and the path from the mediator to the criterion variable (*i.e.* path *b*) (Preacher & Hayes, 2004). Thus the indirect effect of *X* on *Y* is a product of paths *a* and *b*, or *ab*. Standard errors of *a* and *b* are represented by s_a and s_b respectively. The standard error of the indirect effect s_{ab} is given by Mood, Graybill, and Boes (1974) and Sobel (1982) as follows:

$$s_{ab} = \sqrt{b^2 s_a^2 + a^2 s_b^2 + s_a^2 s_b^2}$$

The utility and performance of the Sobel test have been well established, yet the significance of the indirect effect is still very rarely tested (Preacher & Hayes, 2004). This trend needs to be altered given that the Sobel test is superior in terms of both power and intuitive appeal as a product of coefficients estimate (MacKinnon, Fairchild, & Fritz, 2007; MacKinnon *et al.*, 2002).

Simple SEM models testing the direct paths between each of the individual difference predictors (*i.e.* proactivity and CSE) with the criterion variable (*i.e.* creativity) allow for a determination to be made regarding whether full or partial mediation is achieved in the more sophisticated multiple mediator models. Full mediation holds if an independent variable has no statistically significant direct effect on the output/criterion variable or is reduced to zero when the mediator is controlled for. Partial mediation holds if the independent variable has an effect on the output variable both directly and indirectly through the mediator (Baron & Kenny, 1986). Therefore, where simple SEM results in a significant direct path from the predictor to the criterion variable, partial mediation has been achieved in the mediation model. Whereas when the simple SEM results in a non-significant direct path from the predictor to the criterion variable full mediation has been achieved in the mediation model.

The fit indices that were explained in the earlier section on CFA also apply for SEM. The fit of the present SEM models was therefore assessed in terms of Hair's *et al.* (2006) specifications, such that several fit indices were used to verify model-data fit. As was previously explained, Hair *et al.* (2006) recommended that multiple fit indices that address different aspects of model-data fit be considered when assessing a model's goodness-of-fit.

In line with this recommendation, the current study used chi-square, df, CFI and RMSEA statistics (all of which were explained in the earlier CFA section).

SEM can be sensitive to missing data, which is why full information maximum likelihood estimation (FIML) was used to deal with missing data in the present study. This technique effectively utilises all available data during parameter estimation (Enders & Bandalos, 2001). More specifically, FIML relies on alternative data from the missing cases being used as auxiliary information to infer probable values for the missing cases, which reduces parameter estimate bias (Enders, 2001). FIML is therefore favoured by researchers and statisticians on the basis of efficiency as it yields estimates with lower sampling variability (Enders, 2001; Enders & Bandalos, 2001). Consequently, FIML is a superior technique for handling missing data, and generally outperforms conventional methods including listwise and pairwise deletion, as well as the similar response pattern imputation method (Enders, 2001; Enders & Bandalos, 2001; Kline, 2011).

FIML computations can be relatively complicated but need to be discussed to further highlight the benefits of the method. The FIML approach computes a casewise likelihood function, using only those variables that are observed for case i (refer to the equation below). Assuming multivariate normality, the casewise likelihood of the observed data is obtained by maximising the following function:

$$\log L_i = K_i - \frac{1}{2}\log|\Sigma_i| - \frac{1}{2}(x_i - \mu_i)'\ \Sigma_i^{-1}(x_i - \mu_i)$$

where K_i is a constant that depends on the number of complete data points for case i, x_i is the observed data for case i, and μ_i and Σ_i contain the parameter estimates of the mean

vector and covariance matrix respectively, for the variables that are complete for case i (Enders & Bandalos, 2001). The casewise likelihood functions are accumulated across the entire sample and maximised as follows:

$$\log L(\mu, \Sigma) = \sum_{i=l}^{N} \log L_i$$

The first equation reaffirms that all available data are used during parameter estimation and case i contributes to the estimation of all parameters for which there are complete data. Less obvious is the fact that the inclusion of data from partially completed cases contributes to the estimation of parameters that involve the missing portion of the data as well. Moreover, values for the missing data points are implied by the observed values, and the inclusion of the partially complete data increases the precision and accuracy of the parameter estimates.

The present study relied on AMOS 20 to conduct the SEM analysis, which allowed FIML to be employed (Enders, 2001; Enders & Bandalos, 2001). This is a widely used statistical package, most commonly employed for CFA and SEM (Kline, 2011). AMOS 20 also allowed for maximum likelihood estimation (MLE) in SEM which enabled estimates of model parameters to be calculated simultaneously (Hair *et al.*, 2010; Kline, 2011).

4.10 Conclusion

The aim of this chapter was to outline the research methodology used to test the hypotheses developed in Chapter Two. First, the design of the study was detailed with justification for the cross-sectional, quantitative approach provided. Recruitment procedures were then detailed, with particular attention paid to the initial consultations that

were conducted to ensure maximum employee and supervisor participation. The use of multiple sources for data collection (*i.e.* from employees and their supervisors) was highlighted as a key strength of the research design that was likely to preclude CMV issues.

All measures used in this study were drawn from well established, reliable and valid scales. To further ensure the accuracy of these measures, reliability analyses were run for all the independent and dependent variables (excluding the networking variables). Furthermore, the measures were validated using CFA. The specific methods of analysis employed to assess the social networking parameters and roles of interest and to test the hypotheses were also detailed.

The following chapter will describe the analytical procedure undertaken to test the hypotheses proposed in Chapter Two along with the results of these analyses. The chapter will detail the data screening and preparation procedures employed. Descriptive data will also be discussed in relation to the sample demographics and the specific scales used. Finally, results from the SNA, CFA and SEM analyses will be reported.

5   RESULTS

5.1   Introduction

In Chapter Two, the individual difference and social networking perspectives on creativity were reviewed and based on the integration of these perspectives ten hypotheses were developed. These hypotheses were designed to examine the relationships between individual differences and creativity, and to examine the potential of networking variables to mediate the relationship between individual differences and creativity. Chapter Three discussed the specific study context, the TSG, a large Australian based IT organisation. Chapter Four then outlined the study design before describing the study sample, data collection procedures and measures, along with the specific data analysis techniques employed. Justification was provided for the use of SNA, CFA and SEM analyses to test the hypothesized relationships. The results of these analyses will form the focus of this chapter.

This chapter first reports the findings from the preliminary assessment of the data. This assessment was undertaken to ensure the data met the assumptions required for multivariate analysis. In turn, descriptive statistics on the individual difference, networking and creativity constructs, along with the intercorrelations between these variables are provided. The reliability and validity of the scales used in the present study are then reaffirmed. This is followed by the results of the SNA, CFA and SEM analyses used in the study to test the hypotheses. The results are then summarised before the chapter concludes.

5.2   Data Assessment

Prior to undertaking any preliminary statistical analysis, the raw data files were downloaded from the 'results' section of the Qualtrics program and were collated, such that all of the relevant supervisor and employee data were contained in a single spread sheet. The data were then screened to minimise alternative findings due to inaccurate data entry. This procedure meant the data were double checked with the original web-based survey for consistency. Minor errors in data entry (*e.g.* incorrectly transposed data from Qualtrics output to Excel/SPSS file) were found through this method and were corrected. The collated data were subsequently screened for non-response bias, sample size, missing data, outliers and normality. These aspects of data screening will be discussed in more detail next, beginning with non-response bias.

Non-Response Bias

Non-response bias was assessed by comparing early and late respondents, as recommended by Armstrong and Overton (1977). Late respondents are assumed to typify the characteristics of non-respondents. The responses received were split into three groups, those that responded after the initial survey email was sent, those that responded after the first reminder email was sent (one week after the initial survey email was sent), and those that responded after the second and final reminder email was sent (two weeks after the initial survey email was sent).

Responses in relation to all the major variables for the three groups were then compared using an ANOVA. No statistically significant differences were found across the three groups. This indicated that response bias was not likely to be a major concern. Sample size issues were the next potential concern to be addressed.

Sample Size

An adequate sample needed to be secured for the present research, in order for the results to be precise, valid and generalisable (Kline, 2011; Tharenou *et al.*, 2007). Different analytical methods require different minimum sample sizes. According to Kline (2011), both CFA and SEM are techniques which require relatively large samples (Kline, 2011).

Although CFA has been recognised as a large sample technique (Kline, 2011) no definitive rules for sample size in the application of this technique have been established (MacCallum, Widaman, Zhang, & Hong, 1999). As a general rule, having at least 300 cases for factor analysis is advised (Tabachnick & Fidell, 2001). However, in the case of CFA that presents solutions with high loading marker variables (>.80) such large sample sizes are not required; in fact, 150 cases are argued to be sufficient (Guadagnoli & Velicer, 1988). The present solutions demonstrated consistently high factor loadings (refer to the upcoming section on CFA for specific factor loadings), so the current sample of 180 employees (and 51 supervisors) was deemed adequate for CFA.

Addressing the ratio of the number of cases to observed variables can also serve as a good guide to determining adequate sample size for CFA. Cattell (1978) recommended a ratio no less than three to six, whereas Everitt (1975) recommended no less than 10. Given that there were 180 participants in the current study and 13 observed variables, the case to observed variable ratio was 14. This represents an adequate ratio and therefore adequate sample size for conducting CFA.

SEM has similarly been recognised as a large sample technique (Cheng, 2001; Kline, 2011). SEM requires a relatively large sample size in order to fit the data and identify

significant paths among a specific number of parameters. Therefore, SEM requires that the sample size be large relative to the number of parameters in the model (Cheng, 2001; Kline, 2011). Although a minimum sample size of 200 is generally advisable for SEM studies, exemptions can be made for studies where the population is restricted in size (Kline, 2011). This was the case in the current research.

The present population size was restricted through the sampling of employees and corresponding supervisors instead of more simply sampling all members of a target population/organisation. More specifically, although the total number of respondents was 231 (*i.e.* 180 employees and 51 supervisors), matching the employee and supervisor data for individual level analysis meant that only the 180 employee cases constituted the study's final sample. Furthermore, the study sample was restricted in size in order to accommodate the reciprocal networking data, excluding all data pertaining to bidirectional networking nodes/respondents and to organisational members who were included in the personnel roster out of interest to the participating organisation but who would not respond to the employee survey (refer to the procedure section of Chapter Four for details). The present sample of 180 cases was therefore deemed adequate for SEM analysis.

Social network analysis (SNA) provides alternative sample size prescriptions, which focus not on the number of participants required, but on the connections between them. Thus a minimum of two nodes could suffice if merely the existence of a single connection/tie was of interest to the researcher. More participants are therefore required for the assessment of more complicated networking phenomena (Burt, 2004; Pryke, 2012). The network identified in this research consisted of 180 nodes and can thus be deemed a sizeable network for examination.

As was explained in the previous chapter, the sample size was reliant on matching employee and supervisor responses. Therefore, any employee data that was not accompanied by corresponding supervisor data was discarded and supervisor data that was not accompanied by corresponding employee data was also discarded. This matching process can result in a somewhat reduced sample size. Therefore, securing an adequate sample size when matching employee and supervisor data can be particularly difficult. Given the current sizeable sample, these issues were effectively overcome (refer to the preceding Methodology Chapter for details on how these issues were managed). Moreover, these issues were effectively managed to ensure that the sample secured was adequate in size for all of the intended analytical procedures used to test the hypotheses (*i.e.* SNA, CFA and SEM). Missing data was the next potential concern to be addressed.

Missing Data

Data were screened for missing values. Univariate descriptive statistics of all variables were examined to determine the percentage of missing values. In terms of the social networking data, missing values are not problematic as it is highly improbable that every member of an organisation/network is in regular contact with every other member of their organisation/network. The presence of missing values across the nodes can therefore be considered meaningful in the case of SNA. Prior to conducting SNA a network matrix was developed to depict the existence, absence and reciprocity of ties (where absence of ties was represented by missing values). This matrix was then further refined to represent a unidirectional matrix, where the existence and reciprocity of ties meant that some originally missing values were changed to reflect the existence of a reciprocal relationship. This will be discussed in further detail in the upcoming section on SNA.

In terms of the other variables, missing values could have proved problematic, particularly in a small to moderate data set (Tabachnick & Fidell, 2001). More specifically, missing values can adversely affect both CFA and SEM analyses. Missing values analysis revealed that the data did not contain high levels of missing data, with all variables having less than 14 percent missing values (Scheffer, 2002). It was therefore not necessary to delete any cases due to a high proportion of missing values. Table 3 displays the percentage of missing data across the scales.

Table 3: Missing data percentages across scales

Scale	Missing values percent
Creativity	1.7%
Proactivity	13.3%
Creative self-efficacy	13.3%

Missing data were managed using full information maximum likelihood estimation (FIML), which was explained in the preceding Methodology Chapter. FIML has been recognised as a superior technique for handling missing data, as it uses all available information about the observed data and in turn yields parameter estimates with less bias (Enders, 2001; Enders & Bandalos, 2001; Kline, 2011). The use of this technique is also said to benefit both CFA and SEM analyses (Enders, 2001; Enders & Bandalos, 2001; Kline, 2011). Outliers were the next potential concern to be addressed.

Outliers

Data were screened for outliers. Univariate descriptive statistics for all variables were examined to determine those values that did not fall within the possible response range for

each scale (*e.g.* 1-7). All continuous variables were found to possess means and standard deviations within a plausible range. There was only a single case of a significant outlier existing in the social networking data where one individual identified all other members of the identified network as contacts. Given that outliers can occur due to either data entry error or differences in participants (Stevens, 1992) this particular outlier was attributed to the latter explanation and was therefore kept in the sample.

Outliers are known to have a significant influence on multivariate analyses via their effects on regression coefficients and standard errors, along with the overall variance explained (R^2) (Cohen, Cohen, West, & Aiken, 2003). Therefore, even where a case may be only moderately extreme on component terms *X* and *Y* separately, the product of these values (*e.g. XY*) may result in an extreme value. This can create spurious effects or mask *a priori* hypothesised effects (Cohen *et al.*, 2003). With only a single significant outlier (which can be justified in terms of the social networking data), outlier-related adverse effects were not a significant concern in the present research. Normality issues were the next potential concern to be addressed.

Normality

The normality of data requires the underlying distribution of a random variable to be normally distributed, which can be tested through specific statistical inference procedures (D'Agostino, Belanger, & D'Agostino Jr, 1990). The data were tested by estimating the extent of skewness and kurtosis (which are both components of normality) across variables. Skewness indicates the symmetry of distributions (*i.e.* when the mean is not in the centre), and kurtosis indicates the peakedness of distributions (Tabachnick & Fidell, 2001). Significance tests for both skewness and kurtosis involve the calculation of z scores

for each variable (Tabachnick & Fidell, 2001). The following equation can be used to calculate z scores for skewness:

$$z = \frac{S - 0}{Ss}$$

where S is the reported value for skewness and Ss is the reported standard error for skewness. A similar equation is also used to calculate the z score for kurtosis:

$$z = \frac{K - 0}{Kk}$$

Again K is the reported value for kurtosis and Kk is the reported standard error for kurtosis. Tabachnick and Fidell (2001) have recommended that where z scores are ±3, variables need to be examined for outliers and where data entry was the cause, cases need to be cross-checked with the original survey data. Given that no outliers were present as a result of data entry errors in the present data set, the z scores for skewness and kurtosis were calculated only once for all of the scales.

Tharenou *et al.* (2007) have more recently suggested that skewness and kurtosis values should not exceed ±2 and ±5 respectively. In line with this relatively recent prescription for normality assessment, the present data demonstrates acceptable skew (*i.e.* z scores not greater than ±2) and kurtosis values (*i.e.* z scores not greater than ±5). Even more recently, Kline (2011) has established that acceptable levels for skewness and kurtosis are those that do not exceed ±10, which further highlights the acceptable levels of skewness and kurtosis

observed in the present data. Therefore no further data transformations were required. Table 4 displays the skewness and kurtosis scores for the variables.

Table 4: Skewness and kurtosis statistics

Scale	Skewness	Kurtosis
Creativity	-.75	.03
Proactivity	-1.26	3.37
Creative self-efficacy	-1.41	4.28

This process of screening for non-response bias, sample size, missing data, outliers and normality ensured the data was ready for subsequent analysis. Next, the descriptive statistics for the data will be discussed.

5.3   Descriptive Data

Means, standard deviations, and actual ranges for proactivity, CSE and creativity are presented in Table 5.

Table 5: Means, standard deviations, minimums and maximums for studied scales

Scale	Mean	SD	Min	Max
Creativity	5.19	1.20	2	7
Proactivity	5.19	.96	1	7
Creative Self-Efficacy	5.64	.92	1	7

Examination of the means demonstrates that on average, supervisors rated the creativity of the individual members of their teams slightly lower and with greater variation (M = 5.19, SD =1.20) relative to the individual employee-evaluations of their CSE (M = 5.64, SD = .92). Comparable means were observed for both proactivity (M = 5.19) and creativity (M = 5.19).

Social networking data is commonly assessed via matrices so a different set of descriptive statistics apply in the case of SNA variables (Pryke, 2012). First, social networking data need to be described in terms of matrix dimensions and directionality. In the present study, the *N_N* matrices can be specifically described as 180_180 matrices. In terms of directionality, unidirectional matrices were employed, meaning that identified relationships are assumed to be reciprocal in nature (refer to Chapter Four for more details on unidirectional matrices).

The networking data can be further described in terms of means, standard deviations and actual ranges, only after the unidirectional matrix representing all of the ties in the identified network is developed, weak ties are categorised and counted, outside ties are counted, and brokerage and centrality scores are determined (all of which was outlined in the preceding Methodology Chapter and will be detailed in the upcoming section on SNA). These descriptive statistics are represented in Table 6.

Table 6: Means, standard deviations, minimums and maximums for social networking variables

Variables	Mean	SD	Min	Max
Weak ties	12.74	14.03	1.00	146.00
Outside ties	3.87	3.38	1.00	20.00
Brokerage	.47	2.98	.00	39.86
Centrality	28.52	19.91	3.00	179.00

These descriptive statistics show that on average, individuals in the identified network were associated with weak ties (M = 12.74, SD = 14.03) and outside ties (M = 3.87, SD = 3.38); and, acted as brokers (M = .47, SD = 2.98) and central players (M = 28.52, SD = 19.91). In terms of networking parameters, more respondents identified weak ties (as opposed to outside ties), while in terms of networking roles more respondents identified centrality (as opposed to brokerage). It is noteworthy that brokerage was the only networking role that some respondents did not even minimally associate with (the minimum in the range of scores was .00). Table 7 reports the intercorrelations between all of the variables.

Table 7: Intercorrelations among variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1. Creativity	**(.95)**											
2. Proactivity	.17*	**(.85)**										
3. CSE	.23**	.64**	**(.89)**									
4. Weak Ties	.08	-.00	-.01	-								
5.Outside Ties	-.17	.03	.01	-.10	-							
6. Brokerage	.01	-.35**	-.40**	-.01	.01	-						
7. Centrality	-.06	-.21**	-.23**	-.03	.16	.65**	-					
8. Age	.13	.02	.08	-.05	-.06	.07	.23**	-				
9. Gender	-.17*	.01	-.16*	-.04	-.10	-.05	-.07	-.01	-			
10. Education	.13	.09	.02	-.04	.10	-.00	-.01	.05	.14	-		
11. Function	.01	-.05	.02	.00	-.02	.00	.02	.10	.11	.20*	-	
12. Tenure	.02	-.10	-.05	.00	-.04	.08	.31**	.47**	-.08	-.13	.02	-

Note: Scale reliabilities are shown in bold in parenthesis; * p < .05, ** p < .01 (two tailed).

As expected, there were significant positive correlations between creativity and the individual differences of proactivity (r = .17, p < .05) and CSE (r = .23, p < .01). A significant positive association was also observed between the two individual difference variables of proactivity and CSE (r = .64, p < .01). Brokerage had significant negative associations with proactivity (r = -.35, p < .01) and CSE (r = -.40, p < .01) Centrality also exhibited significant negative correlations with proactivity (r = -.21, p < .01) and CSE (r = -.23, p <.01). Centrality had a significant positive association with brokerage (r = .65, p < .01). In relation to the demographic characteristics, age had a significant positive association with centrality (r = .23, p < .01); gender was significantly negatively related to creativity (r = -.17, p < .05) and CSE (r = -.16, p < .05); function had a positive association with education (r = .20, p < .05); and, tenure had significant positive correlations with centrality (r = .31, p < .01) and age (r = .47, p < .01). The reliability and validity of the scales used in this study will be reaffirmed next.

5.4   Reliability and Validity

All of the measures used in testing the hypotheses postulated in Chapter Two were established measures with evidence of adequate reliability and validity. All summated scale values used in the analyses were constructed in line with the procedures outlined in the original studies. Furthermore, all scale items were used in their original form. As previously reported, all of the scales used in the present study had an acceptable level of reliability which were well above the general agreed upon lower limit of .70 (Hair *et al.*, 2006) (refer to Table 2 or the parentheses in Table 7 for Cronbach's alphas).

In addition, adequate convergent and discriminant validity was found for all scales. In Table 7 discriminant validity is further evidenced by the fact that the scale reliabilities are higher than the correlations amongst the different measures (Campbell & Fiske, 1959; Podsakoff & Organ, 1986). For example, the reliability of the creativity scale (.95) is higher than the correlation between creativity and proactivity (.17). Discriminant validity was further established via confirmatory factor analysis, which will be discussed in the next section on hypothesis testing.

5.5   Hypothesis Testing

A series of statistical analyses were undertaken in order to test the proposed hypotheses. After the data were thoroughly screened, SNA was undertaken to determine the scores and significance scores pertaining to the networking variables. These scores were then inputted into subsequent analysis. The present measures assessing creativity, proactivity and CSE needed to also be validated before the present hypotheses could be tested. For this purpose, CFA was employed. Finally, SEM was used to combine the social networking analysis outcomes with the individual difference and creativity data, in order to test the hypothesised relationships. The specific social networking analyses undertaken will be discussed before the CFA results and the SEM models are presented.

Social Network Analysis

An important assumption of SNA is that all members in the studied network contribute their responses via participation (Pryke, 2012). In this case the assumption was upheld because screening procedures to ensure only those employees that responded to the social networking section of the employee questionnaire were included meant that a fully furnished matrix was developed for analysis. Furthermore, the nature of a unidirectional

matrix is such that it precludes unreciprocated relationships and therefore consists of fully furnished/reciprocated responses (Perry-Smith, 2006; Pryke, 2012).

SNA requires that the existence of ties be mapped before any further analyses of social networking data can be undertaken. Accordingly, the social networking data was organised into unidirectional matrices of 180 by 180 surveyed employees, which were then inputted into UCINET for assessment. Importantly, SNA requires a number of matrices to be developed in order to assess the different networking variables in UCINET. The present research required two separate network matrices for analysis of the networking phenomena under investigation, one mapping the existence of ties and the other mapping strength of ties.

The first network matrix developed and tested consisted of dichotomous data (*i.e.* '0' = no ties; '1' = tie) mapping the existence of ties across the studied network. In line with the procedure employed by Perry-Smith (2006), the *N_N* matrix (180_180 matrix) of relationships was symmetrised, assuming that a tie existed if one member of a pair of actors reported a relationship. This was done in direct recognition that lack of reciprocity may also characterise weak relationships (Granovetter, 1973), which are of importance in the present research. Among the pairs where there was not mutual agreement about the existence of a relationship only 17.8 percent involved the reporting actor indicating a strong relationship. This pattern suggests that most instances of disagreement involved weaker relationships. Given the importance of weak ties for creativity, retaining these types of relationships in the data was critical and was in line with the methodology employed by Perry-Smith (2006).

SPSS was used to describe the existence of ties matrix, which showed that the smallest number of connections/ties identified by an individual participant was three while the highest was 179 (M = 28.52; SD = 19.86). UCINET was then used to map the connections in the existence of ties matrix. The following sociograms depict the ties identified across the bounded network (Figure 8) and the size of individual network nodes relative to the size of their individual networks (*i.e.* number of individual connections) (Figure 9).
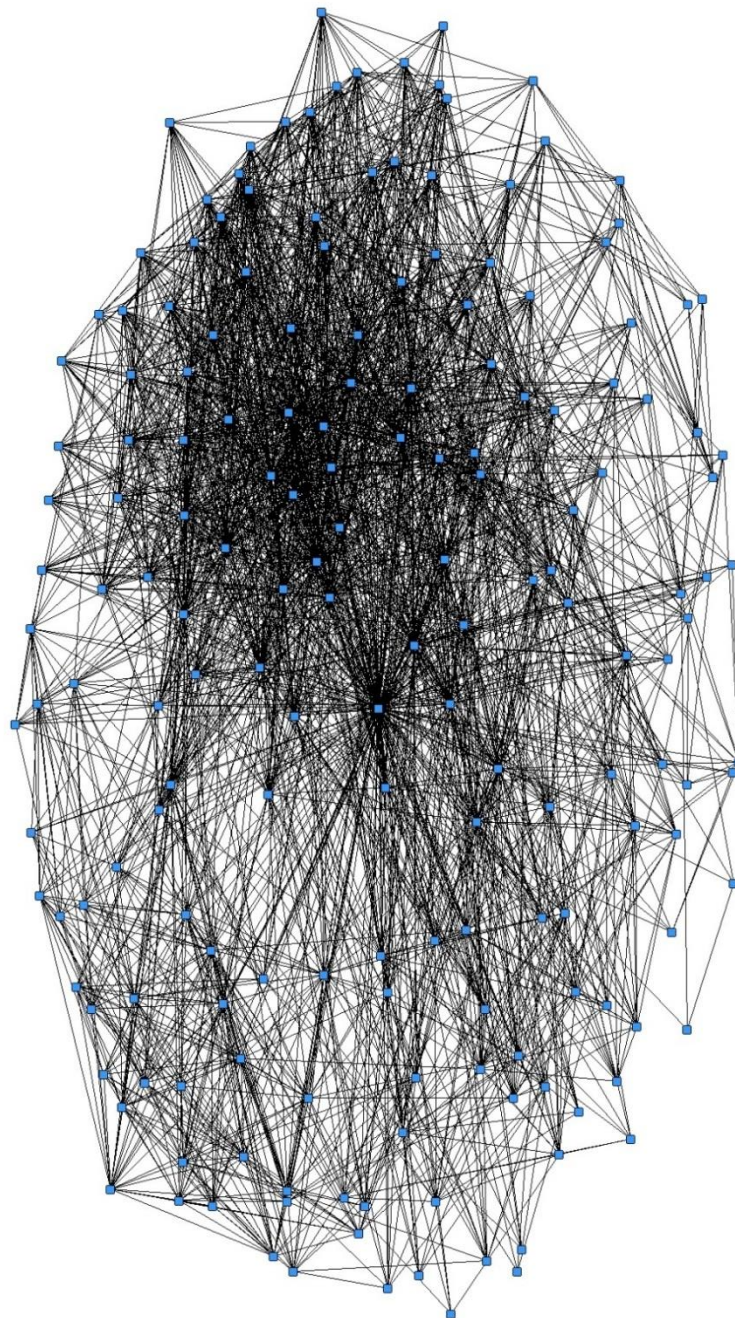
Figure 8: Sociogram illustrating the identified bounded network
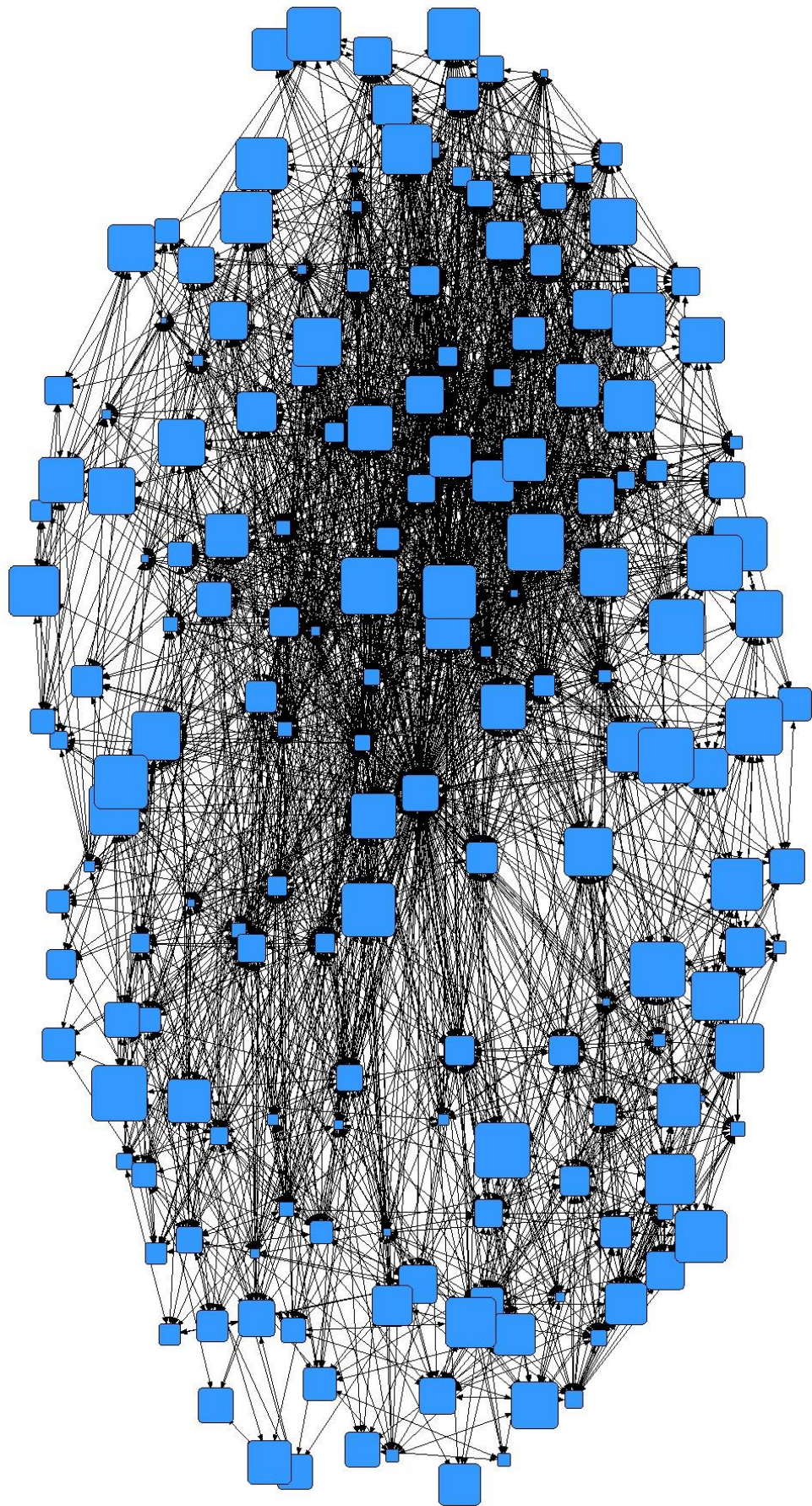
Figure 9: Sociogram illustrating the number of ties per network node

The strength of ties was the next point of assessment. This was done by developing a tie strength matrix, categorising the data according to weak and strong ties (*i.e.* the networking matrix including the strength scores pertaining to the network associations between nodes). Weak ties were those that involved less frequent communication (either a '1' = less often,'2' = several times a year scores on the survey, or a '3' = once a month). Strong ties were categorised as those involving frequent communication (either '4' = several times a month scores on the survey, '5' = several times a week or '6' = daily). These categories were adopted from Perry-Smith's (2006) strength of ties measurement approach. The strength of ties matrix incorporated these scores in a reciprocal manner, given the unidirectional nature of the matrix. This then allowed further mapping of the strength of ties data in the identified network. Consistent with the previous network matrix (*i.e.* the existence of ties matrix), the strength of ties matrix was also assessed and mapped in UCINET (refer to Appendix H for sociogram of reciprocated weak ties).

Strength of ties scores were subsequently summed, to identify the total number of weak and strong ties for each respondent. This process revealed that the least number of weak ties identified by a participant was one and the maximum was 146 (mean = 12.74; SD = 14.03). This data was then inputted into the master file for further analysis. It should be acknowledged that this process was carried out in Excel as UCINET does not possess the necessary categorisation capabilities. Furthermore, only weak ties were included in subsequent analyses.

Outside ties were assessed in terms of the number of relationships with individuals outside of the organisation identified by each participant. Therefore a tally of total outside ties was run in relation to each of the 180 employee respondents. This process was undertaken in

SPSS and not UCINET as the latter does not possess the necessary capabilities to run the required tally. This same process was employed by Perry-Smith (2006). As a result, the least number of outside ties identified by a participant was one and the maximum was 20 (mean = 3.87; SD = 3.38). The following figure depicts the frequency of outside ties identified in the present sample.
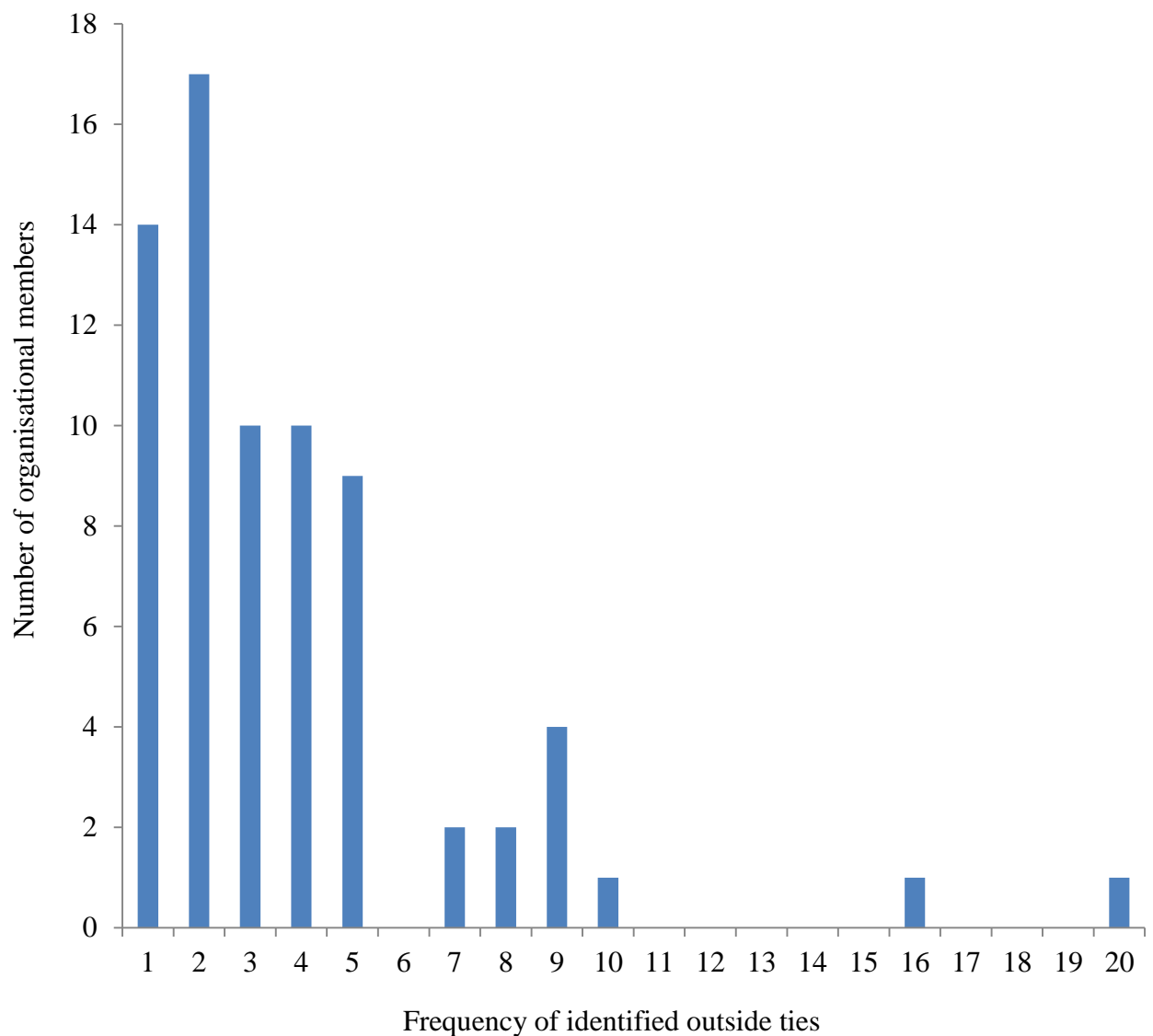
Figure 10: Frequency of outside ties identified by organisational members

Brokerage and centrality scores were calculated using UCINET. The previously explained existence of ties matrix was employed to assess both brokerage and centrality. First, betweenness centrality, otherwise known as brokerage was assessed to identify the extent to which an individual occupied a structural position in the network that was associated with connections to otherwise unconnected others/nodes. This brokerage measure accounted for redundancy and structural bridges. By adopting this betweenness approach in UCINET, the more global measure of brokerage advocated by Perry-Smith (2006) was used. Such an approach is only possible when full network data (from a fully furnished network matrix) is available and this was the case in the present study. Centrality was assessed by identifying the extent to which each network node had ties directly leading to and from it (Perry-Smith, 2006). An actor's centrality was therefore reflected in the number of links needed to reach every other actor in the network.

A good way to observe the brokerage and centrality levels of individuals is to depict individual ego networks (as opposed to the earlier figures of bounded networks which depicted the entire identified network). Refer to Appendix H for examples of sociograms of some of the identified ego networks. The following figure highlights the ego network of the main central player and most significant broker in the network, where the significant node (*i.e.* most central player) is represented as a red square. This ego network reflects the earlier explained outlier pertaining to the networking data, whereby the central player and broker has identified ties to the other 179 nodes in the identified network.
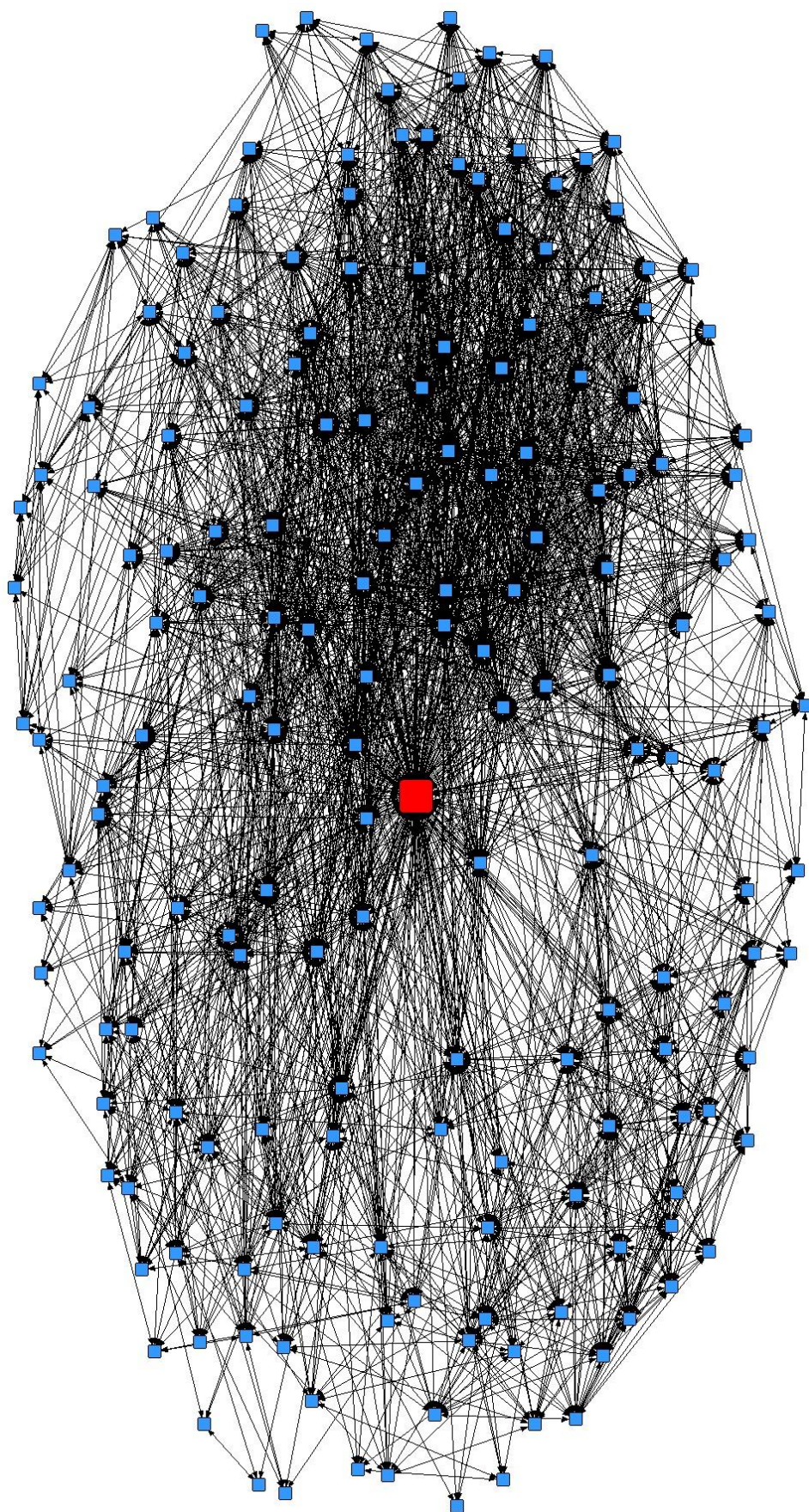
Figure 11: Ego network of the most significant broker and central player

Upon completing the SNA, further analyses were required to test the hypotheses. Confirmatory factor analysis was the necessary next step in the analysis and will be explained next.

Confirmatory Factor Analysis

Confirmatory Factor Analysis (CFA) was conducted using Amos (version 20) to test the unifactorial structure of the proactivity, CSE and creativity scales. CFA was conducted to establish valid latent variables that were subsequently incorporated in the SEM analyses. CFA was also used to test whether the scales measured distinct constructs, thereby confirming discriminant validity across the scales.

Three models were tested. Model one tested a three-factor model, in which all of the items measuring proactivity were loaded onto the first factor (proactivity), all of the items measuring CSE were loaded onto the second factor (CSE), and all of the items measuring creativity were loaded onto the third factor (creativity). Model two tested a two-factor model, in which all of the items measuring proactivity were loaded onto the first factor (proactivity) and all of the items measuring creativity were loaded onto the second factor (creativity). The third model was another two-factor model in which all of the items measuring CSE were loaded onto the first factor (CSE) and all of the items measuring creativity were loaded onto the second factor (creativity). Next, the three-factor model will be discussed.

Factor Structure of Proactivity, CSE and Creativity

The three-factor model represents the combined assessment of factor loadings and discriminant validity across the scales (excluding only the social networking measure). Table 8 presents the standardised factor loadings of the three-factor model.

Table 8: Factor loadings of the three-factor model

Item Content	Proactivity	CSE	Creativity
I always look for better ways to do things.	**.60**		
If I believe in an idea, no obstacle prevents me from making it happen.	**.76**		
Nothing is more exciting than seeing my ideas turn into reality.	**.65**		
No matter what the odds, if I believe in something, I make it happen.	**.82**		
Wherever I am, I am a powerful force for change.	**.82**		
I have confidence in my ability to solve problems creatively.		**.89**	
I feel that I am good at generating novel ideas.		**.79**	
I have a knack for further developing the ideas of others.		**.71**	
I am good at finding creative ways to solve problems.		**.90**	
Suggests many creative ideas that might improve working conditions at TSG.			**.85**
Often comes up with creative solutions to problems at work.			**.91**
Suggests new ways of performing work tasks.			**.92**
Is a good source of creative ideas.			**.95**

χ^2 (*df*=62) = 174.37, χ^2_{62} = 2.81, CFI = .93, RMSEA = .10

Note: Bold indicates that the factor loading is over .40.

Despite producing acceptable factor loadings across the scales, data fit was problematic as evidenced by an unacceptably high RMSEA (.10). This could, to some extent, be explained by the significant covariance observed between proactivity and CSE (β=.32, p<.001), which indicates a lack of discriminant validity between these constructs. In order to address the issues of poor fit and discriminant validity, two further CFA models were developed to test the proactivity items along with the creativity items (model two) separately from the model testing the CSE items along with the creativity items (model three). Model two will be discussed next.

Factor Structure of Proactivity and Creativity

Model two assessed the factor structure of proactivity and creativity, excluding the CSE scale items. Table 9 presents the standardised factor loadings of this first two-factor model.

Table 9: Factor loadings of the two-factor (proactivity and creativity) model

Item Content	Proactivity	Creativity
I always look for better ways to do things.	**.52**	
If I believe in an idea, no obstacle prevents me from making it happen.	**.80**	
Nothing is more exciting than seeing my ideas turn into reality.	**.63**	
No matter what the odds, if I believe in something, I make it happen.	**.88**	
Wherever I am, I am a powerful force for change.	**.80**	
Suggests many creative ideas that might improve working conditions at TSG.		**.85**
Often comes up with creative solutions to problems at work.		**.91**
Suggests new ways of performing work tasks.		**.92**

Item Content	Proactivity	Creativity
Is a good source of creative ideas.		**.95**

χ^2 (*df*=26) = 52.03, $\chi^2{}_{26}$ = 2.00, CFI =.98, RMSEA = .08

Note: Bold indicates that the factor loading is over .40.

This model demonstrated acceptable fit and high factor loadings across all of the proactivity and creativity items. This demonstrated the factorability of both scales and the discriminant validity between the constructs. The results of this two-factor model suggested that proactivity was separate to creativity. Therefore, it was appropriate to include latent variables representing proactivity and creativity in subsequent SEM analysis. The unifactorial structure of the proactivity scale was confirmed in the model data ($\chi^2{}_{26}$ = 2.00). Factor loadings ranged from .52 to .88 (see table 9), with an average factor loading of .73. Considering the five items ('I always look for better ways to do things.'; 'If I believe in an idea, no obstacle prevents me from making it happen.'; 'Nothing is more exciting than seeing my ideas turn into reality.'; 'No matter what the odds, if I believe in something, I make it happen.'; and 'Wherever I am, I am a powerful force for change.') were internally consistent (Cronbach α = .85), they were combined to create the proactivity composite variable (Tabachnick & Fidell, 2005).

The unifactorial structure of creativity was also confirmed in this model ($\chi^2{}_{26}$ = 2.00). Factor loadings ranged from .85 to .95 (see table 9), with an average factor loading of .91. Given the four items ('Suggests many creative ideas that might improve working conditions at TSG.'; 'Often comes up with creative solutions to problems at work.'; 'Suggests new ways of performing work tasks.'; and 'Is a good source of creative ideas.')

were internally consistent (Cronbach α = .95), they were combined to create the creativity composite variable (Tabachnick & Fidell, 2005). The final two-factor model will be discussed next.

Factor Structure of CSE and Creativity

Model three assessed the factor structure of CSE and creativity, excluding the proactivity scale items. Table 10 presents the standardised factor loadings for this second two-factor model.

Table 10: Factor loadings of the two-factor (CSE and creativity) model

Item Content	CSE	Creativity
I have confidence in my ability to solve problems creatively.	**.90**	
I feel that I am good at generating novel ideas.	**.79**	
I have a knack for further developing the ideas of others.	**.70**	
I am good at finding creative ways to solve problems.	**.90**	
Suggests many creative ideas that might improve working conditions at TSG.		**.85**
Often comes up with creative solutions to problems at work.		**.91**
Suggests new ways of performing work tasks.		**.92**
Is a good source of creative ideas.		**.94**
χ^2 (df =19) = 23.89, $\chi^2{}_{19}$ = 1.26, CFI = 1.00, RMSEA = .04		

Note: Bold indicates that the factor loading is over .40.

This model demonstrated acceptable fit and high factor loadings across all of the CSE and creativity items. This demonstrated the factorability of both scales and the discriminant validity between the constructs. The results of this two-factor model suggested that CSE was separate to creativity. Therefore, it was appropriate to include latent variables representing CSE and creativity in subsequent SEM analysis.

The unifactorial structure of the CSE scale was confirmed in the data ($\chi^2_{19} = 1.26$). Factor loadings ranged from .70 to .90 (see table 10), with an average factor loading of .82. Given the four items ('I have confidence in my ability to solve problems creatively.'; 'I feel that I am good at generating novel ideas.'; 'I have a knack for further developing the ideas of others.'; and 'I am good at finding creative ways to solve problems.') were internally consistent (Cronbach α = .89), they were combined to create the CSE composite variable (Tabachnick & Fidell, 2005).

The unifactorial structure of creativity was also confirmed in this model ($\chi^2_{19} = 1.26$). Factor loadings ranged from .85 to .94 (see table 10), with an average factor loading of .91. The four items were also internally consistent (Cronbach α = .95) and were therefore combined to create the creativity composite variable (Tabachnick & Fidell, 2005).

Given the confirmed factor structure of proactivity, CSE and creativity, these constructs were included in structural equation models, along with the earlier explained social networking variables. Results from these path analyses will be explained next.

Path Analysis Results

This section details the results of structural equation modelling (SEM) which incorporated the preceding SNA and CFA output. For the purposes of the hypothesis testing, two path analyses needed to be conducted. One model assessed proactivity in relation to networking and subsequent creativity, while the other model assessed CSE in relation to networking and subsequent creativity. This modelling approach is justified given the earlier identified covariance between proactivity and CSE (in the three-factor CFA model). First, results for the proactivity model will be discussed.

Results of the Proactivity Path Analysis

Using AMOS (version 20), the relationships between proactivity, a latent variable with five indicators, and creativity, a latent variable with four indicators were examined. Also included in the analysis were measured indicators of weak ties, outside ties, brokerage and centrality (as the multiple mediators in the model). Additionally, age, gender, education, tenure and function were also all included as control variables in this model.

Three paths from the hypothesised model were non-significant and therefore removed from the model. Non-significant paths were those from proactivity to weak ties, from proactivity to outside ties, and from weak ties to creativity. Of the control variables included in this proactivity model, gender (β=-.08, p<.05) and education (β=.06, p<.05) were significant. Furthermore, the fit indices for this model were good (χ^2_{116}= 2.45, p<.001; CFI= .86; RMSEA= .09), indicating the model accurately described the relationships in the data. The significant paths identified in the proactivity model are depicted in Figure 12 below:
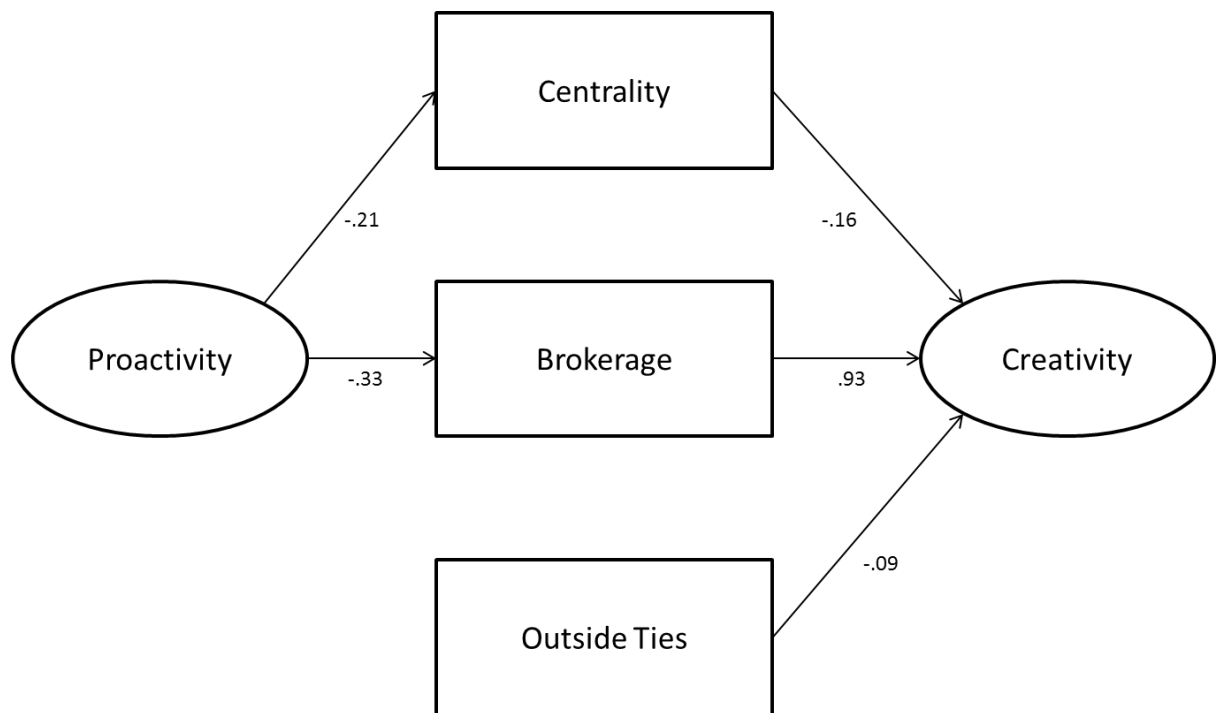
Note: Standardised coefficients reported all paths significant p<.05 (model includes controls)

Figure 12: Results of the proactivity path analysis

Several significant paths/relationships were identified in this model which are depicted in Figure 12. The significant negative paths from proactivity to centrality (β=-.21, p<.05), proactivity to brokerage (β= -.33, p<.001), centrality to creativity (β=-.16, p<.001), and from outside ties to creativity (β=-.09, p<.05) were unexpected (as positive paths were expected). However, as expected there was a significant positive relationship between brokerage (β=.93, p<.001) and creativity. Brokerage was the most significant antecedent to individual creativity in this model.

According to the prescriptions of the joint test, mediation was established in this model. Given the significant relationship between proactivity and centrality and the significant relationship between centrality and creativity, centrality was deemed to be a significant

mediator in the relationship between proactivity and creativity. Similarly, given the significant relationship between proactivity and brokerage and the significant relationship between brokerage and creativity, brokerage was deemed to be a significant mediator in the relationship between proactivity and creativity.

Indirect effects were examined to further assess the significance of the networking variables as mediators in the relationship between proactivity and individual creativity. Table 11 details the results for the observed direct, indirect and total effects.

Table 11: Direct, indirect and total effects for the revised proactivity model

Effect	Direct effect	Indirect effect	Total effect
On Centrality			
Of Proactivity	-.21	.00	-.21
On Brokerage			
Of Proactivity	-.33	.00	-.33
On Creativity			
Of Centrality	-.16	.00	-.16
Of Brokerage	.93	.00	.93
Of Outside Ties	-.09	.00	-.09
Of Weak Ties	.03	.00	.03
Of Gender	-.08	.00	-.08
Of Age	.05	.00	.05
Of Education	.06	.00	.06
Of Function	-.00	.00	-.00
Of Tenure	.00	.00	.00
Of Proactivity	.00	-.27	-.27

Proactivity had a significant indirect effect on creativity through brokerage (β=-.30) and centrality (β=.03). The significance of these indirect effects was further confirmed by the Sobel test. Results from this testing reaffirmed that the relationship between proactivity and individual creativity was significantly mediated by brokerage (z = -3.92, p<.001) and centrality (z = 2.30, p<.05).

The direct relationship between proactivity and creativity was assessed in a separate path analysis, which demonstrated ideal model-data fit (χ^2_{61}= 1.42, p<.05; CFI= .98; RMSEA= .05). This model resulted in a non-significant positive relationship being found between proactivity and creativity (β=.16, p<.08). The more complicated multiple mediator model (*i.e.* joint effects model) was therefore deemed to demonstrate full mediation. Specifically, the multiple mediator model showed that centrality and brokerage fully mediated the relationship between proactivity and creativity.

Overall, the multiple mediator model explained 89 percent of the variance in individual creativity, with the relationship between proactivity and individual creativity being *fully* mediated by both brokerage and centrality.

Results of the CSE Path Analysis

Using AMOS (version 20), the relationships between CSE, a latent variable with four indicators and creativity, a latent variable with four indicators were tested. Also included in the analysis were measured indicators of weak ties, outside ties, brokerage and centrality as the multiple mediators in the model. Additionally, age, gender, education, tenure and function were all included as control variables in the model.

Three paths from the hypothesised model were non-significant and therefore removed from the model. The non-significant paths were those from CSE to weak ties, from CSE to outside ties, and from weak ties to creativity. Of the control variables included in this CSE model, gender (β= -.08, p<.05) and education (β=.06, p<.05) were significant. Furthermore, the fit indices for this model were good (χ^2_{100}= 1.98, p<.001; CFI= .92; RMSEA= .07), indicating that the model represented the relationships in the data accurately. The significant paths identified in the CSE model are depicted in Figure 13 below:
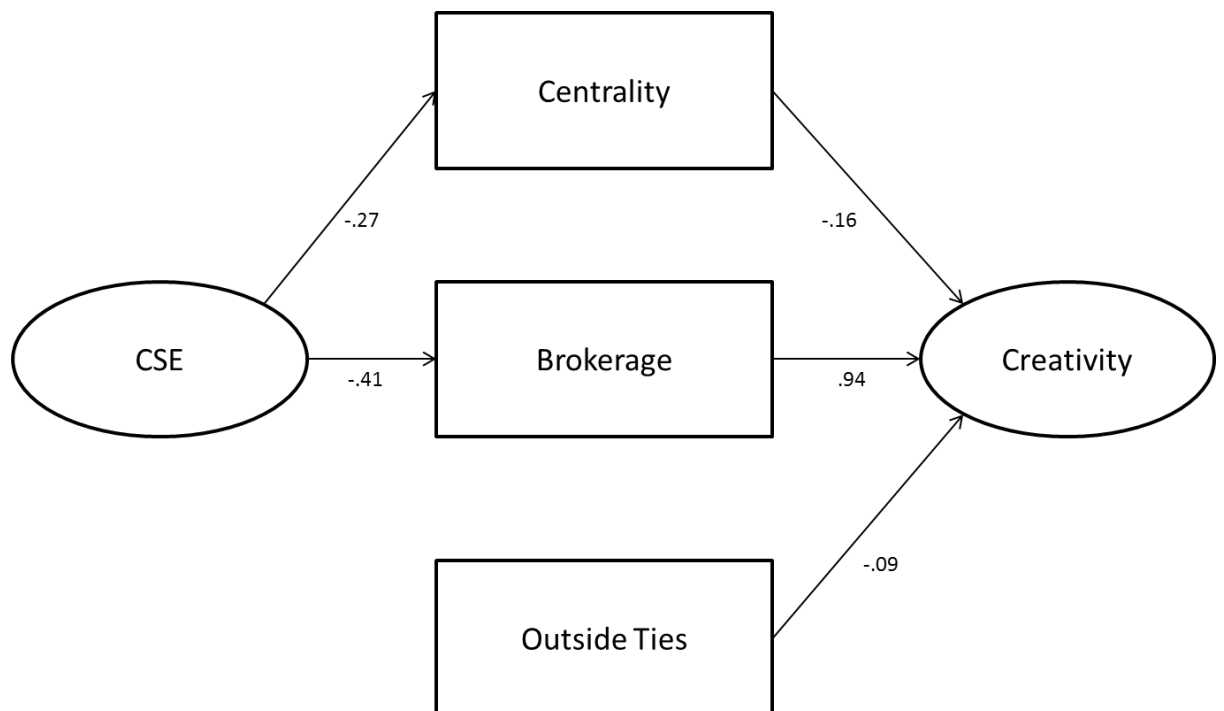
Note: Standardised coefficients reported all paths significant p<.05 (model includes controls)

Figure 13: Results of the CSE path analysis

Similar to the preceding proactivity model, several significant paths/relationships were also identified in this model. The significant negative paths from CSE to centrality (β=-.27, p<.001), CSE to brokerage (β= -.41, p<.001), centrality to creativity (β=-.16, p<.001), and from outside ties to creativity (β=-.09, p<.05) were unexpected (as positive paths were expected). However, as expected a significant positive relationship was observed between brokerage and creativity (β=.94, p<.001). Brokerage was the most significant antecedent to individual creativity in this model.

According to the prescriptions of the joint test, mediation was established in this model. Given the significant relationship between CSE and centrality and the significant relationship between centrality and creativity, centrality was deemed to be a significant mediator in the relationship between CSE and creativity. Similarly, given the significant relationship between CSE and brokerage and the significant relationship between brokerage and creativity, brokerage was deemed to be a significant mediator in the relationship between CSE and creativity.

Indirect effects were examined to further assess the significance of networking variables as mediators in the relationship between CSE and individual creativity. The following table presents the results of the observed direct, indirect and total effects.

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Table 12: Direct, indirect and total effects for the revised CSE model

Effect	Direct effect	Indirect effect	Total effect
On Centrality			
Of CSE	-.27	.00	-.27
On Brokerage			
Of CSE	-.41	.00	-.41
On Creativity			
Of Centrality	-.16	.00	-.16
Of Brokerage	.94	.00	.94
Of Outside Ties	-.09	.00	-.09
Of Weak Ties	.03	.00	.03
Of Gender	-.08	.00	-.08
Of Age	.06	.00	.06
Of Education	.06	.00	.06
Of Function	-.01	.00	-.01
Of Tenure	.00	.00	.00
Of CSE	.00	-.34	-.34

CSE had a significant indirect effect on creativity through brokerage (β=-.38) and centrality (β=.04). Both of these networking roles therefore significantly mediated the relationship between CSE and individual creativity. The significance of these indirect effects was further confirmed by the Sobel test. Results from this testing further demonstrated that the relationship between CSE and individual creativity was significantly mediated by brokerage ($z = -5.25$, $p<.001$) and centrality ($z = 2.96$, $p<.005$).

The direct relationship between CSE and creativity was assessed in a separate path analysis, which demonstrated good model-data fit (χ^2_{49}= 1.13, p<.05; CFI= .99; RMSEA= .03). In this model there was a significant positive relationship between CSE and creativity (β=.29, p<.001). The more complicated multiple mediator model (*i.e.* joint effects model) therefore demonstrated partial mediation. Specifically, the multiple mediator model showed that centrality and brokerage partially mediated the relationship between CSE and creativity.

Overall, the multiple mediator model explained 89 percent of the variance in individual creativity, with the relationship between CSE and individual creativity *partially* mediated by both brokerage and centrality. A summary of the findings in relation to each of the hypotheses will be provided next.

5.6 Summary of Research Findings

Some of the present results (*i.e.* the significant negative relationships) represent unexpected findings, so there was mixed support for some of the hypotheses. Table 13 presents the hypotheses that were supported and unsupported, as well as those for which mixed support was found.

Table 13: The supported and unsupported hypotheses and the mixed findings

Hypothesis	Finding
Hypothesis 1: Proactivity will be positively related to individual creativity.	**Not supported**
Hypothesis 2: CSE will be positively related to individual creativity.	**Supported**
Hypothesis 3: Weak ties will mediate the positive relationship between proactivity and creativity.	**Not supported**
Hypothesis 4: Number of outside ties will mediate the positive relationship between proactivity and creativity.	**Not supported**
Hypothesis 5: The brokerage role will mediate the positive relationship between proactivity and creativity.	**Mixed support found**
Hypothesis 6: Network centrality will mediate the positive relationship between proactivity and creativity.	**Mixed support found**
Hypothesis 7: Weak ties will mediate the positive relationship between CSE and creativity.	**Not supported**
Hypothesis 8: Number of outside ties will mediate the positive relationship between CSE and creativity.	**Not supported**
Hypothesis 9: The brokerage role will mediate the positive relationship between CSE and creativity.	**Mixed support found**
Hypothesis 10: Network centrality will mediate the positive relationship between CSE and creativity.	**Mixed support found**

5.7   Conclusion

This chapter detailed the analytical methods employed to test the hypotheses proposed in Chapter Two. First, preliminary data assessment techniques, including the screening processes for non-response bias, sample size, missing data, outliers and normality (skewness and kurtosis) were expounded. This was followed by presentation of the descriptive statistics in relation to the social networking, individual difference and creativity variables. Results from the specific techniques used to test the proposed hypotheses (*i.e.* SNA, CFA and SEM) were then presented. The earlier methodology

(Chapter Four) explained that three separate analytical techniques would be required in this study, as SNA would allow the social side to this study to be assessed, while CFA would validate the individual difference and creativity measures used, and SEM would assess the joint effects of individual differences and networking on creativity.

The SNA results involved 180 by 180 network matrices, consisting of reciprocated relationships such that when a member of a pair of connections identified a tie, the other member would also be attributed with having this tie. In this way, weak ties were more accurately accounted for (Perry-Smith, 2006). UCINET was the statistical package that allowed brokerage and centrality scores to be determined. A standout central player and broker was identified as a significant outlier in the present data and the relevant ego network was mapped and presented (Refer to Figure 11). UCINET also allowed for the networking parameters of interest to be mapped.

CFA analyses allowed for the CSE, proactivity and creativity measures to be validated, particularly in terms of discriminant validity. A three-factor model was first developed to assess all three of these scales, which found covariance between proactivity and CSE. Consequently, separate two-factor models were developed, in which proactivity and CSE measures were each independently assessed along with the creativity measure. This demonstrated the factorability and discriminant validity of the proactivity, CSE and creativity scales.

Subsequent SEM analysis was based on the SNA and CFA analyses. To avoid any issues of covariance, proactivity and CSE were assessed in separate path models. These models

were designed to test the hypotheses. Both were multiple mediator models which enabled the joint effects of individual differences and networking on creativity to be assessed.

Results from this analysis demonstrate mixed findings, with some hypotheses supported, some unsupported and some unexpected findings. Overall, the networking roles of brokerage and centrality were found to mediate the relationships between individual differences and creativity. The brokerage role was also found to be the most significant antecedent to individual creativity.

The significance of the findings for both theory and practice will be discussed in detail in the following Discussion Chapter. This chapter will discuss the relationships between individual differences and creativity, between networking and creativity, between individual differences and networking as well as the mediating effects of networking on the relationships between individual differences and creativity. The major contributions of the research will be highlighted and a new model of individual differences, networking and creativity based on current findings will be presented. The limitations of this research and directions for future research will also be considered.

6 DISCUSSION

6.1 Introduction

In recognition of the ongoing scholarly calls for concurrent considerations of the antecedents to creativity (Barron & Harrington, 1981; Rank *et al.*, 2004; Runco, 2004; Shalley *et al.*, 2004), which were highlighted in Chapter Two, this research examined individual differences, networking and subsequent creativity. Ten hypotheses drawn from the literature were proposed to test the relationships between the variables of interest.

This study specifically assessed the relationships between individual differences, networking parameters and roles and individual creativity. In so doing, the individual difference and networking perspectives on creativity were integrated. Proactivity and creative self-efficacy were the individual difference variables of interest, while the networking variables of weak and outside ties, and brokerage and centrality roles were concurrently examined. This concurrent consideration of potential antecedents to individual creativity constituted a major theoretical and methodological advance. Furthermore, the results of this research (presented in the preceding chapter) confirm that there is much more to predicting individual creativity than individual difference variables alone.

In considering multiple antecedents to creativity, the multifaceted nature of creativity is more comprehensively accounted for. Creativity enables individuals to invent, dream, problem solve, craft, and correspond in new ways which is vital for organisational success (Egan, 2005). The concept of creativity therefore subsumes other concepts including idea generation, problem solving and implementation strategies. Assessing the potential effect

of multiple predictors significantly assists in advancing our understanding of the multifaceted nature of individual creativity.

The findings of this research provide valuable insights into both creativity and networking. The new insights gained from the present findings can in part be attributed to the novel study context employed. The decision to conduct this research in the Australian IT industry was based on the importance of this industry in creativity research as well as the relatively few Australian based creativity studies. Indeed, to date, creativity research has been primarily limited to Asian and/or student contexts with the findings from these studies not necessarily being generalisable. In light of this, the present research used a novel context.

The findings of the study will frame this chapter. The first relationship to be discussed will be that between individual differences and creativity. The joint effects of individual differences and networking on creativity will then be covered by discussing the relationships between networking and creativity as well as between individual differences and networking. Following this, the mediating effects of networking in the relationship between individual differences and creativity will be detailed. The theoretical implications of the study's findings will be discussed throughout. Contextual considerations will be discussed prior to highlighting the major contributions of this research, with a new conceptual model of individual differences, networking and creativity also provided. Practical implications inferred from the study findings will subsequently be expounded. The limitations of the research will also be discussed along with directions for future research. A summary of the significant findings will be provided next.

6.2   Summary of Significant Findings

As predicted, CSE and brokerage were both significantly and positively related to individual creativity (providing full support for Hypothesis 2 and mixed support for Hypothesis 9). Unexpectedly, both outside ties and centrality were significantly and negatively related to individual creativity, with these findings pertaining to Hypotheses 4, 6, 8 and 10, when positive relationships were expected. Similar unexpected significant negative relationships were observed between proactivity and both brokerage and centrality, with these findings pertaining to Hypotheses 5 and 6; and, CSE with both brokerage and centrality, with these findings pertaining to Hypotheses 9 and 10.

The following figures depict the significant relationships for both the proactivity and CSE models. Weak ties are not featured in either the proactivity or CSE figures, as weak ties were not found to be significantly related to proactivity, CSE or creativity. Figure 14 depicts the significant paths in the proactivity model while Figure 15 depicts the significant paths in the CSE model.
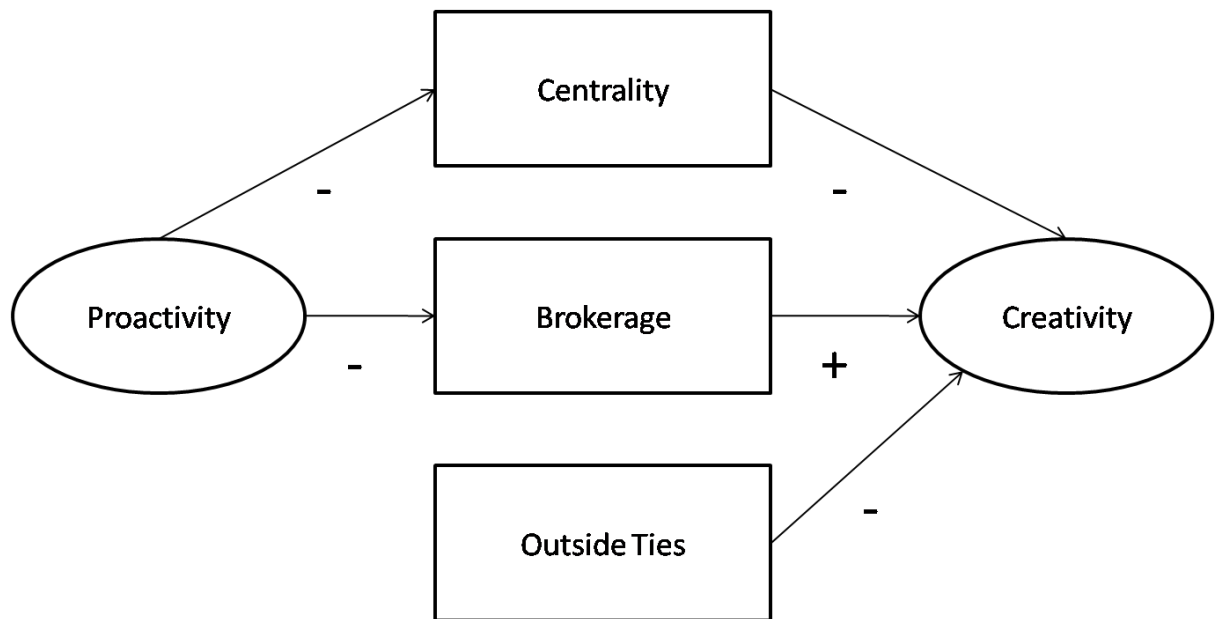
Figure 14: Significant paths in proactivity model
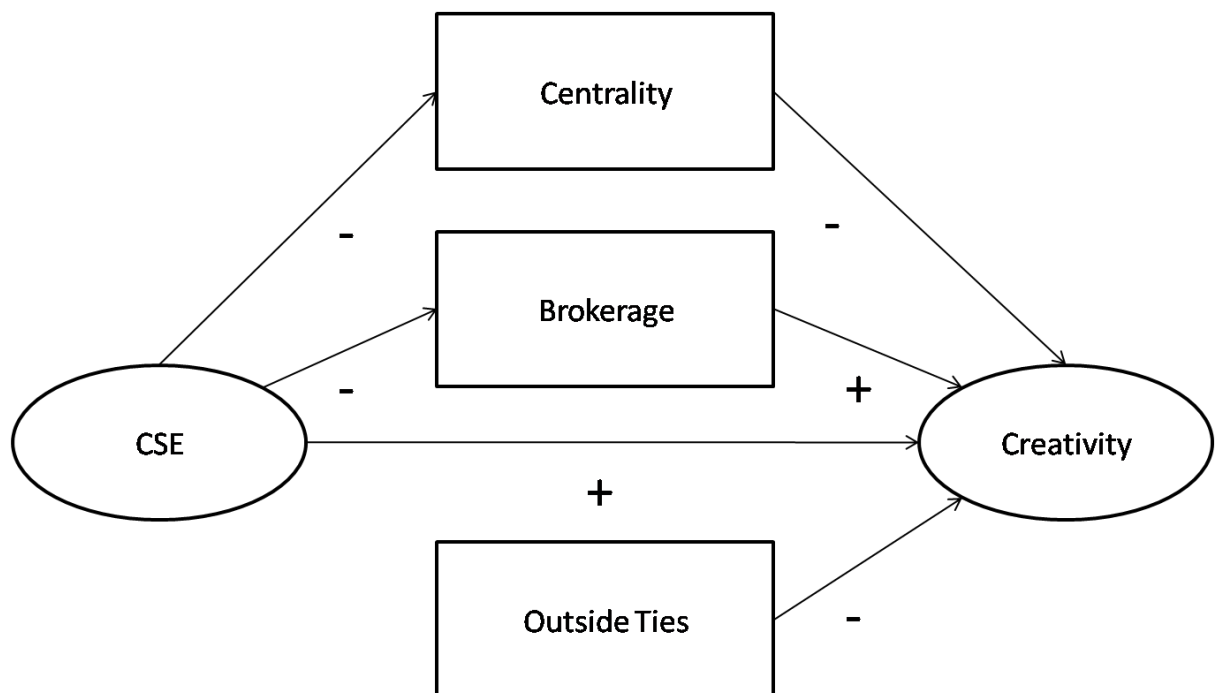
Figure 15: Significant paths in creative self-efficacy model

Proactivity and CSE were predicted to have positive effects on weak ties, outside ties, and

brokerage and centrality which in turn were predicted to have positive effects on creativity.

Contrary to this, proactivity and CSE were significantly and negatively related to

brokerage and centrality, with the former positively and the latter negatively related to creativity. Interestingly, neither proactivity nor CSE significantly affected weak or outside ties. Therefore, in line with the joint effects mediation method, only networking roles (*i.e.* brokerage and centrality), and not the networking parameters (*i.e.* weak and outside ties), mediated the relationship between individual differences (*i.e.* proactivity and CSE) and creativity. This was a surprising finding given that both networking parameters and roles were expected to be significant mediators. The implications of these findings will be discussed next, beginning with those concerning the relationships between individual differences (*i.e.* proactivity and CSE) and individual creativity.

6.3   Individual Differences and Creativity

This research examined the relationship both proactivity and CSE had with individual creativity. This accounted for the individual difference perspective on creativity. While proactivity was not a significant predictor of individual creativity, CSE was significantly and positively related to individual creativity. These mixed findings will be discussed further, with the non-significant relationship between proactivity and creativity being discussed next.

Proactivity and Creativity

The positive relationship predicted between proactivity and individual creativity (Hypothesis 1) was not supported in this research. It should be acknowledged that this relationship was only marginally non-significant. Nevertheless this finding is in contrast to past findings which have supported the notion that proactive people are also more creative (Kaufmann, 2003; Kim *et al.*, 2010; Kim *et al.*, 2009; Seibert *et al.*, 2001; Unsworth, 2001; Unsworth & Parker, 2003; Zampetakis, 2008).

As was described in Chapter Two, existing literature centres on the premise that proactive people are more likely to strive for success at work. This existing literature did however focus more on innovation than creativity, which could to some extent explain the present non-significant result. More specifically, existing research has focussed on the fact that many organisations are becoming increasingly decentralised, with individuals needing to work without close supervision, making proactive and innovative behaviours essential (Crant, 2000; Parker, 1998). Perhaps, therefore, proactivity is more important in terms of innovation than creativity. Amabile (1996) clearly distinguished between creativity and innovation with the former involving the development of novel and useful ideas, and the latter involving the actual implementation of creative ideas. Accordingly, creativity by individuals can be considered a starting point for innovation, with successful innovation stemming from creative idea generation within the organisation and from ideas that originate elsewhere (such as technology transfer) (Amabile, 1996). Proactivity, in the current context, may have thus been more important for innovation than creativity.

Proactivity may also have stronger effects on team and system level creativity. Individual proactivity may spur on groups, teams and divisions when tackling implementation issues more significantly than individual idea generation. This may in part be because modern organisations tend to rely on highly collaborative and cohesive workers who can effectively cope with unpredictable environments. To enable sustained success in such environments proactivity and innovation may converge (Unsworth & Parker, 2003). Where individuals are working in collaborative environments this may negate the need for individual proactivity in creative output.

Although creative action can be seen as a subset of proactive action, not all proactivity is designed to result in creative outcomes (Unsworth & Parker, 2003; Unsworth & Clegg, 2010). Many additional factors could be expected to affect individual engagement in creative action. For example, instrumentality (*i.e.* performance-to-reward relationship), which helps individuals determine whether taking creative action is worthwhile has been deemed integral in determining an individuals' engagement in creative action (Unsworth & Clegg, 2010). Therefore, individuals in this research may have been affected by instrumentality and other factors which could have impeded the relationship between proactivity and creativity.

It is also important to note that a large portion of the existing research which has examined the relationship between proactivity and creativity has utilised Asian samples (Kim *et al.*, 2010; Kim *et al.*, 2009). Possibly the positive associations observed in these studies do not hold true in Western contexts. Cultural differences have long been known to influence organisational behaviours and practices in different ways (Hofstede, 1980, 1991). For example, individualistic cultures rely on different organisational practices which pose different implications for individual behaviour (Hofstede, 1980). Individualistic contexts are characterised by the pursuit of individual goals and rewards, whereas collectivist contexts are characterised by the pursuit of collective/group goals and rewards (Hofstede, 1980). Australia exemplifies the former context while Asian countries, where most of the existing research has been conducted, exemplify the latter context. Therefore, in line with these contexts being at opposite ends of the cultural spectrum, research findings from these different contexts may be similarly polarised.

Rank *et al.* (2004) emphasised the importance of such cultural considerations in creativity research, focussing on culture-bound differences in motivational orientations and leadership. Specifically, the concern with security in high uncertainty-avoidance cultures may reflect a prevention orientation (*i.e.* self-regulatory focus on safety and responsibility) instead of a promotion orientation (*i.e.* focus on advancement and aspiration) which is associated with creativity. Friedman and Forster (2001) confirmed that a promotion orientation predicted creativity in several laboratory studies. Although individualistic contexts are more likely to be categorised by moderate to low uncertainty-avoidance (Hofstede, 2001), given the radical restructuring taking place at the organisation studied in this research, uncertainty and thus a prevention orientation may have been more prevalent at the time of data collection. This may have restricted proactivity, in turn precluding a significant influence on creativity. Furthermore, individuals from collectivist cultures have been shown to generate more creative ideas under transformational leadership while individuals from individualistic cultures have been shown to generate more creative ideas under transactional leadership (Jung & Avolio, 1999; Rank *et al.*, 2004). Although the current context can be categorised as individualistic, the newly appointed CIO who was responsible for the major restructure taking place was indeed a transformational leader, so the clashing cultural context and leadership style may also help explain the non-significant association between proactivity and creativity.

The non-significant association between proactivity and creativity may also be explained by a prevalence of negative proactivity (as opposed to positive proactivity which was the focus of this research) amongst the sampled individuals. As was explained in Chapter Two, some individuals can be proactive for all the wrong reasons, while pursuing personal rather than organisational agendas (Chan, 2006). Such undesirable proactivity could limit

individual creative potential. More specifically, while negative proactivity adversely affects creativity that benefits the organisation, it may improve creativity that benefits the proactive individual. In this case, the creativity scale emphasised creativity benefitting the organisation and work tasks, for which negative proactivity would be undesirable. Therefore, the present non-significant association between proactivity and creativity may be explained by participants from the studied organisation relying on negative instead of positive proactive behaviours. The relationship between CSE and individual creativity will be discussed next.

CSE and Creativity

As predicted, CSE was significantly and positively related to individual creativity with creatively efficacious individuals more likely to be creative at work (Hypothesis 2). This result was expected because CSE was developed, in large part, to account for individual creative potential (Tierney & Farmer, 2002, 2004). The limited existing CSE research has largely demonstrated that CSE is instrumental in individuals achieving and maintaining high levels of creative outputs (Beghetto *et al.*, 2011; Tierney & Farmer, 2011). The present finding therefore reaffirms these existing research findings.

Most of the existing research on CSE (Beghetto *et al.*, 2011; Choi, 2004; Gong *et al.*, 2009; Tierney & Farmer, 2011; Yang & Cheng, 2009) has however, focussed exclusively on student samples. The present research therefore not only replicates the positive association between CSE and creativity but further extends this finding beyond student samples. Assessing the relationship between CSE and creativity in an Australian based IT organisation means that the findings from this research have greater generalisability than previous research based on student samples.

Chapter Two acknowledged that existing research on the individual difference perspective on creativity had focussed more on the effects of proactivity, with far fewer studies examining the role of CSE. Given, in the present study, CSE was significantly related to creativity while proactivity was not, it may be that CSE is more important for individual creativity than proactivity. Moreover, the CSE model demonstrated better model-data fit compared to the proactivity model, so CSE seems to have the potential to more accurately explain variations in individual creativity. Indeed, CSE was more strongly correlated with creativity ($r = .23$, $p<.01$) compared to proactivity ($r = .17$, $p<.05$).

Summary of Individual Differences and Creativity

To summarise CSE was significantly and positively related to individual creativity while proactivity was not. Given the mixed findings in relation to the relationship between individual differences and creativity, examining networking variables as potential mediators of these relationships may clarify and advance our understanding further. The findings in relation to the joint effects of individual differences and networking on individual creativity will be discussed next.

6.4 Joint Effects of Individual Differences and Networking on Creativity

This study examined the potential for networking variables to mediate the relationship between individual differences and creativity, by assessing the effects of individual differences on networking and networking on creativity. Despite no significant direct effect being found between proactivity and creativity, it was still possible for the networking variables to fully mediate this relationship. This is because under the joint effects mediation method (refer to Chapter Four for details), provided there is a significant relationship between the independent variable (*i.e.* proactivity) and the mediator (*i.e.*

networking variables) and between the mediator and the dependent variable (i.e. creativity) mediation can still be established in the absence of a significant direct relationship between the independent variable and the dependent variable (MacKinnon *et al.*, 2007). Given the significant direct relationship found between CSE and creativity it was thought that characteristics of individuals' networks would potentially help to explain the mechanisms via which CSE had its positive effect on creativity. In order to discuss the mediation potential of networking on the relationship between individual differences and creativity, the findings on the relationship between networking and creativity will be detailed next.

Networking and Creativity

Alongside assessment of the effects of individual differences on individual creativity (accounting for the individual difference perspective), the networking perspective on creativity was also accounted for. Therefore the relationship between networking variables and creativity were also assessed. In the current research, unlike prior research, both networking parameters (*i.e.* weak and outside ties) and networking roles (*i.e.* brokerage and centrality) were examined. Specific hypotheses pertaining to these relationships were not proposed as they would have been redundant given the joint effects mediation hypotheses in the study. However these relationships, which will be discussed in more detail next, are integral to understanding the mediation hypotheses (Hypotheses 3-10) which are central to this research.

Outside ties were the only network parameter significantly related to creativity, while both networking roles (*i.e.* brokerage and centrality) were significant predictors of creativity. However, only brokerage demonstrated the positive association which was expected, while

the other significant networking predictors were negatively related to creativity. The non-significant relationship between weak ties and creativity will be discussed next.

Weak Ties and Creativity

Weak ties were expected to have a significant positive relationship with individual creativity, however no significant relationship was found. This was surprising given that the majority of research on the networking perspective on creativity has focussed almost exclusively on weak ties and largely supports the notion that weak ties and creativity are positively related (Baer, 2010; Burt, 2004, 2007; Granovetter, 1973; Kratzer & Lettl, 2008; Perry-Smith, 2006; Perry-Smith & Shalley, 2003; Staber, 2004; Vedres & Stark, 2008; Zhou *et al.*, 2009).

Unlike the majority of existing research, Madjar *et al.* (2002) refuted Granovetter's (1973) tie strength theory. Madjar *et al.* (2002) suggested that strong ties (those involving more frequent and close interactions), as opposed to weak ties (those involving fewer and more distant interactions), provide personal support which enhances creativity. Madjar *et al.*'s (2002) study was the first to show that support from an individual's family and friends (*i.e.* strong ties) contributed positively to their creativity at work. More specifically, the results of Madjar *et al.* (2002) demonstrated that individuals' family and friends contributed to their levels of creativity over and above the contribution made by support from individuals inside the organisation. Given that weak ties were not significantly related to creativity, stronger or more trust based ties may have been more important across the study sample. Perhaps a combination of weak and strong/trust based ties were relied on for creativity enhancement, minimising the significance of weak ties alone.

Individuals in high-tech contexts (such as that under investigation in the present study) may rely more on strong ties while individuals in other organisational contexts may rely more on weak ties. High-tech contexts often make for particularly stressful work environments in which time pressures and persistent demands are commonplace (refer to Chapter Three for details) and therefore, individuals may be more inclined to rely on those closest to them for inspiration and motivation (Madjar *et al.*, 2002; Staber, 2004). This is particularly plausible given that trust, which is associated with strong ties (Madjar *et al.*, 2002), is often particularly valuable to individuals working in the competitive IT industry (Cooper, 2000; Dewett & Jones, 2001; Lapierre & Giroux, 2003; Mitchell *et al.*, 2003; Staber, 2004). Indeed, given the time pressures associated with high-tech industries, individuals working in the current context may also rely on those closest to them or strong/well-established ties for support simply to save time that would otherwise be spent seeking support elsewhere.

There is also evidence that individuals can retain so many weak ties that it becomes a constraint and adversely affects individual creativity (Baer, 2010; Perry-Smith & Shalley, 2003; Uzzi & Spiro, 2005). Zhou *et al.* (2009) found a curvilinear relationship between individual creativity and number of weak ties, with the maximum point of curve equal to 49. Zhou *et al.* (2009) had employees identify their networks while supervisors rated employee creativity. Given that this study relied on a sample of 151 employees and their 17 supervisors in a high-tech Chinese company, while the present research relied on a comparable sample (consisting of only 29 more employees) this point of curve can be reasonably applied to the current research. The present research found participants possessed a minimum of 1 and maximum of 146 weak ties, which greatly exceed the optimal point of curve value of 49 found by Zhou *et al.* (2009), indicative of participants

having too few or too many weak ties. Furthermore, the mean number of weak ties (M = 12.74) was well below the optimal point of curve value of 49 so some of the current sample exhibited too few weak ties. The presence of too few or too many weak ties in the current sample may further explain the non-significance of weak ties in relation to creativity.

Extensive weak ties have been associated with information overload (Perry-Smith & Shalley, 2003; Yang & Cheng, 2009), with individuals potentially exposed to excessive amounts of information impeding their individual creativity. More recent research has therefore focused on identifying the 'optimal' number of weak ties that may benefit individual creativity (Baer, 2010; Zhou *et al.*, 2009). Given the infancy of such research and the differences in contexts and sample sizes, an optimal number or range of weak ties has yet to be identified.

Weak ties may also be categorised as informal networks (such as lunch groups) which may be easier to move away from than formal ones (such as organisational departments or quality circles). This makes them more fluid and dynamic in nature and as such more difficult to measure and monitor (Chan & Liebowitz, 2006; Emirbayer & Goodwin, 1994; Krackhardt, 1990). Given the restructuring that was taking place at the studied organisation during the data collection phase of the research (refer to Chapter Three for details) it may have been difficult for participants to accurately report their weak ties, negatively impacting the measurement of this variable.

It needs to be acknowledged that this non-significant finding precluded the potential of weak ties to mediate the relationship between individual differences and creativity in this

study, so Hypotheses 3 and 7 were not supported in the current research. The significant negative relationship between outside ties and individual creativity will be discussed next.

Outside Ties and Creativity

The expected positive relationship between outside ties and individual creativity was not supported in this research. Rather, outside ties had a significant negative relationship with individual creativity in both the proactivity and CSE models. Individuals with more outside ties were less creative than those with fewer outside ties. Based on the existing literature it was expected that greater exposure to information outside of the organisation would result in higher levels of individual creativity (Baer, 2010; Cross & Cummings, 2004; Madjar *et al.*, 2002; Perry-Smith & Shalley, 2003; Staber, 2004). This existing research was however limited in many ways, including the lack of explicit examination of the relationship between outside ties and individual creativity. For example, research indicated that individuals who relied on networks that ranged from inside to outside of the organisation were better performers at work (Cross & Cummings, 2004; Madjar *et al.*, 2002; Reagans & McEvily, 2003), but specific assessments of creative performance had been neglected. Furthermore, while Madjar *et al.* (2002) found that an individual's outside ties contributed positively to their creativity at work, this research measured outside ties only in terms of family and friends outside of the studied organisation. The current research assessed outside ties more broadly and only limited the number of outside ties (with a maximum of 20 ties allowed) but not the types of outside ties that could be identified by participants. Therefore, the specific type of outside tie may affect the relationship and it may be that outside ties that are not family or friends (*e.g.* suppliers, customers or competitors) may negatively affect individual creativity at work.

It was anticipated that less knowledge overlap (which implies greater access to diverse sources of information/knowledge) would be associated with more extensive external ties (Daly & Finnigan, 2011; Wong, 2008), which in turn would enhance individual creativity. However it could be that extensive outside ties may be associated with information overload, which has been shown to impede individual creativity (Perry-Smith & Shalley, 2003; Yang & Cheng, 2009). The mean number of outside ties for participants was only four in this research, which may make the potential for information overload seem unlikely, unless comparing the current mean to that in Perry-Smith's (2006) study which was seven. Perry-Smith (2006) found outside ties to be particularly problematic in relation to creativity when also accounting for centrality, so the problem of information overload may also have impacted this earlier research. The current sample (n = 180) was much larger than that in Perry-Smith's (2006) research (n = 97), and as such may have been slightly less reliant on outside ties (considering the sample size to mean number of outside ties ratio). Nevertheless, outside ties may have provided redundant information which negatively affected rather than improved individual creativity.

While investigating the effect of outside ties on the relationship between centrality and creativity Perry-Smith (2006) also identified the potential for outside ties to hinder individual creativity. It was found that individuals who were most central in a network were more creative when they had fewer outside ties. Despite participants demonstrating an average of only four outside ties in the current research, this may have been enough to disrupt the creativity of those in the relatively large study sample, consisting of many centrally positioned individuals. Overall, it may be that individual creativity is hindered by many outside ties which can pull individuals in many different directions, exposing them to ideas that are not favoured internally in their organisation, creating more distraction and

dissonance than creative stimulation. There is also evidence to suggest that information from outside ties only benefits organisations when it is combined with existing internal knowledge (Teigland & Wasko, 2003). The studied organisation may not have provided effective avenues through which individuals could combine information from outside ties with internal information, contributing to the significant negative relationship.

Teigland and Wasko (2003) assessed knowledge integration through information trading using data from a large European IT services and management consulting company. This study found that in order for individuals to access information and knowledge from others outside their immediate physical location, they had to be willing to give something in return (Teigland & Wasko, 2003). This finding may be true of most technical organisational environments, including the Australian based IT organisation used in the current research. Furthermore, while the efficiency of collocation was important for creativity, non-collocated co-workers also positively influenced creativity via internal information trading (Teigland & Wasko, 2003). Therefore, apart from the obvious time constraint associated with accessing information from ties to those who are physically removed from the organisation (as opposed to collocated co-workers), outside ties may also require extra effort on the part of individuals in order to effectively integrate outside sources of information. This in turn could detract from an individual's creative activities.

Teigland and Wasko (2003) also examined boundary spanning communication and individual performance, questioning the quality and relevance of information exchanged in the reciprocal relations between individuals inside and outside of an IT organisation. They found that ties to outside individuals could impede individual creativity if these individuals were not in similar professions, did not have similar interests, or were not well versed in

the relevant language of the profession (Teigland & Wasko, 2003). The IT organisation surveyed in the present research is similar to the organisation studied by Teigland and Wasko (2003), where work tasks primarily required the application of technical knowledge and skills (refer to Chapter Three for more details on the studied organisation). Therefore, outside ties to individuals that are not similarly skilled in technical matters may not be beneficial but instead may be detrimental to individual creativity.

Teigland and Wasko (2003) also found that knowledge coming from outside the organisation may be so novel that it cannot be applied to any immediate problem inside the organisation. Therefore, outside ties may lead to the accumulation of novel and irrelevant information/knowledge which can undermine individual creativity at work. Indeed, in order for knowledge flows to benefit individual creativity, the knowledge needs to be relevant to work tasks (Amabile, 1996, 1998; Oldham & Cummings, 1996; Teigland & Wasko, 2003; Woodman *et al.*, 1993). If outside knowledge sources provided individuals with irrelevant and/or misleading information, this may potentially explain the negative relationship between outside ties and individual creativity.

It needs to be acknowledged that despite finding a significant negative relationship between outside ties and creativity when a positive relationship was expected, this significant relationship reaffirms the mediation potential of outside ties in the relationship between individual differences and creativity. However, individual differences were not related to outside ties (which will be discussed later in this chapter) and consequently Hypotheses 4 and 8 were not supported. Next the significant positive relationship between brokerage and individual creativity will be discussed.

Brokerage and Creativity

As expected, brokerage had a significant positive relationship with individual creativity, as individuals who occupied a brokerage role were more likely to be creative than non-brokers. Indeed, brokerage exhibited a very strong (*i.e.* close to $\beta = 1.0$) relationship with creativity in both the proactivity and CSE models. Given the importance of networking roles in organisational contexts (Burt, 2001, 2004; Fleming *et al.*, 2005, 2007) the findings of the present study affirm that brokerage is particularly important in promoting creativity.

This positive association is consistent with past findings (Burt, 2001, 2004; Fleming *et al.*, 2005, 2007; Kratzer & Lettl, 2008). However, the majority of existing brokerage research has not explicitly measured creativity. For example, Burt (2004) deduced that brokerage would enhance creativity by exposing individuals to diverse knowledge and information which would improve idea generation (which is key to creativity), implying that the positive relationship between brokerage and idea generation would also result in a positive relationship between brokerage and creativity. Similarly, Perry-Smith and Shalley (2003) argued that peripheral persons or brokers would be exposed to more diverse ideas which would bolster their creative capabilities. Overall however, explicit investigation into the positive association between brokerage and creativity has been limited. This research provided an explicit test and affirms the positive relationship between brokerage and creativity. This finding therefore constitutes an important contribution to the field.

The existing explicit examinations of this relationship need to also be considered. Burt (2005, p. 62) studied brokerage behaviour in terms of boundary spanning and deduced that "brokers are critical to learning and creativity." Although the system/organisational level was the emphasis of this work, Burt (2005) recognised that spanning boundaries/structural

holes allows early access to diverse and often contradictory information which gives individuals a competitive advantage in generating good ideas and being creative. Research has also assessed collaborative brokerage, whereby individuals broker collaborations between diverse and extensive ties (*i.e.* two or more individuals who have no direct ties to each other), which can aid in the development of creative ideas (Fleming *et al.*, 2007). Teigland and Wasko (2003) also found a positive relationship between boundary spanning communication and creativity, with brokerage behaviour often involved in boundary spanning communication (Burt, 2005). The present study corroborates and extends these established findings, demonstrating that brokerage behaviour has a significant positive effect on individual creativity.

It needs to be acknowledged that this significant positive relationship points to the potential for brokerage to mediate the relationship between individual differences and creativity as was predicted in this research (Hypotheses 5 and 9). However the negative relationship found between individual differences and brokerage (which will be discussed later in this chapter) means that the nature of the mediation effect of brokerage found in this research was somewhat unexpected. The nature of this unexpected mediation effect will be detailed in the later section on mediation. The significant negative relationship between centrality and creativity will be discussed next.

Centrality and Creativity

Support for the predicted positive relationship between centrality and individual creativity was not found. Rather, centrality had a significant negative relationship with individual creativity in both the proactivity and CSE models. This meant that central players were less likely to be creative than non-central players in this research.

The existing literature suggested that individuals who were more central in the flow of information would be more creative at work (Ibarra & Andrews, 1993; Perry-Smith & Shalley, 2003; Sparrowe *et al.*, 2001). Extant research was however limited since this association had largely been alluded to or discussed purely theoretically without actual empirical examination. For example, the majority of existing research assessed centrality in relation to overall work performance which might include aspects of individual creativity, but specific assessments of centrality in relation to individual creativity were lacking.

Where the relationship between centrality and individual creativity has been explicitly examined there have also been unexpected findings. For example, Perry-Smith (2006) found a positive relationship between centrality and creativity, dependent on the number of outside ties an individual had. Specifically, when the number of outside ties was high, centrality had little effect on individual creativity (Perry-Smith, 2006). It is therefore possible that the presence of outside ties in the current study resulted in centrality impeding individual creativity. Indeed outside ties had a significant negative effect on individual creativity in the present research, which could in turn explain the unexpected negative relationship observed between centrality and creativity.

Lechner, Frankenberger, and Floyd (2010) assessed the relationship between centrality and performance at work, at the intergroup level, across five large multinational corporations competing in a range of fields (*e.g.* automotive, semiconductor and insurance industries). They found negative consequences of centrality to be more pronounced in exploratory initiatives. In Lechner *et al.'s* (2010) study, exploratory initiatives, or the extent to which initiatives drew on knowledge that was new to the firm, were assessed along a continuum.

Therefore, centrality may be detrimental to creative performance in contexts where work is mainly characterised by exploratory initiatives, as opposed to exploitative initiatives (*i.e.* initiatives that draw on existing knowledge within an organisation). It is possible work at the organisation studied in the current research was based more on exploring new knowledge as opposed to exploiting existing organisational knowledge, offering a possible reason as to why centrality was detrimental to creativity.

Research by Perry-Smith and Shalley (2003) found moderate levels of centrality, as opposed to very low or very high levels, were associated with enhanced creativity. Therefore, being highly central in the present study may have resulted in reduced creativity. In line with this view, the fact that the current study sample consisted of many central players with extensive connections to others in the bounded network might explain the negative effect of centrality on creativity. Theoretically, this can be explained based on findings from research on diversity and creativity. Having access to diverse sources of information is likely to improve individual creativity (Burt, 2000; Fleming *et al.*, 2007; Perry-Smith, 2006; Polzer *et al.*, 2002), while the reverse can be expected of homogeneous sources of information. Therefore, moderate levels of centrality can ensure the accrual of excessive ties to homogenous sources of information is avoided. Perhaps the current context consisted of many homogenous sources of information which proved ineffectual in terms of individual creativity.

Being central in a network may mean that an individual is accessing redundant and homogenous sources of information (rather than diverse and heterogenous sources of information), which are not likely to improve individual creativity. This is supported by research which indicates that homogenous/homophilous contacts tend to provide

homogenous ideas, while heterogenous/diverse contacts tend to provide heterogenous ideas which improve creativity (Burt, 2004, 2007; Fleming *et al.*, 2005; Kratzer & Lettl, 2008; Perry-Smith & Shalley, 2003; Vedres & Stark, 2008). Therefore, the findings from this research suggest centrality within a potentially homogenous network can be detrimental to individual creativity.

Teigland and Wasko (2003) assessed how organisations should manage employees' knowledge-sourcing activities, as well as the relationship between different knowledge-sourcing activities and individual performance. These authors found a negative relationship between a reliance on collocated co-workers as knowledge sources and creativity (Teigland & Wasko, 2003). This finding indicated that being central amongst a network of collocated co-workers can result in reduced individual creativity. The significant negative relationship between centrality and individual creativity in the present study can thus be explained by the fact that these ties were mapped across collocated co-workers, as studied individuals largely identified collocated co-workers as being part of their networks. Centrality in restricted/limited networks such as this would seem to hamper creativity while centrality in a diverse/extensive network may improve creativity.

Uzzi (1997) argued that organisations can become over embedded within a network structure. As such, when a network surrounding an actor is already comprised of many direct links (*i.e.* dense) it is likely that additional ties will yield non-redundant information. Under such circumstances, further increases in the number of direct ties to an actor reduces performance because the cost of maintaining an additional tie exceeds its information benefits (Burt, 1992). In turn, centrality may have a negative impact on individual creativity. Some of the networks identified in the present research could be considered

relatively dense, which would mean there were minimal benefits of centrality to creativity. Furthermore, the central players in the identified network may not have had the capacity to accurately assess the number and types of ties worth maintaining to maximise information benefits.

Further evidence for a link between centrality and creativity comes from relatively recent research on the professional networks of mid-level managers (Chua, Morris, & Ingram, 2010). This research found that managers were more likely to share new ideas with the people in their network who were centrally embedded, with affect-based trust mediating this relationship (Chua *et al.*, 2010). This information sharing improved individual creativity. Despite the focus on mid-level managers, these findings can be extended to help explain the negative relationship between centrality and creativity found in the present study. Perhaps members in the studied networks did not necessarily trust the identified central players and therefore did not go out of their way to exchange information with them in ways which could have improved their creativity.

It needs to be acknowledged that despite finding a negative relationship between centrality and creativity when a positive relationship was expected (Hypotheses 6 and 10), this significant relationship reaffirms the mediation potential of centrality in the relationship between individual differences and creativity. However, the negative nature of this and the later discussed relationship between individual differences and centrality means that the nature of the mediation effect was unexpected. The details of this unexpected mediation effect will be provided in the upcoming section on mediation. Next the networking perspective on creativity will be summarised before the relationship between the individual differences and networking is discussed.

Summary of Networking and Creativity

Using the networking perspective on creativity, the relationships that networking parameters (*i.e.* weak and outside ties) and roles (*i.e.* brokerage and centrality) had with individual creativity were examined. Existing research had predominantly found that these networking variables were positively related to individual creativity however these networking parameters and roles had never previously been assessed concurrently, as was the case in this research. Weak ties did not have a significant relationship with individual creativity, while outside ties unexpectedly had a significant negative relationship with individual creativity. As expected, brokerage had a significant positive relationship with individual creativity, while surprisingly centrality had a significant negative relationship with individual creativity. Brokerage had the strongest effect on individual creativity of the networking variables. The next step in establishing the mediation potential of networking in the relationship between individual differences and creativity requires the discussion of findings on the relationship between individual differences and networking, which will be detailed next.

Individual Differences and Networking

With the individual difference and networking perspectives accounted for, this section represents the integration of these two perspectives. Specific hypotheses pertaining to these relationships were not proposed as they would have been redundant given the joint effects mediation hypotheses in the study. However, these relationships are integral to understanding the mediation hypotheses (Hypotheses 3-10) which are central to this research.

While neither proactivity nor CSE had significant relationships with the network parameters (*i.e.* weak or outside ties), both of these individual differences unexpectedly had significant negative relationships with networking roles (*i.e.* brokerage and centrality) when positive relationships were expected. The non-significant relationship between proactivity and weak ties will be discussed next.

Proactivity and Weak Ties

Existing research suggested that proactivity would be positively related to weak ties (O'Donnell, 2004), however no significant relationship was observed between these variables in the current study. A proactive person goes out of their way to control their work outcomes and be successful through a variety of means (Bateman & Crant, 1993; Chan, 2006; Crant, 2000; Griffin *et al.*, 2007; Ohly & Fritz, 2010), which would imply having a good sense of the organisation and/or industry within which they are operating. As such, if the current context required more strong types of ties in order to ensure work outcomes, this is the networking route a proactive person would take, rendering weak ties less useful.

Theoretically, this non-significant relationship means that proactive people can be disinclined to network with large relatively diffuse groups in which there are no clear boundaries (Jones, Ferreday, & Hodgson, 2008). Furthermore, some networks may consist of members with weaker ties to one another than might be expected in terms of a community or work group (Jones *et al.*, 2008). This may particularly be the case when the network is under structural pressure which was the case in the current study, given the major system-wide restructuring that was taking place at the time of data collection.

Resultantly, blurred boundaries may have weakened connections between network nodes, in turn negating the need for proactivity in the maintenance of weak ties.

Given, as previously explained, the relationship between weak ties and creativity was non-significant and the relationship between proactivity and weak ties was also non-significant, weak ties did not mediate the relationship between proactivity and creativity in the current research. Therefore Hypothesis 3 was not supported. The non-significant relationship between proactivity and outside ties will be discussed next.

Proactivity and Outside Ties

Existing research suggested that proactivity would be positively related to outside ties (O'Donnell, 2004), however the relationship between these variables in this research was non-significant. As previously discussed, proactive people go out of their way to control their work environments and outcomes (Bateman & Crant, 1993; Chan, 2006; Crant, 2000; Griffin *et al.*, 2007; Ohly & Fritz, 2010). Therefore, proactive people in the studied context may not have considered outside ties to be valuable connections for improving work outcomes and so did not go out of their way to make such connections.

Madjar *et al.* (2002) found that a major source of outside/nonwork support was from close ties to those such as family, with whom proactive behaviours may not be as obligatory as would be the case with more distant contacts. Perhaps individuals in the current context relied on some close contacts (such as family) for support from outside of the organisation and proactivity may therefore not have been necessary. Unfortunately, this proposition could not be tested in the current study because outside ties were not categorised in terms of their specific type (*e.g.* family).

Although a significant negative relationship was observed between outside ties and creativity, the lack of relationship between proactivity and outside ties meant that outside ties did not mediate the relationship between proactivity and creativity. Therefore Hypothesis 4 was not supported. The significant negative relationship between proactivity and brokerage will be discussed next.

Proactivity and Brokerage

Existing research suggested that proactivity would be positively related to brokerage (Gong *et al.*, 2012; O'Donnell, 2004; Thompson, 2005), however proactivity had a significant negative relationship with brokerage in the current study. The existing literature indicated that individuals who are more proactive at work would also be more likely to broker extensive ties (Gong *et al.*, 2012; O'Donnell, 2004; Thompson, 2005). However, previous research had not explicitly examined this relationship, with this study being the first to do so. This finding therefore provides important novel empirical evidence in relation to the nature of the relationship between proactivity and brokerage.

Information redundancy (Burt, 2005) may help to explain this unexpected finding. Specifically, the value of a contact in terms of the information he/she can provide depends on the information an individual already possesses. Thus, a person can have many ties to others in their network or across networks, but a number of these ties may be redundant, resulting in a negative relationship between proactivity and brokerage. This also means that proactive people are unlikely to broker ties with redundant network nodes. Perry-Smith (2006) claimed that brokerage is central to non-redundancy. The present finding may mean that many nodes in the studied network possessed redundant information which proactive people were not motivated to access, hence the negative relationship.

This negative relationship may also be due to the fact that less proactive people are more likely to be on the periphery of a network, exposing them to diverse sources of information outside of the mapped network (Burt, 2005). This means that peripheral people may not need to be proactive in order to broker ties to proximally close and yet diverse others. Clearly the relationship between proactivity and brokerage is more complicated than was thought previously.

In certain contexts boundary spanning or brokerage behaviour may be discouraged which would mean that even proactive members of a network avoid brokerage behaviour. Jones *et al.* (2008) examined two networked settings in which educational leaders exchanged ideas and created knowledge. Interestingly, it was found that brokerage was discouraged, in order to maintain a stable network environment in which members felt at ease and able to share information freely while at the same time boundaries could be crossed for valid reasons. Amongst the valid reasons were matters of expertise which could justify brokerage behaviour (Jones *et al.*, 2008). Therefore, in certain networks, proactive people may be discouraged from acting as brokers unless required expertise can only be accessed through boundary spanning. It is possible that proactive individuals in the studied organisation potentially did not require additional expertise and in turn may have been discouraged to act as brokers.

Given that brokerage had a significant (positive) relationship with creativity and that proactivity had a significant (negative) relationship with brokerage, this networking role was a significant mediator in the relationship between proactivity and creativity. Nevertheless, as joint positive effects were expected, there was mixed support for Hypothesis 5. The nature and meaning of this mediated relationship will be detailed later in

this chapter. The significant negative relationship between proactivity and centrality will be discussed next.

Proactivity and Centrality

Existing research suggested that proactivity would be positively related to centrality (Gong *et al.*, 2012; Mehra *et al.*, 2001), however proactivity had a significant negative relationship with centrality in this study. It is important to note that there had previously been no empirical research which had explicitly examined this relationship. Therefore, this finding provides novel empirical evidence in relation to the actual nature of the relationship between proactivity and centrality.

Information redundancy (Burt, 2005) may help to explain this unexpected finding. The negative relationship between proactivity and centrality may mean that proactive people avoid securing central roles in networks where information flows are likely to be homogenous and redundant. Potentially the present study context consisted of networks which were quiet dense in terms of the types of nodes contained. Higher density means lower diversity which in turn implies redundant/homogenous sources of information. Therefore, an individual's motivation to secure a central position in such dense networks may have been minimal.

Perhaps individuals who are considered successful at work are less proactive due to early career networking efforts which may have effectively secured them ongoing sources of information and knowledge (*i.e.* central roles). In line with this argument, Seibert *et al.* (2001) found career success was linked with access to information and resources. Additionally, individuals and groups may go out of their way to stay connected with other

individuals who possess reputations for being particularly successful and who have diverse connections. Wong and Boh (2010) claimed that reputable organisational members are likely to have more advocates with diverse and efficient channels through which information can be dispersed and retrieved. As such, reputable people may not need to be proactive to secure and maintain central positions.

Given that centrality had a significant (negative) relationship with creativity and that proactivity had a significant (negative) relationship with centrality, this networking role was a significant mediator in the relationship between proactivity and creativity. Nevertheless, as joint positive effects were expected, there was mixed support for Hypothesis 6. The nature and meaning of this mediated relationship will be detailed later in this chapter. Next, the non-significant relationship between CSE and weak ties will be discussed.

CSE and Weak Ties

Existing research suggested that CSE would be positively related to weak ties (Beghetto, 2006; Yang & Cheng, 2009), however no significant relationship between these two variables was observed in this study. A creatively efficacious individual is confident in their creative abilities (Beghetto *et al.*, 2011; Gong *et al.*, 2009; Tierney & Farmer, 2002, 2004, 2011; Yang & Cheng, 2009) and so may have avoided additional sources of information from weak ties. Indeed, with high average CSE levels accessing weak ties may not have been necessary for the current study sample. Given the lack of empirical examination of this relationship, this finding represents another novel contribution of this research.

Strong ties, as opposed to weak ties tend to be associated with trust-based relationships (Madjar *et al.*, 2002) which creatively efficacious individuals may be more interested in maintaining. Perhaps, the competitive IT climate in which this research was conducted meant creatively efficacious individuals had to rely primarily on ties to trusted nodes instead of ties to weak and diversely diffused nodes. The IT context has been identified as one in which workers are more likely to share knowledge and information with strong ties (as opposed to weak ties), with whom trust is evident (Smith *et al.*, 2005). This may therefore also be true for the individuals surveyed in the studied organisation.

Given that no significant relationship was found between weak ties and creativity, or between CSE and weak ties, weak ties did not mediate the relationship between CSE and creativity in the current research. Therefore Hypothesis 7 was not supported. Next, the non-significant relationship between CSE and outside ties will be discussed.

CSE and Outside Ties

Existing research suggested that CSE would be positively related to outside ties (Beghetto, 2006; Yang & Cheng, 2009), however the relationship between these two variables was non-significant in the current study. The particularly scant nature of existing research on this relationship can to some extent justify the surprising nature of this non-significant finding, as a significant direct relationship between these two variables was not well established.

Like the previously discussed weak ties, outside ties are also unlikely to be characterised by the trust that is associated with strong ties (Madjar *et al.*, 2002). Therefore, creatively efficacious individuals may rely more on trust-based relationships than on outside ties

when discussing work-related tasks. Some outside ties, such as family and friends, can however be categorised as close ties (Baer, 2010; Madjar *et al.*, 2002) which would likely be associated with high levels of trust. No such specific categories were identified in the current study and participants may have only identified outside ties to individuals other than family and friends such as customers and suppliers with whom the same high levels of trust may not have existed. The potential lack of trust that participants may have had in some of their outside ties can potentially help explain the non-significant relationship between CSE and outside ties.

Despite outside ties having a significant (negative) relationship with creativity, the lack of relationship between CSE and outside ties means that outside ties did not mediate the relationship between CSE and creativity. Therefore Hypothesis 8 was not supported. Next, the significant negative relationship between CSE and brokerage will be discussed.

CSE and Brokerage

Existing research suggested that CSE would be positively related to brokerage (Beghetto, 2006; Guler & Guillen, 2010; Pryke, 2012), however a significant negative relationship between these two variables was found in the current study. This may potentially be because less efficacious people are more likely to require assistance when performing work tasks and may therefore seek out information and resources via brokerage behaviour. Conversely, a creatively efficacious individual may not need to rely on brokering extensive and diverse ties to perform at work and may therefore demonstrate low levels of brokerage behaviour. The high average CSE levels reaffirm the likelihood that individuals in this research were confident enough in their abilities to avoid brokerage behaviour. This research is the first to empirically test the relationship between CSE and brokerage.

The broader self-efficacy literature as well as the more specific CSE literature highlights that most people engage in tasks in which they feel competent and confident while avoiding tasks in which they do not feel confident (Bandura, 1997; Tierney & Farmer, 2002, 2004). In line with this reasoning, individuals who were high on creative self-efficacy or confidence were expected to be similarly confident brokers. However, it may be that creatively efficacious individuals are confident to work well alone and so are less motivated to engage in brokerage behaviour. Therefore, the present findings provide important new information in relation to the nature of the relationship between CSE and brokerage.

Although existing research suggests that individuals who were more efficacious about their creative abilities would be more likely to broker extensive ties (Beghetto, 2006), limitations of this research may help explain the present unexpected finding. Existing research in this area is very limited as CSE has not been extensively examined beyond the creativity field. Furthermore, while the existing research alluded to brokerage via reference to engagement in social activities (Beghetto, 2006), it had not been explicitly examined in relation to CSE, as was the case in the current research.

Given the limitations of existing research, theorists may have assumed that confidence in one domain (*i.e.* creativity) would spill over into another domain such as networking and specifically brokerage, but evidently that is not necessarily the case. For example, Yang and Cheng (2009) found a correlation between Domain-specific IT skills of systems analysts and their creative self-efficacy, indicative of a potential spill over between confidence in IT skills and CSE. Thus, while confidence in one's own creative abilities and

specialised IT skills are likely to bolster one another, the same may not be expected in terms of an individual's belief in their creative abilities and brokerage skills.

As with the findings in the proactivity model, given the significant (positive) relationship between brokerage and creativity and the significant (negative) relationship between CSE and brokerage, brokerage also mediated the relationship between CSE and creativity. Nevertheless, as joint positive effects were expected to establish mediation, there was mixed support for Hypothesis 9. The nature and meaning of this mediated relationship will be detailed in a later section of this chapter. Next, the significant negative relationship between CSE and centrality will be discussed.

CSE and Centrality

Existing research suggested that CSE would be positively related to centrality (Perry-Smith & Shalley, 2003; Yang & Cheng, 2009), however a significant negative relationship between these variables was found in this study. With most individuals in this research demonstrating high levels of CSE, they may not have felt the need to connect with other people or groups, hence the negative relationship between CSE and centrality.

Existing research on this specific relationship was very limited given that CSE has yet to be extensively examined, particularly in terms of networking. Previously, CSE had only been assessed in relation to centrality once by Yang and Cheng (2009) who also predicted a positive relationship between these variables. However, consistent with the present finding, Yang and Cheng (2009) also found that centrality (or degree centrality) was negatively related to CSE for both systems analysts and programmers. Yang and Cheng (2009) argued that this finding could be explained by the context in which their research

was conducted, as study participants had too many roles, rendering a lot of their ties redundant. Individuals had many direct ties to a variety of other individuals who could not help to clarify specific problems and instead possibly caused information overload, which has been deemed disruptive to creativity (Perry-Smith & Shalley, 2003; Yang & Cheng, 2009). The present study context may have resembled that in Yang and Cheng's (2009) study, which would explain the negative relationship found between CSE and centrality.

Similar to findings from the proactivity model, the significant (negative) relationship between centrality and creativity and the significant (negative) relationship between CSE and centrality, means that centrality also mediated the relationship between CSE and creativity. Nevertheless, as joint positive effects were expected to establish mediation, there was mixed support for Hypothesis 10. This mediated relationship, along with the other mediated relationships will be detailed after the following summary of the relationships between individual differences and networking.

Summary of Individual Differences and Networking

In an effort to establish joint effects mediation the relationships between the individual difference and networking antecedents to creativity needed to be examined. Examining proactivity and CSE in relation to weak and outside ties, brokerage and centrality roles, represents the integration of the individual difference and networking perspectives on creativity. The mixed findings pertaining to the integration of these two perspectives were detailed. Both proactivity and CSE had significant relationships with networking roles (*i.e.* brokerage and centrality) and non-significant relationships with networking parameters (*i.e.* weak and outside ties). The significant relationships were negative in nature when positive relationships were expected. Therefore, networking roles (and not networking

parameters) can be deemed significant mediators in the relationship between individual differences and creativity. Next, the significant mediated relationships found in this research will be discussed.

6.5   Mediation Effects of Networking in the Relationship between Individual Differences and Creativity

With the effects of networking on creativity and individual differences on networking discussed, the joint effects of individual differences and networking on creativity need to now be considered. The preceding discussions have highlighted that Hypotheses 3, 4, 7 and 8 were unsupported, so this section will focus on explaining the significant mediation effects found in relation to Hypotheses 5, 6, 9 and 10.

As was highlighted previously outside ties, brokerage and centrality were significantly related to creativity while proactivity and CSE were significantly related to brokerage and centrality. Therefore, networking parameters (*i.e.* weak and outside ties) did not have any significant mediating effects, while networking roles (*i.e.* brokerage and centrality) were significant mediators in the relationship between individual differences and creativity. The mediating effects of networking in the relationship between proactivity and creativity will be discussed next.

Proactivity, Networking and Creativity

This section will discuss the significant findings in terms of the mediating relationships proposed in Hypotheses 5 and 6. Earlier discussions of the relationships between networking and creativity and between proactivity and networking identified networking roles (*i.e.* brokerage and centrality) to be significant mediators in the relationship between

proactivity and creativity. Given that proactivity did not have a significant direct effect on creativity, both of the networking roles fully mediated the relationship between proactivity and individual creativity. First, the significance of brokerage as a mediator in the relationship between proactivity and individual creativity will be discussed.

Proactivity, Brokerage and Creativity

Proactivity had an indirect effect on creativity via brokerage. More specifically, proactivity had a negative relationship with brokerage and brokerage in turn had a positive relationship with creativity. Since joint positive effects were predicted, there was mixed support for Hypothesis 5. This finding means that less proactive individuals demonstrated more brokerage behaviour and in turn were more creative. Given the earlier explained non-significant relationship between proactivity and creativity, brokerage (along with centrality) fully mediated the relationship between proactivity and creativity. This study is the first to establish brokerage as a significant mediator in the relationship between proactivity and creativity.

Despite the somewhat unexpected nature of this mediation effect, some have argued that individuals who are successful in a particular field or industry could attract diverse and extensive connections automatically (*i.e.* successful individuals can be less proactive and still broker extensive ties) which in turn can result in increased creativity (Luthans, 1988; Seibert *et al.*, 2001). Luthans (1988) defined individual success in terms of the speed at which an individual is promoted in an organisation, relative to individual tenure. By studying managers from across the service industry in America, Luthans (1988) found the key to managerial success (as per the given definition) was networking. More specifically, the most successful managers engaged in considerably more networking (*i.e.* socialising,

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politicking and interacting with outsiders) and only slightly more routine communication than their less successful managerial counterparts (Luthans, 1988). Less proactive people in the context of the current study may have therefore, relied more heavily on brokerage behaviour in order to ensure creative success. Conversely, proactive individuals in the current context may have had well established connections which negated the need for ongoing brokerage, as other network nodes (*i.e.* individuals and groups) were likely to want to have actively associated with these seemingly successful individuals. Thus, brokerage may benefit the creativity of less proactive workers but not workers who are already successful.

Seibert *et al.* (2001) also found that career success was linked with access to information and resources. As such, successful individuals may not need to actively broker ties as they have well established connections which allow for sustained success, even in the creativity domain. Furthermore, Wong and Boh (2010) found that the reputation of managers was dependent upon efficient networking and communication channels. Thus, reputable individuals can be less proactive and still have extensively brokered connections (to and through diverse advocates) and in turn creative success.

Individuals may accumulate adequate levels of work and nonwork support earlier in their careers justifying a decrease in proactivity in their later careers, which according to the current findings is associated with more brokered connections. Furthermore, work (supervisors/co-workers) and nonwork (family/ friends) supporters have been found to make significant independent contributions to individual creative performance (Madjar *et al.*, 2002). Collectively, existing research supports the potential for successful/reputable individuals, and those that have accumulated ties earlier in their careers, to be less

proactive while still maintaining extensively brokered connections which improve their creativity.

The relationship between proactivity, brokerage and creativity can be further explained by the fact that organisational members who operate on the outskirts of organisational networks may not need to be proactive in order to broker relationships that are relatively easily accessible to them (Burt, 2004, 2005). Brokers are proximally disposed to access information that more central players may be removed from, eliminating the need for proactivity in brokerage behaviour. In turn evidence suggests that bridging structural divides and brokering relationships with diverse others enhances individual creativity (Burt, 2004, 2005), as was corroborated here.

A further argument on accessibility can be made drawing on network density, such that the higher the density within networks (*i.e.* groups, divisions or industries), the easier access individuals have to other network nodes within rather than between networks (Burt, 2005). Individuals would therefore not need to be proactive to broker and access information within dense networks, which are categorised by actors maintaining many direct and easily accessible links to other network nodes. Proactivity may therefore not be necessary for brokerage roles to prevail to the benefit of individual creativity.

Although not as predicted, these findings clearly confirm that brokerage is an important mechanism in the relationship between proactivity and creativity. The mediating effects of centrality on the relationship between proactivity and creativity will be discussed next.

Proactivity, Centrality and Creativity

Proactivity had an indirect effect on creativity via centrality. More specifically, proactivity had a negative relationship with centrality and centrality had a negative relationship with creativity. Since positive joint effects were predicted, there was mixed support for Hypothesis 6. This finding means that more proactive individuals were less central in networks and in turn more creative. Given the earlier explained non-significant relationship between proactivity and creativity, centrality (along with brokerage) fully mediated the relationship between proactivity and creativity. This study is the first to establish centrality as a significant mediator in the relationship between proactivity and creativity.

The results demonstrate that some organisational members may not need to be proactive in order to secure central network positions and such network positioning may not be as advantageous to creativity as originally anticipated. Furthermore, this research has shown proactive individuals avoid centrality in networks in order to improve their creativity. Theoretical explanations of this unexpected result are harder to provide than those pertaining to the mediating effects of brokerage, as studies on brokerage outnumber studies on centrality.

Research on organisational tenure may however help to explain this unexpected result. The longer an individual works in an organisation, the greater their knowledge of tasks and the organisation is likely to be (Gilson & Shalley, 2004). This may in turn constitute the knowledge accumulation necessary to accord them a central network position, the quality and relevance of this knowledge may however impede individual creativity. Individuals with greater organisational tenure often rely on out-of-date or redundant sources of information which impedes creativity (Gilson & Shalley, 2004). The majority of

individuals in the studied organisation had relatively extended tenures and may have been less inclined to act proactively due to knowledge they had already accumulated over their time at the organisation. In turn, these long-tenured individuals were more likely to assume central network positions (as opposed to less-tenured and less knowledgeable individuals) and in turn be less flexible in their approaches to work tasks. These individuals may have also held, for extended periods of time, central positions in the same/unvaried networks which ultimately reduced their creative outputs.

Unvaried networks implicate network diversity issues, in which homogenous versus heterogenous information sources apply. Being central in a diverse network and being central in a homogenous network may have varied implications on individual creativity. Specifically, homogenous/homophilous contacts are likely to provide homogenous ideas, while heterogenous/diverse contacts are likely to provide heterogenous ideas which improve creativity (Burt, 2004, 2007; Fleming *et al.*, 2005; Kratzer & Lettl, 2008; Perry-Smith & Shalley, 2003; Vedres & Stark, 2008). Some of the identified networks may have thus, constituted homogenous networks in which central players had access to limited/homogenous information and knowledge which in turn limited their individual creativity. Conversely, proactive people may have avoided centrality in such networks which lead to improved creativity.

Despite the unexpected nature of these findings, they confirm that centrality is another important mechanism in the relationship between proactivity and creativity. The mediating effects of networking variables in the relationship between CSE and creativity will be discussed next.

CSE, Networking and Creativity

This section will discuss the significant findings in terms of the mediating relationships proposed in Hypotheses 9 and 10. Earlier discussions of the relationships between networking and creativity and between CSE and networking identified that networking roles (*i.e.* brokerage and centrality) significantly mediated the relationship between CSE and creativity. Given the significant direct relationship found between CSE and creativity, networking roles were partial mediators in the relationship between CSE and creativity. First, the significance of brokerage as a mediator in the relationship between CSE and individual creativity will be discussed.

CSE, Brokerage and Creativity

CSE had an indirect effect on creativity via brokerage. More specifically, CSE had a negative relationship with brokerage and brokerage in turn had a positive relationship with creativity. This finding means that less creatively efficacious individuals demonstrated more brokerage behaviour and in turn were more creative. Since joint positive effects were predicted, there was mixed support for Hypothesis 9. Given the earlier explained finding demonstrating a significant positive relationship between CSE and creativity, brokerage can be deemed a partial mediator in the relationship between CSE and creativity. This study is the first to establish brokerage as a significant mediator in the relationship between CSE and creativity.

This finding demonstrates that brokerage is important in understanding the relationship between CSE and creativity. Less creatively efficacious individuals are potentially more likely to broker extensive ties than their more creatively efficacious counterparts because they require additional sources of information and knowledge in order to be creative.

Conversely, individuals who have high levels of CSE may avoid brokerage behaviour because they are confident in their individual knowledge and capabilities to be creative. This is evidenced by the positive relationship between CSE and creativity in the current research, as well as in past research (Beghetto *et al.*, 2011; Gong *et al.*, 2009; Tierney & Farmer, 2002, 2004, 2011; Yang & Cheng, 2009). Moreover, creatively efficacious individuals may prefer to work more independently when working on creative tasks, whereas less creatively efficacious individuals may rely on extensive collaborations for creative undertakings.

This mediated relationship may also in part be explained by the nature of the work being undertaken by employees at the studied organisation. Tierney and Farmer (2011) found that CSE levels decreased when individuals felt increased pressure to be creative at work. If pressure for creative output was high at the studied organisation at the time of data collection, this could explain why reduced CSE levels were associated with greater brokerage behaviour, as individuals sought out sources of information and knowledge they were not confident they possessed, in order to meet the creativity demands of their work. This may well have been the case given the high-pressure and demanding nature of the work being done at the studied organisation (refer to Chapter Three for details).

Although not as predicted, these findings clearly confirm that brokerage is an important mechanism in the relationship between CSE and creativity. The mediating effects of centrality in the relationship between CSE and creativity will be discussed next.

CSE, Centrality and Creativity

CSE had an indirect effect on creativity via centrality. More specifically, CSE had a negative relationship with centrality and centrality in turn had a negative relationship with creativity. Creatively efficacious individuals avoided central network positions and in turn were more creative. In comparison, less creatively efficacious individuals were more likely to secure central network positions and had lower levels of creativity. Since positive joint effects were predicted, there was mixed support for Hypothesis 10. Given the earlier explained finding demonstrating a significant positive relationship between CSE and creativity, centrality was a partial mediator in the relationship between CSE and creativity. This study is the first to establish centrality as a significant mediator in the relationship between CSE and creativity.

Creatively efficacious members of the studied organisation may have felt confident enough in their abilities to maintain individual creativity without being central in the flow of information. Theoretical explanations of this unexpected result are particularly hard to provide given the limited literature on centrality when compared to that on brokerage, as well as on CSE when compared to that on proactivity.

Given the positive relationship between CSE and creativity in the current research, as well as past research (Beghetto *et al.*, 2011; Gong *et al.*, 2009; Tierney & Farmer, 2002, 2004, 2011; Yang & Cheng, 2009), creatively efficacious individuals are likely to be confident to work independently on creative tasks. Moreover, individuals with high CSE levels may avoid central network positions because they are confident in their individual knowledge and capabilities, whereas less creatively efficacious individuals may rely on inroads and

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collaborations with surrounding organisational members/network nodes when working on creative tasks.

Network diversity may also be relevant in terms of understanding this mediation effect. Perhaps the present finding reflects homogenous network centrality (as opposed to diverse/heterogeneous network diversity) in which information and knowledge may not positively enhance individual creativity. As was previously discussed, being central in the flow of homogenous ideas may be detrimental to individual creativity while being central in the flow of heterogeneous information may benefit individual creativity (Burt, 2004, 2007; Fleming *et al.*, 2005; Kratzer & Lettl, 2008; Perry-Smith & Shalley, 2003; Vedres & Stark, 2008). Therefore, less creatively efficacious individuals in the current context may be unwittingly seeking central positions in redundant/homogenous information networks thereby negatively impacting their creativity.

Less creatively efficacious individuals may have also succumbed to their homophilous instincts which motivate individuals to associate with like others (McPherson *et al.*, 2001; Retica, 2006; Ruef *et al.*, 2003). Given that homogenous/homophilous contacts tend to provide homogenous ideas which impede creativity (Burt, 2004, 2007; Fleming *et al.*, 2005; Kratzer & Lettl, 2008; Perry-Smith & Shalley, 2003; Vedres & Stark, 2008), less creatively efficacious individuals need to avoid centrality in such networks and instead seek out exposure to more diverse/heterogenous information. Therefore, if less creatively efficacious individuals secure central positions in homophilous/homogenous networks, their individual creativity may be hampered even further.

The issue of network diversity also implicates the actual quality of ties in a network. This is because direct ties to a variety of individuals who cannot help to clarify specific problems and instead possibly cause information overload, are potentially disruptive to creativity (Perry-Smith & Shalley, 2003; Yang & Cheng, 2009). The present context may constitute one where information overload issues proved problematic.

Despite the unexpected nature of these findings, they confirm that centrality is another important mechanism in the relationship between CSE and creativity. Next, the mediated relationships will be summarised.

Summary of Mediated Relationships

Networking roles (*i.e.* brokerage and centrality) fully mediated the relationship between proactivity and creativity. While in the case of the relationship between CSE and creativity, brokerage and centrality were only partial mediators. Despite positive joint effects being predicted for all the hypothesised relationships, brokerage was the only variable to have a positive relationship with creativity in both the proactivity and CSE models. The remainder of the significant relationships were negative. Collectively, these expected and unexpected findings represent novel and important contributions to the field. Additional contextual considerations will be discussed next, to further explain the current findings.

6.6 Contextual Considerations

Considering the novel nature of the current research context may help to further explain some of the mixed findings of this research. Theory alone cannot completely account for the fact that most of the present significant findings were unexpected in nature (*i.e.*

negative relationships were found when positive relationships were expected). Therefore considering some of the contextual characteristics outlined in Chapter Three may help to further clarify the present findings.

In Chapter Three the current organisational context was categorised by high time pressure and technical demands amidst an array of turbulent internal environmental factors. The identified turbulence was attributed to the major system-wide restructuring which was under way at the time of data collection. Given the particularly turbulent times at the studied organisation it could be argued that network boundaries were somewhat blurred and remained in a state of flux for some time. This could help to explain some of the present unexpected findings, with individuals potentially finding it more challenging (at the time of data collection) to identify their networks. Furthermore, the specific roles that they occupied within networks may have been confused due to the blurred boundaries caused by the system-wide restructuring.

Research on restructuring has shown that this form of change, like any other radical change process, can be characterised by high pressures and demands as well as uncertainty (Greenwood & Hinings, 1996). When coupled with the more general competitive and innovation pressures associated with the IT industry (Cooper, 2000; Lapierre & Giroux, 2003; Mitchell *et al.*, 2003; Staber, 2004), the networks in the current context could probably be characterised as complex and fluid. Such networks can be difficult to measure and monitor (Chan & Liebowitz, 2006; Emirbayer & Goodwin, 1994; Krackhardt, 1990), as individuals are likely to take on nonstandard patterns of networking behaviour. Therefore, the identified bounded network may have constituted a fluid network in which parameters and roles were not firmly fixed. This may in part account for the unexpected

negative relationships found between individual differences and networking roles, and between centrality and creativity.

Guler and Guillen (2010) asserted that a brokerage advantage is context-specific and difficult to transfer, as such, the present study context may help to explain the findings pertaining to brokerage. Perhaps the turbulent times besetting the studied organisation can explain the unexpected negative relationships between each of the individual difference variables (*i.e.* proactivity and CSE) and brokerage. With system-wide restructuring blurring the boundaries between organisational networks, individuals may have found brokerage behaviour more challenging. More specifically, proactive and creatively efficacious individuals may have needed to adapt their brokerage patterns and strategies to the new work conditions, which would have been difficult amidst the significant ongoing changes.

When network boundaries are shifting, it is particularly difficult for individuals to assume specific network roles or to be identifiable as occupying specific roles (Guler & Guillen, 2010). Therefore, during times of significant change, assuming brokerage and/or central roles may become more difficult for proactive and creatively efficacious individuals, which may have been the case in the current context. Specifically, individuals may have struggled to centre themselves within organisational networks or to broker connections between blurred network lines when the networks themselves were unclear due to ongoing structural changes. This in turn may have contributed to the negative implications for individual creativity, particularly in the case of the negative relationship found between centrality and creativity. However, in a more stable organisational context proactivity and CSE may have positive relationships with brokerage and centrality, and centrality may

have a positive relationship with creativity. Next, the major contributions of this research will be discussed.

6.7   Contributions of the Research

The present research represents a movement away from the over utilised, under analytical approaches which have limited research to unitary considerations of creativity. Under-analytical approaches have ignored the multifaceted nature of individual creativity, resulting in many questions in relation to the antecedents of creativity remaining unanswered (Miller & Osborn, 2008; Rietzschel *et al.*, 2009; Shalley *et al.*, 2004). Comprehensive research examining the multifaceted nature of individual creativity was therefore needed in order to answer important questions about how and why different individuals are creative at work (Shalley *et al.*, 2004). By studying multiple antecedents to individual creativity, the present research has significantly contributed to the field.

The use of an integrative framework which incorporated both the individual difference and networking perspectives on creativity is a major contribution of the research. Until recently, these perspectives have been studied exclusively in isolation to the detriment of the creativity field. Indeed, individual difference variables of proactivity and CSE have never been assessed in the same study before. Similarly, the social networking variables of weak ties, outside ties, brokerage and centrality have never been assessed concurrently, despite the theoretical justification for such assessments. Zhou *et al.* (2009) recently asserted that studying individual differences or networking parameters alone would not allow for an in-depth understanding of individual creative behaviour to be achieved. Furthermore, Zhou *et al.* (2009) showed that personal values and weak ties were both significant contributors to individual creativity. The present research therefore, also

subscribes to this integrative view, employing multiple individual difference and networking variables to arrive at a much broader understanding of individual creativity.

The inclusion of multiple antecedents to creativity was not only consistent with ongoing scholarly calls for more comprehensive research (Barron & Harrington, 1981; Rank *et al.*, 2004; Shalley *et al.*, 2004), but also enabled the most significant predictors of creativity to be identified. The present research assessed individual difference antecedents to creativity (*i.e.* proactivity and CSE) in two separate models along with multiple networking antecedents (*i.e.* weak and outside ties; brokerage and centrality) in both of these models. Concurrent consideration of the individual difference characteristics with networking parameters and roles enabled CSE to be identified as the significant individual difference antecedent to creativity. Most importantly, brokerage was identified as the most significant contributor to individual creativity in both the proactivity and CSE models.

This integrative approach also enabled networking roles (*i.e.* brokerage and centrality) to be identified as the key mechanisms through which different individuals are creative at work. Therefore, the concurrent examination of individual differences and networking demonstrated that individual differences affect creativity via networking roles. These findings serve as valuable contributions to creativity research, demonstrating the importance of the social side to individual creativity while also highlighting the complexity of relationships that underlie creativity. The potential for these relationships to change across contexts needs to be acknowledged.

The fact that this research was conducted in a novel context broadens the generalisability of findings. Much of the creativity literature to date has been conducted across a limited

range of contexts and has relied heavily on student and non-Western samples (Anderson *et al.*, 2004; Shalley *et al.*, 2004). The present research, however, assessed individual creativity in an Australian based IT organisation, highlighting the importance of cultural/contextual considerations in creativity research to improve the generalisability of findings.

This novel combination of antecedents examined via a multi-method approach and in a novel context represents major theoretical and methodological advancements in creativity research. This has culminated in generating a new conceptual model that can be utilised by future researchers interested in individual creativity. This model will be discussed next.

Individual Differences, Networking and Creativity: A New Model

Many individual difference and networking models of creativity have been proposed in the literature (Rank *et al.*, 2004; Runco, 2004; Shalley *et al.*, 2004; Simonton, 2000). However, by neglecting to integrate individual difference and networking considerations in the assessment of individual creativity, many questions about individual creativity have remained unanswered in existing research. Existing research has also failed to explain the mechanisms through which different individuals are creative at work. The present research was designed to examine the significance of networking variables as the mechanisms through which individuals are creative. In achieving this aim, a new model has been developed. This model outlined in Figure 16 provides a more comprehensive framework upon which to assess individual creative behaviour, unlike past research which has largely been limited by unitary and unintegrated considerations (Rietzschel *et al.*, 2009).
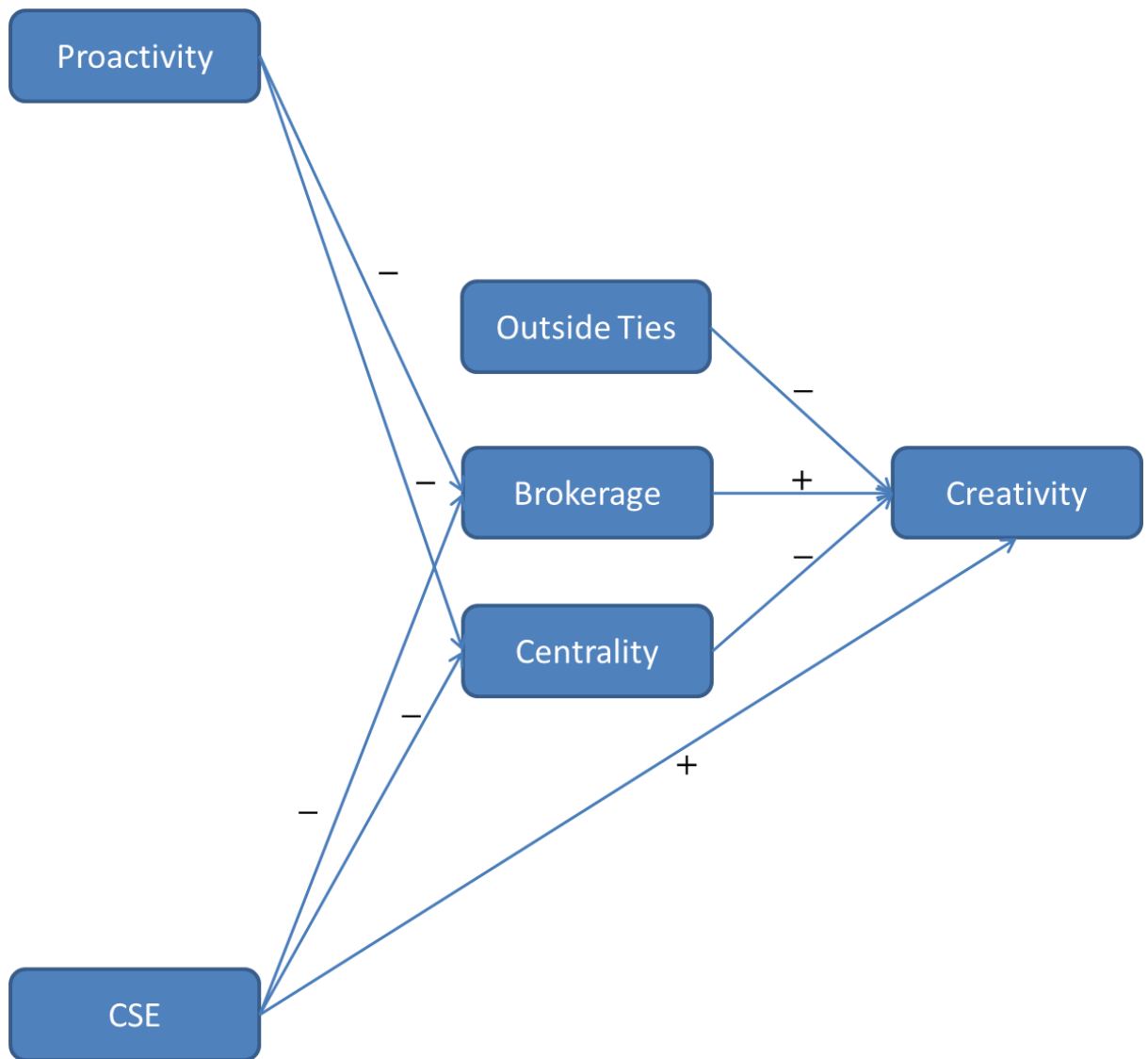
Figure 16: Model of individual differences, networking and creativity

Adaptability of the Model

This model can be used as a template to assess individual creativity across contexts. This model can also be used as a template to develop alternative integrative models, which consider different combinations of individual differences and networking variables (parameters and roles) in relation to creativity. In turn, this may further the agenda for concurrent considerations of the antecedents to individual creativity. In doing so, additional conclusions may be reached about the most significant individual difference and networking antecedents to creativity. This model could also serve as the basis upon which

to extend integrative considerations across different levels of creativity (*i.e.* team and system levels). Next, practical implications of the research findings will be discussed.

6.8   Practical Implications

Given that CSE was positively associated with individual creativity, managers should endeavour to understand how to enhance an individual's CSE in order to further improve their creativity. Mathisen and Bronnick (2009) have identified CSE as an individual attribute that is amenable to change, with creativity training having a positive effect on CSE. Therefore mangers could provide creativity training in order to effectively foster CSE and in turn improve individual creativity.

The significant negative relationship between outside ties and individual creativity implicates knowledge management strategies. For example, knowing that outside ties can impede individual creativity in certain contexts (*i.e.* high tech, IT contexts) means that managers need to develop internal communication technologies such as an Intranet, to improve knowledge flows and communication channels within the organisation. In doing so they will be negating the need for external information or ensuring that the accuracy and usefulness of external information can be gauged easily. Furthermore, by improving internal communication channels, employees' chances of effectively combining outside information with existing internal information is likely to be improved. Enhancing the capacity of employees to effectively combine external and internal information has been shown to be particularly beneficial in IT settings (Teigland & Wasko, 2003).

The significant positive association between brokerage and creativity means that managers need to pay particular attention to brokers when assigning creative tasks. Managers can

thus, capitalise on the ability of brokers to effectively position themselves along many informational paths in order to secure greater access to diverse information and knowledge, improving their creative output (Kratzer & Lettl, 2008). Seeking out and identifying brokers across organisational networks, may also allow managers to keep track of the most significant informational paths and brokers. In this way, managers can more clearly target specific staff or networks of staff for information. Hiring individuals with brokerage tendencies may also prove beneficial to organisations that rely on creative success.

The significant negative relationship between centrality and individual creativity highlights the need for managers to develop systems and strategies that allow for more open communication flows in which centrality may be rendered redundant, in turn diminishing any potential adverse effects on individual creativity. For example, providing online communication forums which are easily accessible may help to open communication channels, allowing individuals to be exposed to others in their immediate and peripheral networks, making them less likely to assume a central role. Managers may also seek to maintain a diverse workforce, in terms of backgrounds and skill sets. In this way, the potential negatives associated with centrality (such as centrality in homogenous/homophilous networks) may be minimised, mitigating any negative flow on implications for individual creativity.

The negative relationship between proactivity and brokerage implicates organisational structures and systems, such that the proactivity and brokerage behaviour of organisational members is influenced by whether the organisation's structure is established or changing (Bandura, 1986; Bateman & Crant, 1993; Burt, 2000). As such, when an organisation's structure is changing proactivity can be expected to have a negative effect on brokerage,

which may not be the case when an organisation's structure is established and inert. To this end Pryke (2012) claims that the capabilities of individual actors in a network depends on the context of the network and the other actors' roles. Thus, when the network environment is unstable and roles of individual actors are in a state of flux individual networking capabilities may be negatively impacted. Change managers need to be aware that periods of change are also associated with periods of structural and social change which potentially blur the boundaries within and across networks. Therefore, transparency in change plans and processes may aid organisational members to be proactive in maintaining beneficial brokerage roles within and across networks.

The negative relationship between proactivity and centrality also implicates organisational structures and systems. Specifically, rigid organisational structures and systems are likely to undermine the potential positives associated with centrality since access to alternative sources of information becomes difficult (Ibarra, 1993). Therefore, organisational structures need to facilitate knowledge sharing and communication channels in a way which entices proactive people to want to assume central network positions. Furthermore, well established, easily accessible and free flowing communication channels would allow for more advanced internal networking structures to evolve, which are likely to be characterised by heterogeneity and diverse information sources (Kratzer & Lettl, 2008; Polzer *et al.*, 2002; Smith *et al.*, 2005). Such network structures would make the pursuit of central positions more attractive and beneficial for proactive individuals.

The negative relationship between CSE and brokerage has implications for training. Chapter Two explained that CSE could be inculcated and trained (Mathisen & Bronnick, 2009) which in turn would positively affect other organisational behaviours and outcomes.

As such, organisations for which creativity is important need to provide creativity training programs that are designed to bolster individual CSE levels. Managers need to be aware that creatively capable people are more likely to avoid brokerage behaviour while those who are less creatively capable are likely to depend on brokerage. This may help organisations to identify creatively capable and less creatively capable individuals, for the purpose of administering training programs.

The negative relationship between CSE and centrality similarly implicates creativity training programs that are designed to bolster individual CSE levels (Mathisen & Bronnick, 2009). The more creatively confident an individual becomes, the more likely this confidence will spill over into other aspects of their work, to the benefit of the organisation. For example, Yang and Cheng (2009) found a positive correlation between CSE and computer self-efficacy amongst their sample of 94 information systems developers. In turn, when individuals have high levels of CSE they may not need to rely on central positioning to enhance their workplace creativity, as was the case in the present research. Managers should therefore, provide CSE training for individuals with low levels of CSE so that they can learn to be confident in their abilities, become more creative at work and even potentially improve in other work areas.

The significant role of brokerage and centrality as mediators in the relationship between individual differences and creativity implicates both organisational communication channels and creativity training initiatives. In line with the present findings, managers need to be aware of the detrimental effects proactivity and CSE may have on brokerage and the positive effect that brokerage has on individual creativity. In this way, managers may be better prepared to offset any disadvantages associated with proactivity and CSE amongst

staff while effectively leveraging the advantages brokerage poses for individual creativity. This could be achieved by making communication channels more transparent and easily accessible across organisational networks to offset any potential negative effects of individual differences and to make brokerage efforts easier. This may also reduce the potential for central players to emerge, which would in turn improve individual creativity. This alone may improve creative outputs, but managers may also seek to provide ongoing creativity training opportunities (targeted to the specific responsibilities of employees) to further ensure creative confidence amongst their employees.

In terms of sustainable benefits to individual creativity, management practitioners need to recognise and promote the importance of the quality of information and knowledge, as well as the availability of it (Perry-Smith & Shalley, 2003; Yang & Cheng, 2009). This will ensure that proactive and creatively efficacious individuals only access the most relevant information and knowledge for their work tasks, through brokerage and/or central roles, in turn maximising their creativity. Next, limitations of the research will be considered before focussing on additional directions for future research.

6.9   Research Limitations

Shortcomings of the research need to be considered when interpreting the study's findings. The data were gathered using self-report surveys creating the potential for issues associated with self-report bias (Biemer, Groves, Lyberg, Mathiowetz, & Sudman, 2004). Participants may have been responding in a socially desirable manner. However, considering the psychometric soundness of the measures utilised in the survey and that the self-report method has been deemed the optimal method for the measurement of subjective constructs such as proactivity and CSE (McIntosh, 2001; Saane, Sluiter, Verbeek, & Frings-Dresen,

2003), these shortcomings are likely to have been rendered negligible in the present study. Furthermore, the use of supervisor reports also serves to offset any potential disadvantages associated with use of the self-report method alone. This multi-method approach has been identified as key to improving the reliability of research findings (Chang *et al.*, 2010; Millsap, 1990; Mitchell, 1985; Williams *et al.*, 1989).

The model that was hypothesised in the present study incorporated a relatively large number of parameters which weakened the data-model fit. The complete hypothesised model was proposed to test all of the hypothesised relationships and included control variables. While preparing the data for path analysis, confirmatory factor analyses highlighted the validity of the data set and also obviated the need for testing two separate structural equation models effectively mitigating model-data fit issues. Moreover, preliminary CFA of the three-factor model demonstrated covariance between proactivity and CSE which was addressed by conducting separate two-factor CFA models. This also necessitated the use of two separate path analyses (*i.e.* one including proactivity and one including CSE), which directly decreased model parameters and in turn resulted in acceptable model-data fit for both models. Model fit could be expected to improve with increases in sample size and increases in variance among binary variables (Kline, 2011; Tabachnick & Fidell, 2001). Future studies should therefore endeavour to recruit larger and more demographically diverse samples.

Limitations associated with the cross-sectional design of the study also need to be considered. The main limitation of a cross-sectional design is that it cannot be used to make causal inferences (Peat *et al.*, 2002; Tharenou *et al.*, 2007). As such, cross-sectional designs are weak on internal validity, which mainly relates to whether 'the cause' results in

'the effect' (Tharenou *et al.*, 2007). Nevertheless, comparing several variables simultaneously through the use of this technique allows for the fulfilment of the present study aims. Given that several of the findings were unexpected with the directions of the observed relationships opposite to what was hypothesised, this limitation is relevant to this study. Longitudinal research is therefore necessary to establish firmer conclusions in relation to the direction of the hypothesised relationships.

The personnel roster that was used to furnish the networking section of the team member survey was very beneficial in terms of enhancing respondent recall, but it did affect the data collection process due to its length. The final personnel roster consisted of 293 names, 59 of which were the names of the prospective supervisor participants (who would also not be completing networking surveys for the present study), 180 of which reflected the identified network in the research, with the remaining 54 including senior staff members specified by the organisation, members who did not complete the employee survey, or members for whom the absence of corresponding supervisor data meant their data had to be discarded. In endeavouring to provide additional data to the participating organisation, the quality of the networking data may have been somewhat compromised. Therefore, despite the enhanced recall associated with the use of a personnel roster, some participants may have responded inaccurately as a result of the sheer length of the roster. More accurate and detailed networking data could potentially have been secured if the roster had only contained the 180 names under investigation. Despite these limitations, the present research demonstrates a sound and robust study of individual differences, networking and creativity. Directions for future research will be discussed next.

6.10 Directions for Future Research

The presence of multiple significant negative relationships in the present research, all of which were unexpected, points to several important directions for future research. Specifically, given the negative relationships between both outside ties and centrality with individual creativity; between proactivity and both brokerage and centrality; and, between CSE and both brokerage and centrality were all unexpected, further exploration of these relationships would represent an important research endeavour. Furthermore, according to Lechner *et al.* (2010), few studies have examined the negative outcomes associated with intergroup relations/networking. Given some of the negative relationships identified between networking variables and creativity in the present research, further research on these negative relationships may prove insightful. Such research could help to clarify the paradox that network structures would seem to potentially both help and hinder work outcomes.

The failure of weak ties to act as a significant predictor of creativity also points to the need for studies to rely less on weak ties and include additional alternative networking parameters in future research. The examination of weak ties has dominated the literature on the networking perspective on creativity, thereby limiting our understanding of the social side of creativity. Researchers may want to follow the path of Madjar *et al.* (2002) and explore the effects of strong ties (as opposed to just weak ties) on creativity. Alternatively, future research could continue to focus on uncovering the optimal number of weak ties that may benefit creativity, which is in line with the recent research efforts of Baer (2010) and Zhou *et al.* (2009). Such efforts should also involve the assessment of multiple networking variables (*i.e.* not assessing the strength-of-ties theory alone), as was the case in the present

research. This will ensure that important questions about the social side of creativity are answered.

Earlier in this chapter the significant negative relationship between outside ties and individual creativity was in part explained by the study's context. The high-tech IT organisation used in this study provided a novel context for examining the proposed relationships. This differed from alternative contexts, such as student based contexts which have dominated research thus far. Uncertainty around the generalisability of findings from research on creativity will persist until additional research assessing the effect of outside ties in relation to creativity is conducted across different industry contexts. It would be particularly pertinent to examine whether a significant negative relationship between outside ties and individual creativity is also present in other high-tech organisations. This unexpected negative relationship between outside ties and creativity also means research on the specific types of outside ties that are most likely to hinder individual creativity is needed. Research which identifies specific categories of outside ties (such as family, friends, and others working in the same field) would provide important information in relation to which types of outside ties have the most significant effect on individual creativity, and the nature of the effect across categories.

The significant negative relationship between centrality and individual creativity raises questions in relation to the value of the information accessed at the centre of a network. This relationship was in part explained by the fact that centrality may mean accessing redundant and homogenous ideas from amongst collocated co-workers (Perry-Smith & Shalley, 2003; Teigland & Wasko, 2003). Centrality clearly involves much more than being connected to many others in a network and the quality and diversity of those

connections and number of outside ties also seem to matter. Therefore, future studies should examine this relationship in more detail.

The present research also demonstrated that CSE is important for individual creativity, unlike proactivity. Therefore, more research attention on the potential for CSE to improve individual creativity is warranted; especially given the infancy of CSE research relative to that on proactivity. The previously highlighted potential for CSE and creativity to be inculcated and developed (Bharadwaj & Menon, 2000; DiLiello & Houghton, 2008; Mathisen & Bronnick, 2009; Woodman *et al.*, 1993) needs to be reiterated here, as this provides further justification for better understanding the relationship between CSE and creativity. Indeed, understanding how and why CSE positively affects individual creativity is likely to assist management practitioners to develop training programs to enhance employee CSE levels.

Additional research needs to also be conducted to explain the non-significant relationship between proactivity and creativity, given the relative importance of this individual difference variable in the field. Despite the extant research which has shown proactivity to be positively related to individual creativity (Burt, 2001, 2004; Seibert *et al.*, 2001; Tierney & Farmer, 2002; Unsworth, 2001; Zampetakis, 2008; Zhou & Oldham, 2001) the present research could not corroborate these existing findings. The fact that the relationship between proactivity and creativity was fully mediated by networking roles (*i.e.* brokerage and centrality) suggests that this relationship is potentially more complicated than what was previously thought. The earlier literature review also acknowledged that some people can be proactive for all the wrong reasons, pursuing personal rather than organisational agendas (Chan, 2006). Such undesirable proactivity could potentially limit individual

creative potential. Future research should therefore focus on exploring the effect of different types of proactivity (positive versus negative) on creativity.

Given the links found between individual differences (*i.e.* proactivity and CSE) and networking variables (*i.e.* outside ties, brokerage and centrality roles), along with the subsequent links to individual creativity, the potential for joint effects mediation warrants further attention. Specifically, since the relationship between proactivity and creativity was fully mediated by networking variables, research may delve deeper into explaining the indirect effects of proactivity on creativity. Since the relationship between CSE and creativity was only partially mediated by networking variables research should continue to investigate the direct and indirect effects of CSE on creativity. Future research could also assess alternative individual difference (*e.g.* social capital or mood) and networking (*e.g.* advice versus friendship networks) variables in order to continue to answer questions in relation to how different types of individuals can be social and in turn creative.

The current research context consisted of an organisation that was undergoing a major system-wide restructure, which may have affected the assessment of networking parameters and roles. Future longitudinal studies could determine whether relationships change after an organisational structure stabilises. More specifically, longitudinal investigations into networking and creativity, where employees are surveyed during the early stages of a system-wide restructure (as was the case in the present research) and then again at the later stages of the restructure would allow for a more accurate assessment of the effect of organisational change on networking and creativity.

It needs to be acknowledged that this research represents the importance of focussing on individual level assessments of creativity. Given the persisting inconsistencies and ambiguities that have been identified across extant research, future research should endeavour to adopt a comprehensive approach to examining individual creativity, similar to that employed in this research. By elucidating the individual level construct in this way, team and system level creativity considerations may subsequently benefit.

6.11 Conclusion

This chapter has provided a detailed discussion of the results, highlighting the contributions made by the present research. Mixed support was found for the proposed relationships. Findings from the present research demonstrated that individual differences alone cannot comprehensively explain differences in individual creativity. Indeed, social networking played a significant role in the creativity levels of individuals in the present study. In particular, networking roles (*i.e.* brokerage and centrality) were found to be significant mediators in the relationship between individual differences (*i.e.* proactivity and CSE) and creativity. The relationship between proactivity and creativity was fully mediated by brokerage and centrality roles, while the relationship between CSE and creativity was only partially mediated by brokerage and centrality roles. Furthermore, brokerage was found to be the most significant antecedent to individual creativity.

The theoretical and practical implications of the findings were highlighted. In terms of theory, the current findings have united the individual difference and networking perspectives on creativity, with a new conceptual model depicting the relationships between individual differences, networking and creativity presented. The generalisability of existing creativity research findings was also extended given the use of a novel context

in the current research. The practical implications of the findings are diverse and include the role of CSE training programs along with implications for organisational structure, strategy, knowledge management and communication.

A number of limitations were observed in interpreting the findings of this study. Issues associated with self-report bias, the relatively large number of parameters included in the path analyses, the cross-sectional design of the study, and the long personnel roster included in the networking section of the employee survey were all discussed. It was highlighted that these issues had been effectively managed to ensure the psychometric soundness of the research. However, the need for future research to avoid such research limitations was also highlighted.

It was specifically suggested that future research focus more intently on exploring the intricacies of individual creativity through further assessment of the mediating effects of social networking on the relationship between individual differences and creativity. The next Chapter will summarise the major arguments in the preceding chapters and provide a final conclusion.

7   CONCLUSION

The primary aim of this study was to clarify our understanding of individual creativity as well as the relationship between individual differences and creativity. In order to fulfil this aim, an integrative approach was employed. Integrating the individual difference and networking perspectives on creativity allowed for a comprehensive assessment of how individuals with differing levels of proactivity and CSE construct their networks and how in turn this influences their creativity. By incorporating multiple individual difference and networking variables, this study was able to address some of the inconsistencies and ambiguities in existing research.

In terms of the individual difference perspective, both proactivity and CSE were assessed as both are well established antecedents to individual creativity. Whilst existing creativity research had established positive associations between each of these individual differences and creativity, there were however many limitations to this research. For example, proactivity and CSE had not previously been assessed in the same study and existing research was largely reliant on student and/or non-Western samples. More importantly, the mechanisms through which individual difference characteristics have their effect on individual creativity had yet to be explored. These limitations were all addressed in this research.

The networking perspective on creativity was assessed in this research in order to demonstrate the potential for networking parameters and roles to mediate the relationship between individual differences and creativity. The networking parameters of weak and outside ties, along with brokerage and centrality roles were included in this study.

Historically, weak ties were over-relied on by theorists, with the assessment of alternative explanations for the social side to creativity neglected. The concurrent consideration of multiple networking parameters and roles as antecedents to individual creativity in the current study, thus, constituted a novel approach.

The main considerations of the preceding six chapters need to be summarised before firm conclusions are drawn. *Chapter One* began by explaining the 'rise of the creative class' and emphasised the importance and inevitability of creativity across modern industries. This chapter explained the progressive thinking that led to the realisation that creativity was indeed distinct from traditional intelligence and was important not only in the creative arts. The more contemporary considerations pertaining to individual differences and networking in relation to creativity were also addressed to set the scene for this study's integrative approach.

Chapter Two reviewed the relevant research on creativity, individual differences and networking. Definitions and current conceptualisations of the key concepts were provided before a discussion of the research on the predicted relationships was provided. First, the relationships between individual differences (*i.e.* proactivity and CSE) and creativity were reviewed, with positive relationships between both proactivity and CSE with creativity hypothesised.

The networking perspective on creativity was in turn reviewed, specifically assessing the relationships that networking parameters (*i.e.* weak and outside ties) and roles (*i.e.* brokerage and centrality) had with creativity. This was followed by a review of the relatively limited research on the relationships between the individual difference and

networking antecedents to creativity. Reviewing these relationships highlighted the potential for networks to mediate the relationship between individual differences and creativity.

The meditating potential of networking was in turn considered. Existing research in this area proved to be particularly scant, further highlighting the need for the present research. Based on existing research, mediation hypotheses were proposed that predicted positive joint effects of individual differences and networking on creativity. An integrative framework was presented, which specified the ten hypotheses to be tested.

The use of student and/or non-Western based contexts was identified as a major limitation of existing research, restricting the generalisability of existing findings. In light of this limitation, the present research targeted a unique research context, which was detailed in *Chapter Three*. The study context consisted of a large Australian based IT organisation (TSG), operating within an Australian university. This chapter highlighted the limited nature of creativity research in Australia, the integral role of the IT industry to the Australian economy, the inherent importance of creativity in IT, and that to date only one study had examined creativity in the Australian IT context. Collectively this provided justification for the study context.

A unique contribution of the present research is that novel mediation models were tested in a novel context, thus, ensuring that many limitations of extant research were addressed and important questions about creativity answered. In order to test the hypotheses, data was collected from 180 employees and 51 of their respective supervisors from the participating organisation, the TSG. Matching employee and supervisor data allowed for issues of

common method variance to be avoided, but presented challenges in terms of data collection. Details of the study design and data collection procedures were presented in *Chapter Four*.

Also outlined in the aforementioned chapter were the procedures used to analyse the data and in turn test the hypotheses. Given this research sought to determine the mediating effects of networking in the relationship between individual differences and creativity, multiple mediator structural equation models (SEM) were employed. Social network analysis (SNA) was also undertaken to calculate the networking scores used in the SEM analyses.

Data analysis produced a number of important findings which were presented in *Chapter Five*. Data screening procedures highlighted the suitability of the data for subsequent analysis. Descriptive statistics for the individual difference, creativity and networking data were presented and Confirmatory Factor Analysis (CFA) confirmed the validity and factor structure of the measures used. SEM analysis resulted in mixed support for the hypothesised relationships. Figure 17 depicts these mixed findings, with *dashed* arrows representing non-significant relationships, *red* arrows representing unexpected negative relationships and the *blue* arrows representing the expected positive relationships.
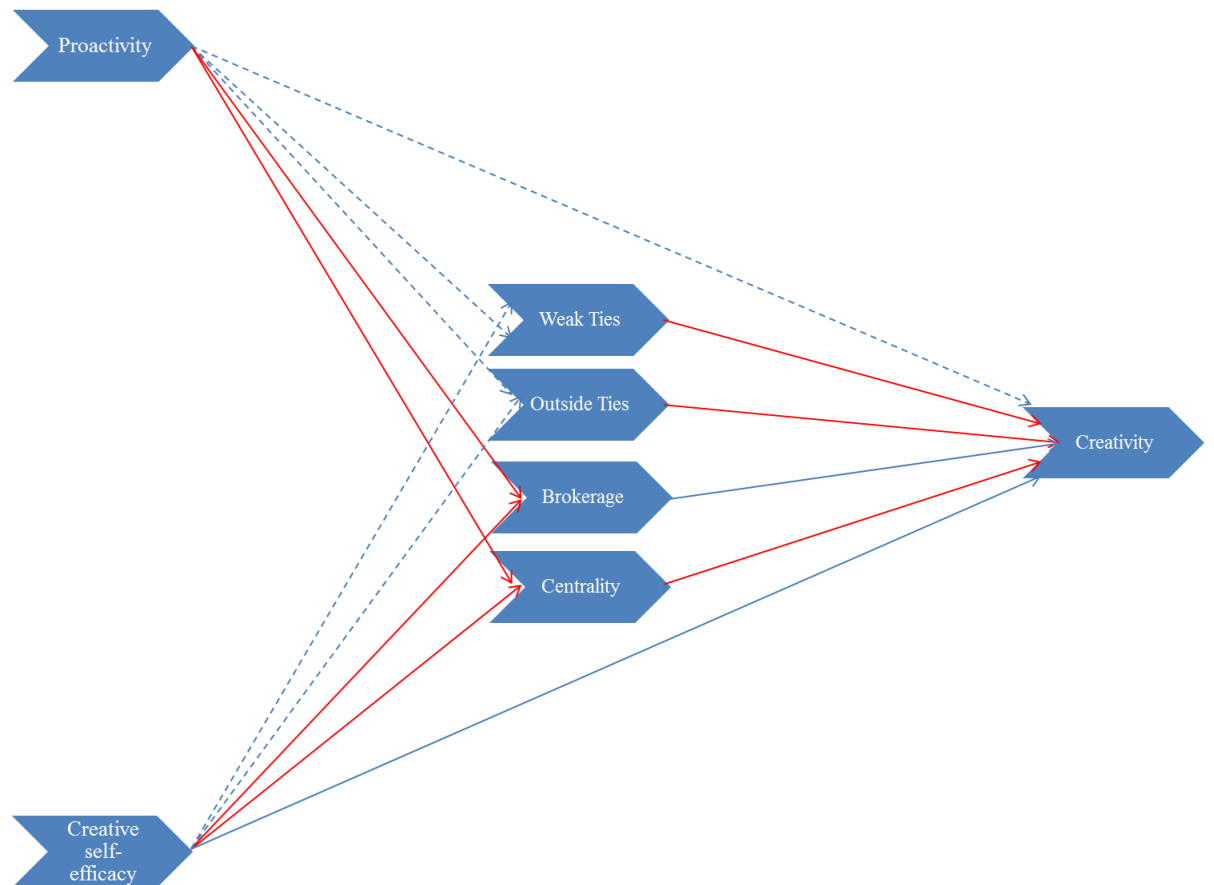
Figure 17: Non-significant and significant (negative and positive) relationships

The significant theoretical implications of the findings for the creativity field were discussed in *Chapter Six*. In particular, the significant relationships found between individual differences (*i.e.* proactivity and CSE), networking roles (*i.e.* brokerage and centrality) and creativity provide a substantial contribution to existing knowledge on individual creativity. That is, this was the first study to establish networking roles as significant mediators in the relationship between individual differences and creativity and as such presents a new conceptual model that can guide future research on individual creativity. The significant negative nature of some of the relationships was unexpected and so provides particularly novel insights into the relationships of interest. Given the unexpected nature of many of the current findings it was argued that researchers need to now delve deeper into exploring and explaining these relationships in order to more

accurately understand the antecedents to creativity along with any mediating factors. Even the non-significance of some of the present findings, in particular the non-significance of weak ties in both the proactivity and CSE models, demonstrates the need for alternative assessments of the networking perspective on creativity.

Ultimately, this research has demonstrated how individual difference and networking perspectives on creativity can be effectively integrated, to advance our understanding of individual creativity. This in turn provides a more solid platform upon which to also study creativity at the team and system levels. Given the importance of creativity in contemporary workplaces, theorists and practitioners can no longer afford to rely on under-developed and/or unitary perspectives. Thus, there is a pressing need to understand how to effectively leverage the positives and offset any negatives associated with creativity and its antecedents, through comprehensive and integrative research approaches. The present research represents an important initial step forward in this regard.

8 REFERENCES

Abra, J. (1989). Changes in creativity with age: data, explanations, and further predictions. *The International Journal of Aging and Human Development, 28*(2), 105-126.

ABS. (2009-2010). Business Use of Information Technology, 2009-10 (Vol. 2012). Canberra: Australian Bureau of Statistics.

ABS. (2010-2011). Business Use of Information Technology. Canberra: Australian Bureau of Statistics.

Adler, P. S., & Kwon, S.-W. (2002). Social Capital: Prospects for a New Concept. *Academy of Management Review, 27*(1), 17-40.

Agars, M. D., Kaufman, J. C., & Locke, T. R. (2008). Social influence and creativity in organizations: A multi-level lens for theory, research, and practice. In M. D. Mumford, S. T. Hunter & K. E. Bedell (Eds.), *Multi-level issues in creativity and innovation*. Oxford: Elsevier.

Ahuja, M. K., Galletta, D. F., & Carley, K. M. (2003). Individual centrality and performance in virtual R&D groups: an empirical study. *Management Science, 49*(1), 21-38.

Ai, X. (1999). Creativity and academic achievement: an investigation of gender differences. *Creativity Research Journal, 12*(4), 329-337.

Albert, R. S., & Runco, M. A. (1989). Independence and the creative potential of gifted and exceptionally gifted boys. *Journal of Youth and Adolescence, 18*(3), 221-230.

Amabile, T. M. (1996). *Creativity and innovation in organizations* (Vol. 5). Boston: Harvard Business School.

Amabile, T. M. (1998). How to kill creativity. *Harvard Business Review, 76*(5), 77-87.

Amabile, T. M., Barsade, S. G., Mueller, J. S., & Staw, B. M. (2005). Affect and Creativity at Work. *Administrative Science Quarterly, 50*(3), 367-403.

Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. (1996). Assessing the work environment for creativity. *Academy of Management Journal, 39*(5), 1154-1184.

Anderson, N., Dreu, C. K. W. D., & Nijstad, B. A. (2004). The routinization of innovation research: a constructively critical review of the state-of-the-science. *Journal of Organizational Behavior, 25*(2), 147-173.

Armstrong, J. S., & Overton, T. S. (1977). Estimating nonresponse bias in mail surveys. *Journal of Marketing Research, 14*(3), 396-402.

Atinc, G., & Simmering, M. J. (2008). *Use of control variables in management research*. Paper presented at the Southern Management Association, St Petersburg FL.

Atkinson, R., & Easthope, H. (2007). *The Consequences of the Creative Class: The Pursuit of Creative Strategies in Australia's Cities.* Paper presented at the The State of Australian Cities Conference, Adelaide.

Australian Government: Australian Trade Commission. (2010). Global financial crisis Retrieved July, 2012, from www.austrade.gov.au/Global-financial-crisis/default.aspx

Ayres, R., & Zuscovitch, E. (1990). Technology and information: chain reactions and sustainable economic growth. *Technovation, 10*(3), 163-183.

Baer, M. (2010). The Strength-of-Weak-Ties Perspective on Creativity: A Comprehensive Examination and Extension. *Journal of Applied Psychology, 95*(3), 592-601.

Baer, M. (2012). Putting Creativity to Work: The Implementation of Creative Ideas in Organizations. *Academy of Management Journal, 55*(5), 1102-1119.

Baer, M., Oldham, G., & Cummings, A. (2003). Rewarding creativity: When does it really matter? . *The Leadership Quarterly, 14*(4), 569-586.

Baer, M., & Oldham, G. R. (2006). The curvilinear relation between experienced creative time pressure and creativity: moderating effects of openness to experience and support for creativity. *Journal of Applied Psychology, 91*(4), 963-970.

Bain, P. G., Mann, L., & Pirola-Merlo, A. (2001). The Innovation Imperative: The Relationships Between Team Climate, Innovation, and Performance in Research and Development Teams. *Small Group Research, 32*(1), 55-73.

Bains, P., & Tran, V. (2006). *Creativity and innovation: Taking it to the next level*. Paper presented at the the 21st SIOP Annual Conference, Dallas, TX.

Balkundi, P., & Harrison, D. A. (2006). Ties, leaders and time in teams: strong inference about network structure's effects on team viability and performance. *Academy of Management Journal, 49*(1), 49-68.

Bandura, A. (1986). *Social foundations of thought and action: a social-cognitive view*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman and Company.

Banks, G. (2001). *The Role of ICT in Australia's Economic Performance* Paper presented at the The Communications Research Forum, Canberra.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173-1182.

Barron, F., & Harrington, D. M. (1981). Creativity, Intelligence, and Personality. In M. Rosenzweig & L. Porter (Eds.), *Annual Review of Psychology* (Vol. 32, pp. 439-476). Palo Alto CA: Annual Reviews.

Bateman, S. T., & Crant, M. J. (1993). The Proactive Component of Organizational Behavior: A Measure and Correlates. *Journal of Organizational Behavior, 14*(2), 103-118.

Becherer, R. C., & Maurer, J. G. (1999). The proactive personality disposition and entrepreneurial behavior among small company presidents. *Journal of Small Business Management, 37*(1), 28-36.

Beghetto, R. A. (2006). Creative self-efficacy: correlates in middle and secondary students. *Creativity Research Journal, 18*(4), 447-457.

Beghetto, R. A., Kaufman, J. C., & Baxter, J. (2011). answering the unexpected questions: exploring the relationships between students' creative self-efficacy and teacher ratings of creativity. *Psychology of Aesthetics, Creativity, and the Arts, 5*(4), 342-349.

Bharadwaj, S., & Menon, A. (2000). Making innovation happen in organizations: individual creativity mechanisms, organizational creativity mechanisms or both? *Journal of Product Innovation Management, 17*(6), 424-434.

Biemer, P. P., Groves, R. M., Lyberg, L. E., Mathiowetz, N. A., & Sudman, S. (2004). *Measurement Errors in Surveys*: Wiley.

Boden, M. A. (1998). Creativity and artificial intelligence. *Artificial Intelligent, 103*(1), 347-356.

Borgatti, S. P. (2005). Centrality and network flow. *Social Networks, 27*(1), 55-71.

Borgatti, S. P., & Everett, M. G. (1997). Network analysis of 2-mode data. *Social Networks, 19*(3), 243-269.

Borgatti, S. P., & Halgin, D. S. (2011). On Network Theory. *Organization Science, 22*(5), 1168-1181.

Borgatti, S. P., Mehra, A., Brass, D. J., & Labianca, G. (2009). Network Analysis in the Social Sciences. *Science, 323*(5916), 892-895.

Brass, D. J., Butterfield, K. D., & Skaggs, B. C. (1998). Relatioships and unethical behavior: a social networking perspective. *Academy of Management Review, 23*(1), 14-31.

Brass, D. J., Galaskiewicz, J., Greve, H. R., & Tsai, W. (2004). Taking stock of networks and organizations: a multilevel perspective. *Academy of Management Journal, 47*(6), 795-817.

Bresnahan, T. F., Brynjolfsson, E., & Hitt, L. M. (2002). Information technology, workplace organization, and the demand for skilled labor: firm-level evidence. *The Quarterly Journal of Economics, 117*(1), 339-376.

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models* (pp. 136-162). Newbury Park, CA: Sage.

Bryman, A., & Bell, E. (2007). *Business Research Methods*. London: Oxford University Press.

Brynjolfsson, E., & Yang, S. (1996). Information technology and productivity: a review of the literature. *Advances in Computers, 43*, 179-214.

Bullinger, H.-J. (1999). Turbulent times require creative thinking: New European concepts in production management *International Journal of Production Economics, 60-61*(1), 9-27.

Burger, M. J., & Buskens, V. (2009). Social context and network formation: an experimental study. *Social Networks, 31*(1), 63-75.

Burt, R. S. (1992). *Structural holes: The social structure of competition*. Cambridge, MA: Harvard University Press.

Burt, R. S. (2000). The network structure of social capital. *Research in Organizational Behavior, 22*, 345-423.

Burt, R. S. (2001). Structural Holes versus Network Closure as Social Capital. In N. Lin, K. S. Cook & R. S. Burt (Eds.), *Social Capital: Theory and Research*. New Jersey: Transaction Publishers.

Burt, R. S. (2004). Structural Holes and Good Ideas. *American Journal of Sociology, 110*(2), 349-399.

Burt, R. S. (2005). *Brokerage and Closure: An Introduction to Social Capital*. Oxford: Oxford University Press.

Burt, R. S. (2007). Secondhand Brokerage: Evidence on the Importance of Local Structure for Managers, Bankers, and Analysts. *Academy of Management Journal, 50*(1), 119-148.

Camarinha-Matos, L. M., Afsarmanesh, H., Galeano, N., & Molina, A. (2009). Collaborative networked organizations - concepts and practice in manufacturing enterprises. *Computers and Industrial Engineering, 57*(1), 46-60.

Campbell, D. J. (2000). The Proactive Employee: Managing Workplace Initiative. *The Academy of Management Executive, 14*(3), 52-66.

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin, 56*(2), 81-105.

Carayannis, E. G., & Wang, V. (2008). The role of the firm in innovation networks and knowledge clusters. In E. G. Carayannis, D. Assimakopoulos & M. Kondo (Eds.), *Innovation Networks and Knowledge Clusters: Findings and Insights from the US, Eu and Japan*. New York: Palgrave Macmillan.

Carr, K. (2009). IT Industy Innovation Council Members Announced Retrieved July, 2012, from http://archive.innovation.gov.au/ministriesarchive2011/carr/mediarelease

Cattell, R. B. (1978). *Scientific use of factor analysis in behavioral and life sciences*. New York: Plenum Press.

Chadwick, B., Bahr, H., & Albrecht, S. (1984). *Social Science Research Methods*. New Jersey: Prentice-Hall.

Chan, D. (2006). Interactive effects of situational judgement effectiveness and proactive personality on work perceptions and work outcomes. *Journal of Applied Psychology, 91*(2), 475-481.

Chan, K., & Liebowitz, J. (2006). The synergy of social network analysis and knowledge mapping: a case study. *International Journal of Management and Decision Making, 7*(1), 19-35.

Chang, S.-J., Witteloostuijn, A. v., & Eden, L. (2010). From the editors: common method variance in international business research. *Journal of International Business Studies, 41*(2), 178-184.

Cheng, E. W. L. (2001). SEM being more effective than multiple regression in parsimonious model testing for management development research. *Journal of Management Development, 20*(7), 650-667.

Choi, J. N. (2004). Individual and contextual predictors of creative performance: the mediating role of psychological processes. *Creativity Research Journal, 16*(2), 187-199.

Chong, E., & Ma, X. (2010). The influence of individual factors, supervision and work environment on creative self-efficacy. *Creativity and Innovation Management 19*(3), 233-247.

Chua, R. Y. J., Morris, M. W., & Ingram, P. (2010). Embeddedness and New Idea Discussion in Professional Networks: The Mediating Role of Affect-Based Trust. *Journal of Creative Behavior, 44*(2), 85-104.

Clover, V. T., & Balseley, H. L. (1984). *Business Research Methods* (Vol. 3). Columbus: Grid Publishing.

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd ed.). Hillside, NJ: Erlbaum.

Colecchia, A., & Schreyer, P. (2001). *ICT investment and economic growth in the 1990s: is the United States a unique case? A comparative study of nine OECD countries.* STI Working Papers. Organisation for Economic Co-operation and Development

Coonan, H. (2006). *Information Technology: Transforming the Australian Economy.* Paper presented at the The 15th World Congress on Information Technology, Texas.

Cooper, R. B. (2000). Information technology development creativity: a case study of attempted radical change. *MIS Quarterly, 24*(2), 245-276.

Crant, M. J. (1995). The Proactive Personality Scale and Objective Job Performance Among Real Estate Agents. *Journal of Applied Psychology, 80*(4), 532-537.

Crant, M. J. (2000). Proactive Behavior in Organizations. *Journal of Management, 26*(3), 435-462.

Cross, R., & Cummings, J. N. (2004). Tie and network correlates of individual performance in knowledge-intensive work. *Academy of Management Journal, 47*(6), 928-937.

D'Agostino, R. B., Belanger, A., & D'Agostino Jr, R. B. (1990). A suggestion for using powerful and informative tests of normality. *The American Statistician, 44*(4), 316-321.

Daly, A. J., & Finnigan, K. S. (2011). The Ebb and Flow of Social Network Ties Between District Leaders Under High-Stakes Accountability. *American Educational Research Journal, 48*(1), 39-79.

De Vos, A., Clippeleer, I. D., & Dewilde, T. (2009). Proactive career behaviors and career success during the early career. *Journal of Occupational and Organizational Psychology, 82*(4), 761-777.

Dedrick, J., Gurbaxani, V., & Kraemer, K. L. (2003). Information technology and economic performance: a critical review of the empirical evidence. *ACM Computing Surveys, 35*(1), 1-28.

DeVellis, R. F. (2003). *Scale Development: theory and applications*. Thousand Oaks CA: Sage.

Dewan, S., & Kraemer, K. L. (2000). Information technology and productivity: evidence from country-level data. *Management Science, 46*(4), 548-562.

Dewett, T., & Jones, G. R. (2001). The role of information technology in the organization: a review, model, and assessment. *Journal of Management, 27*(3), 313-346.

Dietrich, A. (2004). The cognitive neuroscience of creativity. *Psychonomic Bulletin & Review, 11*(6), 1011-1026.

DIISRTE. (2012). Information and Technology Australia (Vol. 2012): Department of Industry, Innovation Science Research & Tertiary Education.

DiLiello, T. C., & Houghton, J. D. (2008). Creative potential and practised creativity: identifying untapped creativity in organizations. *Creativity and Innovation Management, 17*(1), 37-46.

Dionne, S. A. (2008). Social influence, creativity, and innovation: Boundaries, brackets, and non-linearity. In M. D. Mumford, S. T. Hunter & K. E. Bedell (Eds.), *Multi-Level Issues in Creativity and Innovation*. Oxford: Elsevier.

Dupont, W., & Plummer, W. (1990). Power and sample size calculations: a review and computer program. *Controlled Clinical Trials, 11*(2), 116-128.

Egan, T. M. (2005). Factors influencing individual creativity in the workplace: an examination of quantitative empirical research. *Advances in Developing Human Resources 7*(2), 160-181.

Emirbayer, M., & Goodwin, J. (1994). Network analysis, culture, and the problem of agency. *American Journal of Sociology, 99*(6), 1411-1454.

Enders, C. K. (2001). The impact of nonnormality on full information maximum-likelihood estimation for structural equation models with missing data. *Psychological Methods, 6*(4), 352-370.

Enders, C. K., & Bandalos, D. L. (2001). The relative performance of full information maximum likelihood estimation for missing data in structural equation models. *Structural Equation Modeling, 8*(3), 430-457.

Everitt, S. (1975). Multivariate analysis. The need for data, and other problems. *British Journal of Psychiatry, 126*(3), 237-240.

Farmer, S. M., Tierney, P., & Kung-McIntyre, K. (2003). Employee creativity in Taiwan: an application of role identity theory. *Academy of Management Journal, 46*(5), 618-630.

Fasko, D. (2000-2001). Education and Creativity. *Creativity Research Journal, 13*(3&4), 317-327.

Feist, G. J. (1998). A Meta-Analysis of Personality in Scientific and Artistic Creativity. *Personality and Social Psychology Review, 2*(4), 290-309.

Firestone, W. A. (1987). Meaning in method: the rhetoric of quantitative and qualitative research. *Educational Researcher, 16*(7), 16-21.

Fischer, G. (2000). Symmetry of ignorance, social creativity, and meta-design. *Knowledge-Based Systems, 13*(7), 527-537.

Fischer, G., Giaccardi, E., Eden, H., Sugimoto, M., & Ye, Y. (2005). Beyond binary choices: integrating individual and social creativity. *International Journal of Human-Computer Studies, 63*(4), 482-512.

Fleming, L., Mingo, S., & Chen, D. (2005). Brokerage versus cohesion and collaborative creativity: an evolutionary resolution. *Working Paper, Harvard Business School, October*.

Fleming, L., Mingo, S., & Chen, D. (2007). Collaborative Brokerage, Generative Creativity, and Creative Success. *Administrative Science Quarterly, 52*(3), 443-475.

Florida, R. L. (2002). *The rise of the creative class : and how it's transforming work, leisure, community and everyday life*. New York: New York: Basic Books.

Foxall, G. R., & Hackett, P. M. (1994). Styles of Managerial Creativity: A Comparison of Adaption-Innovation in the United Kingdom, Australia and the United States. *British Journal of Management, 5*(2), 85-100.

Freeman, L. C. (1979). Centrality in social networks conceptual clarification. *Social Networks, 1*(3), 215-239.

Frese, M., & Fay, D. (2001). Personal initiative: an active performance concept for work in the 21st century. *Research in Organizational Behavior, 23*, 133-187.

Friedman, R. S., & Forster, J. (2001). The effects of promotion and prevention cues on creativity. *Journal of Personality and Social Psychology, 81*(6), 1001-1013.

George, J. M., & Zhou, J. (2001). When Openness to Experience and Conscientiousness Are Related to Creative Behavior: An Interactional Approach. *Journal of Applied Psychology, 86*(3), 513-524.

George, J. M., & Zhou, J. (2007). Dual tuning in a supportive context: Joint contributions of positive mood, negative mood, and supervisory behaviors to employee creativity. *Academy of Management Journal, 50*(3), 605-622.

Gibson, C., & Klocker, N. (2005). The 'Cultural Turn' in Australian Regional Economic Development Discourse: Neoliberalising Creativity? *Geographical Research, 43*(1), 93-102.

Gilson, L. L., & Shalley, C. E. (2004). A little creativity goes a long way: an examination of teams engagement in creative processes. *Journal of Management, 30*(4), 453-470.

Gist, M. E., & Mitchell, T. R. (1992). Self-efficacy: a theoretical analysis of its determinants and malleability. *The Academy of Management Review, 17*(2), 183-211.

Gong, Y., Cheung, S.-Y., Wang, M., & Huang, J.-C. (2012). Unfolding the proactive process for creativity: integration of the employee proactivity, information exchange, and psychological safety perspectives. *Journal of Management, 38*(5), 1611-1633.

Gong, Y., Huang, J.-C., & Farh, J.-L. (2009). Employee learning orientation, transformational leadership, and employee creativity: the mediating role of employee creative self-efficacy. *Academy of Management Journal, 52*(4), 765-778.

Gough, H. G. (1979). A Creative Personality Scale for the Adjective Check List. *Journal of Personality and Social Psychology, 37*(8), 1398-1405.

Granovetter, M. S. (1973). The strength of weak ties. *The American Journal of Sociology, 78*(6), 1360-1380.

Greenwood, R., & Hinings, C. R. (1996). Understanding radical organizational change: briging together the old and the new institutionalism. *Academy of Management Review, 21*(4), 1022-1054.

Griffin, M. A., Neal, A., & Parker, S. K. (2007). A new model of work role performance: positive behavior in uncertain and interdependent contexts. *Academy of Management Journal, 50*(2), 327-347.

Guadagnoli, E., & Velicer, W. F. (1988). Relation of sample size to the stability of component patterns. *Psychological Bulletin, 103*(2), 265-275.

Gudykunst, W. B., Nishida, T., Leung, K., Gao, G., Bond, M. H., Wang, G., & Barraclough, R. A. (1989). A cross-cultural comparison of self-monitoring. *Communications Research Reports, 6*(1), 7-12.

Guilford, J. (1950). Creativity. *American Psychologist, 5*(9), 444-454.

Guilford, J. P. (1967). *The nature of human intelligence*. New York: McGraw-Hill.

Guler, I., & Guillen, M. F. (2010). Home country networks and foreign expansion: evidence from the venture capital industry. *Academy of Management Journal, 53*(2), 390-410.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (2006). *Multi-variate data analysis*. New Jersey: Prentice Hall.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2010). *Multivariate Data Analysis*. New Jersey: Prentice Hall.

Hansen, M. T. (1999). The search-transfer problem: the role of weak ties in sharing knowledge across organization subunits. *Administrative Science Quarterly, 44*(1), 82-111.

Harris, M. M., & Schaubroeck, J. (1990). Confirmatory modeling in organizational behavior/human resource management: issues and applications. *Journal of Management, 16*(2), 237-360.

Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical Mediation Analysis in the New Millennium. *Communication Monographs, 76*(4), 408-420.

Hinkin, T. R. (1995). A review of scale development practices in the study of organizations. *Journal of Management, 21*(5), 967-988.

Hinkin, T. R. (1998). A brief tutorial on the development of measures for use in survey questionnaires. *Organizational Research Methods, 1*(1), 104-121.

Hofstede, G. (1980). *Culture's consequences*. Beverley Hills C.A.: Sage.

Hofstede, G. (1991). *Cultures and Organizationa: Software of the Mind*. New York: McGraw-Hill.

Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions, and organisations across nations*. Thousand Oaks, CA: Sage.

Hoyle, R. H., & Panter, A. T. (1995). Writing about structural equation models. In R. H. Hoyle (Ed.), *Structural equation modeling: concepts, issues, and applications*. Thousand Oaks, California: Sage.

Hunter, S. T., Bedell, K. E., & Mumford, M. D. (2007). Climate for Creativity: A Quantitative Review. *Creativity Research Journal, 19*(1), 69-90.

Hyland, P. W., Marceau, J., & Sloan, T. R. (2006). Sources of innovation and ideas in ICT firms in Australia. *Creativity and Innovation Management, 15*(2), 182-194.

Ibarra, H. (1993). Network centrality, power, and innovation involvement: determinants of technical and administrative roles. *Academy of Management Journal, 36*(3), 471-501.

Ibarra, H., & Andrews, S. B. (1993). Power, social influence, and sense making: effects of network centrality and proximity on employee perceptions. *Administrative Science Quarterly, 38*(2), 277-303.

Im, S., & Workman, J. P. (2004). Market orientation, creativity, and new product performance in high-technology firms. *Journal of Marketing, 68*(2), 114-132.

James, K., Chen, J., & Goldberg, C. (1992). Organizational Conflict and Individual Creativity. *Journal of Applied Social Psychology, 27*(2), 545-566.

Jones, C. R., Ferreday, D., & Hodgson, V. (2008). Networked learning a relational approach: weak and strong ties. *Journal of Computer Assisted Learning, 24*(2), 90-102.

Jung, D. I., & Avolio, B. J. (1999). Effects of leadership style and followers' cultural orientation on performance in group and individual task conditions. *Academy of Management Journal, 42*(2), 208-218.

Karnes, M. B., McCoy, G. F., Zehrbach, R. R., Wollersheim, J. P., Clarizio, H. F., Costin, L., & Stanley, L. S. (1961). *Factors associated with underachievement and overachievement of intellectually gifted children*. Champaign IL: Champaign Community Unit Schools.

Karwowski, M. (2011). It Doesn't Hurt to Ask... But Sometimes It Hurts to Believe: Polish Students' Creative Self-Efficacy and Its Predictors. *Psychology of Aesthetics, Creativity, and the Arts, 5*(2), 154-164.

Kaufmann, G. (2003). What to measure? A new look at the concept of creativity. *Scandinavian Journal of Educational Research, 47*(3), 235-251.

Kelloway, E. K. (1998). *Using LISREL for structural equation modeling: a researcher's guide*. Thousand Oaks CA: Sage.

Kerr, B., & Gagliardi, C. (2003). Measuring creativity in research and practice. In S. Lopez & C. Snyder (Eds.), *Positive psychological assessment: A handbook of models and measures* (pp. 155-169): American Psychological Association.

Kilduff, M., & Krackhardt, D. (1994). Bringing the individual back in: a structural analysis of the internal market for reputation in organizations. *Academy of Management Journal, 37*(1), 87-108.

Kim, T.-Y., Hon, A. H., & Lee, D.-R. (2010). Proactive personality and employee creativity: the effects of job creativity requirement and supervisor support for creativity. *Creativity Research Journal, 22*(1), 37-45.

Kim, T.-Y., Hon, A. H. Y., & Crant, M. (2009). Proactive Personality, Employee Creativity, and Newcomer Outcomes: A Longitudinal Study. *Journal of Business and Psychology, 24*(1), 93-103.

Klein, K. J., Lim, B.-C., Saltz, J. L., & Mayer, D. M. (2004). How Do They Get There? An Examination of the Antecedents of Centrality in Team Networks. *Academy of Management Journal, 47*(6), 952-963.

Kline, R. B. (2011). *Principles and Practices of Structural Equation Modeling* (3rd ed.). New York: The Guilford Press.

Krackhardt, D. (1990). Assessing the political landscape: structure, cognition, and power in organizations. *Administrative Science Quarterly, 35*(2), 342-369.

Krackhardt, D., & Kilduff, M. (2002). Structure, culture and Simmelian ties in entrepreneurial firms. *Social Networks, 24*(3), 279-290.

Kratzer, J., & Lettl, C. (2008). A social network perspective of lead users and creativity: an empirical study among children. *Creativity and Innovation Management, 17*(1), 26-36.

Lambert, T. A., Eby, L. T., & Reeves, M. P. (2006). Predictors of networking intensity and network quality among white-collar job seekers. *Journal of Career Development, 32*(4), 351-365.

Lapierre, J., & Giroux, V.-P. (2003). Creativity and work environment in a high-tech context. *Creativity and Work Environment, 12*(1), 11-23.

Lavenberg, S. S., & Welch, P. D. (1981). A perspective on the use of control variables to increase the efficiency of Monte Carlo simulations *Management Science, 27*(3), 322-335.

Lechner, C., Frankenberger, K., & Floyd, S. W. (2010). Task contingencies in the curvilinear relationships between intergroup networks and initiative performance. *Academy of Management Journal, 53*(4), 865-889.

Lehman, H. C. (1953). *Age and achievement*. Princeton NJ: Princeton University Press.

Lindell, M. K., & Whitney, D. J. (2001). Accounting for common method variance in cross-sectional research designs. *Journal of Applied Psychology, 86*(1), 114-121.

Liu, Y., & Ipe, M. (2010). How Do They Become Nodes? Revisiting Team Member Network Centrality. *The Journal of Psychology, 144*(3), 243-258.

Luthans, F. (1988). Successful vs effective real managers. *Academy of Management Executive, 2*(2), 127-132.

MacCallum, R. C., Widaman, K. F., Zhang, S., & Hong, S. (1999). Sample size in factor analysis. *Psychological Methods, 4*(1), 84-99.

MacKinnon, D. P., Fairchild, A. J., & Fritz, M. S. (2007). Mediation Analysis. *Annual Review of Psychology, 58*, 593-614.

MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychological Methods, 7*(1), 83-104.

MacKinnon, D. W. (1965). Personality and the realization of creative potential. *American Psychologist, 20*, 273-281.

Madjar, N., Oldham, G. R., & Pratt, M. G. (2002). There's no place like home? The contributions of work and nonwork creativity support to employees' creative performance. *Academy of Management Journal, 45*(4), 757-767.

Marceau, J. (1999). Networks of innovation, networks of production, and networks of marketing: collaboration and competition in the biomedical and toolmaking industries in Australia. *Creativity and Innovation Management, 8*(1), 20-27.

Marsden, P. V. (1990). Network data and measurement *Annual Review of Sociology, 16*, 435-463.

Maslow, A. H. (1971). Den Kreativaaftityden. In R. Moonety & T. Razik (Eds.), *Vadar Kreativitet?* Stockholm: Beckmans.

Mathisen, G. E., & Bronnick, K. S. (2009). Creative self-efficacy: an intervention study. *International Journal of Educational Research, 48*(1), 21-29.

McAdam, R., & McClelland, J. (2002). Individual and team-based idea generation within innovation management: organisational and research agendas. *European Journal of Innovation Management, 5*(2), 86-97.

McCrae, R. R. (1987). Creativity, Divergent Thinking, and Openness to Experience. *Journal of Personality and Social Psychology, 52*(6), 1258-1265.

McElroy, M. W., Jorna, R. J., & van Engelen, J. (2006). Rethinking social capital theory: a knowledge management perspective. *Journal of Knowledge Management, 10*(5), 124-136.

McIntosh, C. N. (2001). Report on the construct validity of the Temporal Satisfaction with Life Scale. *Social Indicators Research, 54*(1), 37-56.

McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a Feather: Homophily in Social Networks. *Annual Review of Sociology, 27*, 415-444.

Mehra, A., Kilduff, M., & Brass, D. J. (2001). The Social Networks of High and Low Self-Monitors: Implications for Workplace Performance. *Administrative Science Quarterly, 46*(1), 121-146.

Michalko, M. (2001). *Cracking creativity*. Berkeley, CA: Ten Speed Press.

Miller, C., & Osborn, R. N. (2008). Innovation as a contested terrain: Planned creativity and innovation versus emergent creativity and innovation. In M. D. Mumford, S. T. Hunter & K. E. Bedell-Avers (Eds.), *Multi-Level Issues in Creativity and Innovation*. Oxford: Elsevier.

Millsap, R. E. (1990). A cautionary note on the detection of method variance in multitrait-multimethod data. *Journal of Applied Psychology, 75*(3), 350-353.

Mitchell, T. R. (1985). An evaluation of the validity of correlational research conducted in organizations. *Academy of Management Review, 10*(2), 192-205.

Mitchell, W. J., Inouye, A. S., & Blumenthal, M. S. (2003). *Beyond productivity: information, technology, innovation, and creativity*. Washington D.C.: The National Academies Press.

Mood, A., Graybill, F. A., & Boes, D. C. (1974). *Introduction to the theory of statistics*. New York: McGraw-Hill.

Mumford, M. D. (2003). Where Have We Been, Where Are We Going? Taking Stock in Creativity Research. *Creativity Research Journal, 15*(2&3), 107-120.

Mumford, M. D., & Gustafson, S. B. (1988). Creativity Syndrome: Integration, Application, and Innovation. *Psychological Bulletin, 103*(1), 27-43.

Myung, I. J. (2003). Tutorial on maximum likelihood estimation. *Journal of Mathematical Psychology, 47*(1), 90-100.

Nakamura, L. I. (2000). Economics and the New Economy: The Invisible Hand Meets Creative Destruction. *Business Review, July/August*, 15-30.

Nijstad, B. A., Stroebe, W., & Lodewijkx, H. F. M. (2002). Cognitive stimulation and interference in groups: Exposure effects in an idea generation task. *Journal of Experimental Social Psychology, 38*(6), 535-544.

Nonaka, I. (1991). The Knowledge-Creating Company. *Harvard Business Review, 69*(6), 96-104.

Nunnally, J. (1978). *Psychometric Theory*. New York: McGraw-Hill.

O'Donnell, A. (2004). The nature of networking in small firms. *Qualitative Market Research, 7*(3), 206-217.

Obstfeld, D. (2005). Social Networks, the Tertius lungens Orientation, and Involvement in Innovation. *Administrative Science Quarterly, 50*(1), 100-130.

Oh, H., & Kilduff, M. (2008). The ripple effect of personality on social structure: self-monitoring origins of network brokerage. *Journal of Applied Psychology, 93*(5), 1155-1164.

Ohly, S., & Fritz, C. (2010). Work characteristics, challenge appraisal, creativity, and proactive behavior: A multi-level study. *Journal of Organizational Behavior, 31*(4), 543-565.

Oldham, G. R., & Cummings, A. (1996). Employee Creativity: Personal and Contextual Factors at Work. *Academy of Management Journal, 39*(3), 607-634.

Parker, S. K. (1998). Enhancing role breadth self-efficacy: the roles of job enrichment and other organizational interventions. *Journal of Applied Psychology, 83*(6), 835-852.

Peat, J., Mellis, C., Williams, K., & Xuan, W. (2002). *Health science research: a handbook of quantitative methods*. London: Sage.

Perry-Smith, J. E. (2006). Social Yet Creative: The Role of Social Relationships in Facilitating Individual Creativity. *The Academy of Management Journal, 49*(1), 85-101.

Perry-Smith, J. E. (2014). Social Network ties beyond nonredundancy: An experimental investigation of the effect of knowledge content and tie strength on creativity. *Journal of Applied Psychology, 99*(5), 831-846.

Perry-Smith, J. E., & Shalley, C. E. (2003). The social side of creativity: a static and dynamic social network perspective. *Academy of Management Journal, 28*(1), 89-106.

Piedmont, R. L., McCrae, R. R., & Costa, P. T. (1991). Adjective Check List Scales and the Five-Factor Model. *Journal of Personality and Social Psychology, 60*(4), 630-637.

Pirola-Merlo, A., & Mann, L. (2004). The relationship between individual creativity and team creativity: aggregated across people and time. *Journal of Organizational Behavior, 25*(2), 235-257.

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879-903.

Podsakoff, P. M., & Organ, D. W. (1986). Self-reports in organizational research: problems and prospects. *Journal of Management, 12*, 69-82.

Polzer, J. T., Milton, L. P., & Swann, W. B. J. (2002). Capitalizing on Diversity: Interpersonal Congruence in Small Work Groups. *Administrative Science Quarterly, 47*(2), 296-324.

Porath, C. L., & Bateman, S. T. (2006). Self-Regulation: From Goal Orientation to Job Performance. *Journal of Applied Psychology, 91*(1), 185-192.

Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, instruments, & Computers, 36*(4), 717-731.

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods 40*(3), 879-891.

Pryke, S. (2012). *Social network analysis in construction*. West Sussex, UK: Wiley-Blackwell.

Pulakos, E., Arad, S., Donovan, M., & Plamondon, K. (2000). Adaptability in the workplace: development of a taxonomy of adaptive performance. *Journal of Applied Psychology, 85*(4), 612-624.

Rank, J., Pace, V. L., & Frese, M. (2004). Three Avenues for Future Research on Creativity, Innovation, and Initiative. *Applied Psychology: An International Review, 53*(4), 518-528.

Reagans, R., & McEvily, B. (2003). Network Structure and Knowledge Transfer: The Effects of Cohesion and Range. *Administrative Science Quarterly, 48*(2), 240-267.

Reagans, R., & McEvily, B. (2008). Contradictory or compatible? Reconsidering the "trade-off" between brokerage and closure on knowledge sharing. *Advances in Strategic Management, 25*, 275-313.

Reiter-Palmon, R. (2011). Introduction to Special Issue: The Psychology of Creativity and Innovation in the Workplace. *Psychology of Aesthetics, Creativity, and the Arts, 5*(1), 1-2.

Retica, A. (2006). Homophily, *The New York Times*.

Rietzschel, E. F., De Dreu, C. K. W., & Nijstad, B. A. (2009). What are we talking about, when we talk about creativity? Group creativity as a multifaceted, multistage

phenomenon. In E. Mannix & M. Neale (Eds.), *Research on Managing Groups and Teams* (Vol. 12): Emerald Group Publishing Limited.

Rodan, S., & Galunic, C. (2004). More than network structure: How knowledge heterogeneity influences managerial performance and innovativeness. *Strategic Management Journal, 25*(6), 541-562.

Ruef, M., Aldrich, H. E., & Carter, N. M. (2003). The Structure of Founding Teams: Homophily, Strong Ties, and Isolation among U.S. Entrepreneurs. *American Sociological Review, 68*(2), 195-222.

Runco, M. (2004). Creativity. *Annual Review of Psychology, 55*, 657-687.

Runco, M. A. (2008). Creative Research Should Be a Social Science. In M. D. Mumford, S. T. Hunter & K. E. Bedell (Eds.), *Multi-level Issues In Creativity and Innovation* (pp. 75-95). Oxford: Elsevier.

Ruth, J.-E., & Birren, J. E. (1985). creativity in adulthood and old age: relations to intelligence, sex and mode of testing. *International Journal of Behavioral Development, 8*(1), 99-109.

Saane, N. V., Sluiter, J. K., Verbeek, H. H. A. M., & Frings-Dresen, M. H. W. (2003). Reliability and validity of instruments measuring job satisfaction: A systematic review. *Occupational Medicine, 53*, 191-200.

Sacramento, C. A., Dawson, J. F., & West, M. A. (2008). Team creativity: More than the sum of its parts? . In M. D. Mumford, S. T. Hunter & K. E. Bedell (Eds.), *Multi-Level Issues in Creativity and Innovation*. Oxford: Elsevier.

Scheffer, J. (2002). Dealing with missing data. *Research Letters in the Information and Mathematical Sciences, 3*(1), 153-160.

Scott, B. A., & Judge, T. A. (2009). The popularity contest at work: who wins, why, and what do they receive? *Journal of Applied Psychology, 94*(1), 20-33.

Seibert, S. E., Crant, M. J., & Kraimer, M. L. (1999). Proactive Personality and Career Success. *Journal of Applied Psychology, 84*(3), 416-427.

Seibert, S. E., Kraimer, M. L., & Crant, M. J. (2001). What do proactive people do? A Longitudinal model linking proactive personality and career success. *Personnel Psychology, 54*(4), 845-874.

Sekaran, U. (2000). *Research Methods for Business: A Skill Building Approach*. Chichester: Wiley.

Shalley, C. E., Gilson, L. L., & Blum, T. C. (2000). Matching Creativity Requirements and the Work Environment: Effects on Satisfaction and Intentions to Leave. *Academy of Management Journal, 43*(2), 215-223.

Shalley, C. E., Zhou, J., & Oldham, G. R. (2004). The Effects of Personal and Contextual Characteristics on Creativity: Where Should We Go From Here? *Journal of Management, 30*(6), 933-958.

Shipilov, A. V., & Li, S. X. (2008). Can You Have Your Cake and Eat It Too? Structural Holes' Influence on Status Accumulation and Market Performance in Collaborative Networks. *Administrative Science Quarterly, 53*(1), 73-108.

Simonton, D. K. (1997). Creative Productivity: A Predictive and Explanatory Model of Career Trajectories and Landmarks. *Psychological Review, 104*(1), 66-89.

Simonton, D. K. (2000). Creativity: Cognitive, Personal, Developmental, and Social Aspects. *American Psychological Association, 55*(1), 151-158.

Singleton, R., & Straits, B. (2005). *Approaches to Social Research*. Oxford: Oxford University Press.

Smith, K. G., Collins, C. J., & Clark, K. D. (2005). Existing knowledge, knowledge creation capability, and the rate of new product introduction in high-technology firms. *Academy of Management Journal, 48*(2), 346-357.

Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. In S. Leinhart (Ed.), *Sociological Methodology*. San Francisco: Jossey-Bass.

Sparrowe, R. T., Liden, R. C., & Kraimer, M. L. (2001). Social Networks and the Performance of Individuals and Groups. *Academy of Management Journal, 44*(2), 316-325.

Spector, P. E., & Brannick, M. T. (2011). Methodological urban legends: the misuse of statistical control variables. *Organizational Research Methods, 14*(2), 287-305.

Staber, U. (2004). Networking beyong organizational boundaries: the case of project organizations. *Creativity and Innovation Management, 13*(1), 30-40.

Sternberg, R. J., & Lubart, T. I. (1996). Investing in creativity. *American Psychologist, 51*(7), 677-688.

Stevens, J. (1992). *Applied multivariate statisticsfor the social sciences* (2nd ed.). Hillsdale, New Jersey: Lawrence Erlbaum.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using Multivariate Statistics* (4th ed.). Boston MA: Allyn & Bacon.

Tabachnick, B. G., & Fidell, L. S. (2005). *Using multivariate statistics* (5th ed.). Needham Heights, MA: Allyn and Bacon.

Taylor, S. (2012, September 3rd). [Personal communication with senior staff member at the TSG].

Teigland, R., & Wasko, M. M. (2003). Integrating knowledge through information trading: examining the relationship between boundary spanning communication and individual performance. *Decision Sciences, 34*(2), 261-286.

Tharenou, P., Donohue, R., & Cooper, B. (2007). *Management Research Methods*. Melbourne: Cambridge University Press.

The Parliament of the Commonwealth of Australia. (2009). The Global Financial Crisis and regional Australia. Canberra.

Thomas, J. P., Whitman, D. S., & Viswesvaran, C. (2010). Employee proactivity in organizations: a comparative meta-analysis of emergent proactive constructs. *Journal of Occupational and Organizational Psychology, 83*(2), 275-300.

Thompson, J. A. (2005). Proactive personality and job performance: a social capital perspective. *Journal of Applied Psychology, 90*(5), 1011-1017.

Tierney, P., & Farmer, S. M. (2002). Creative Self-Efficacy: Its Potential Antecedents and Relationship to Creative Performance. *Academy of Management Journal, 45*(6), 1137-1148.

Tierney, P., & Farmer, S. M. (2004). The Pygmalion Process and Employee Creativity. *Journal of Management, 30*(3), 413-432.

Tierney, P., & Farmer, S. M. (2011). Creative self-efficacy development and creative performance over time. *Journal of Applied Psychology, 96*(2), 277-293.

Torrance, E. P. (1963). Education and the creative potetial. from University of Minnesota Press

Triandis, H. C., Bontempo, R., Villareal, M. J., Asai, M., & Lucca, N. (1988). Individualism and Collectivism: Cross-Cultural Perspectives on Self-Ingroup Relationships. *Journal of Personality and Social Psychology, 54*(2), 323-338.

Unsworth, K. (2001). Unpacking creativity. *The Academy of Management Review, 26*(2), 289-297.

Unsworth, K., & Parker, S. (2003). Proactivity and innovation: promoting a new workforce for the new workplace. In D. Holman, T. D. Wall, C. W. Clegg, P. Sparrow & A. Howard (Eds.), *The new workplace: a guide to the human impact of modern working practices* (pp. 175-196). Chichester: John Wiley & Sons.

Unsworth, K. L., & Clegg, C. W. (2010). Who do employees undertake creative action. *Journal of Occupational and Organizational Psychology, 83*(1), 77-99.

Uzzi, B. (1997). Social structure and competition in interfirm networks: the paradox of embeddedness. *Administrative Science Quarterly, 42*, 35-67.

Uzzi, B., & Spiro, J. (2005). Collaboration and Creativity: The Small World Problem. *The American Journal of Sociology, 111*(2), 447-504.

Vardaman, J. M., Amis, J. M., Dyson, B. P., Wright, P. M., & Randolph, R. V. d. G. (2012). Interpreting change as controllable: the role of network centrality and self-efficacy. *Human Relations, 65*(7), 835-859.

Vedres, B., & Stark, D. (2008). Opening Closure: Intercohesion and Entrepreneurial Dynamics in Business Groups, from http://www.personal.ceu.hu/staff/Balazs_Vedres/papers/vedres.stark.intercohesion2.pdf

Watson, E. (2007). Who or what creates? A conceptual framework for social creativity. *Human Resource Development Review, 6*(4), 419-441.

West, M. A. (2002). Sparkling Fountains or Stagnant Ponds: An Integrative Model of Creativity and Innovation Implementation in Work Groups. *Applied Psychology: An International Review, 51*(3), 355-424.

Williams, L. J., Cote, J. A., & Buckley, M. R. (1989). Lack of method variance in self-reported affect and perceptions at work: reality or artifact? *Journal of Applied Psychology, 74*(3), 462-468.

Wong, S.-S. (2008). Task knowledge overlap and knowledge variety: the role of advice network structures and impact on group effectiveness. *Journal of Organizational Behavior, 29*(5), 591-614.

Wong, S.-S., & Boh, W. F. (2010). Leveraging the ties of others to build a reputation for trustworthiness among peers. *Academy of Management Journal, 53*(1), 129-148.

Woodman, R. W., Sawyer, J. E., & Griffin, R. W. (1993). Toward a Theory of Organizational Creativity. *Academy of Management Review, 18*(2), 293-321.

Wu, C. H., Cheng, Y., Ip, H. M., & McBride-Chang, C. (2010). Age differences in creativity: task structure and knowledge base. *Creativity Research Journal, 17*(4), 321-326.

Yang, H.-L., & Cheng, H.-H. (2009). Creative self-efficacy and its factors: an empirical study of information system analysts and programmers. *Computers in Human Behavior, 25*(2), 429-438.

Yuan, F., & Woodman, R. W. (2010). Innovative Behavior in the Workplace: The Role of Performance and Image Outcome Expectations. *The Academy of Management Journal, 53*(2), 323-342.

Zampetakis, L. A. (2008). The role of creativity and proactivity on perceived entrepreneurial desirability *Thinking Skills and Creativity, 3*(2), 154-162.

Zhou, J. (2003). When the presence of creative coworkers is related to creativity: role of supervisor close monitoring, developmental feedback, and creative personality. *Journal of Applied Psychology, 88*(3), 413-422.

Zhou, J., & George, J. M. (2001). When job dissatisfaction leads to creativity: encouraging the expression of voice. *Academy of Management Journal, 44*(4), 682-696.

Zhou, J., & George, J. M. (2003). Awakening employee creativity: The role of leader emotional intelligence. *The Leadership Quarterly, 14*(4), 545-568.

Zhou, J., & Oldham, G. R. (2001). Enhancing Creative Performance: Effects of Expected Developmental Assessment Strategies and Creative Personality. *Journal of Creative Behavior, 35*(3), 151-167.

Zhou, J., Shin, S. J., Brass, D. J., Choi, J., & Zhang, Z.-X. (2009). Social Networks, Personal Values, and Creativity: Evidence for Curvilinear and Interactional Effect. *Journal of Applied Psychology, 94*(6), 1544-1552.

Zhu, C. J., Cooper, B. K., Thomson, S. B., Cieri, H. D., & Zhao, S. (2013). Strategic integration of HRM and firm performance in a changing environment in China: the impact of organisational effectiveness as a mediator. *The International Journal of Human Resource Management, 24*(15), 1-17.

Zibarras, L. D., Port, R. L., & Woods, S. A. (2008). Innovation and the 'Dark Side' of Personality: Dysfunctional Traits and their Relation to Self-Reported Innovative Characteristics *Journal of Creative Behavior, 42*(3), 201-215.

Ziebro, M., & Northcraft, G. (2009). Connecting the dots: Network development, information flow, and creativity in groups. In E. Mannix & M. Neale (Eds.), *Research on Managing Groups and Teams* (Vol. 12): Emerald Group Publishing Limited.

9 APPENDICES

APPENDIX A: TSG Organisational Chart

Chief Information Officer (CIO)

Executive Assistant (office)

Shared Systems
- Managed Hosting Services

Desktop Solutions
- Infrastructure, Services & Operations
- Business Analysis & Project Management

Application Services
- Web Services
- IMS
- Integrated Apps Svcs
- Flex Learn & Teach
- Development Management
- Corporate Business Systems
- Faculty Apps

Student Systems
- Process Improvements

AVCS, Education & Intl
- AVCS

Workforce Dev, Communications
- Communications Manager (Office)
- Workforce Development Management
- Administrative Assistant

Project Management Office
- Scheduling
- Reporting
- Acting Secretariat PM
- Program
- Project Managers

SMO
- Configuration Management
- Change Management
- Release Management
- Service Level Management
- Change & Release Analysis
- Configuration Analysis
- Problem Management

IT Coordination
- Transitional Reporting
- Security
- ICT Quality & Reporting
- Campus Ops C
- IT Training, Service Desk, Switchboard
- Exec Div SC
- Campus Ops BGP
- Distributed Services Coordination
- Student Computing
- Business Analysis
- Arts Educ Service Ctr

Records & Archive Services
- University Archives

Corporate Services & Infrastructure
- VCMO
- Network Installations
- Network Solutions
- IT Asset
- Resources/Corp Projects
- Prod Facilities
- Network Operations

eResearch IT team
- Service Manager (Office)
- Research Data Storage
- HPC Specialists
- Collaborative Researcher Apps
- Collaborative Apps + HD Video
- Software specialists

Finance

290

APPENDIX B: Employee Survey Email Template

Dear employee (name),

The TSG is participating in creativity research at Monash University, for which you have been invited to complete an online survey. The survey will remain online for three weeks, in order for you to complete it at your earliest convenience. An explanatory statement will be provided for you at the outset of the survey. Feel free to contact the research team with any questions regarding this research.

Follow this link to the Survey:
>>>QualtricsMonashMembers

Or copy and paste the URL below into your internet browser:
http://monashbuseco.qualtrics.com/SE/?SID=SV_0OMMzaxSe6vXI1e

Regards,

Olga Abeysekera

Phone: ▮▮▮▮▮▮▮▮

Department of Management

Monash University

APPENDIX C: Supervisor Survey Email Template

Dear supervisor (name),

The TSG is participating in creativity research at Monash University, for which you have been invited to complete an online survey. This survey pertains specifically to your team members. The survey will remain online for three weeks, in order for you to complete it at your earliest convenience. An explanatory statement will be provided for you at the outset of the survey. Feel free to contact the research team with any questions regarding this research.

Follow this link to the Survey:
>>>QualtricsMonashSupervisors

Or copy and paste the URL below into your internet browser:
http://monashbuseco.qualtrics.com/SE/?SID=SV_1NuteIOAc8MKvs0

Regards,

Olga Abeysekera

Phone: ▮▮▮▮▮▮▮▮

Department of Management

Monash University

MONASH University

Explanatory Statement – Individual Differences, Networking and Creativity

This information sheet is for you to keep.

My name is Olga Abeysekera and I am conducting a research project with Dr. Belinda Allen (a Lecturer in the Department of Management) and Prof. Fang Cooke (a Professor in the Department of Management) at Monash University in Australia. This project will count towards my Doctor of Philosophy in Management at Monash University. This means that I will be writing a thesis which will be published as a journal article and/or other form of publication.

I am interested in researching groups of employers and employees to ascertain who is more likely to be creative at work and why. You are invited to take part in this study.

The aim/purpose of the research

The aim of this study is to explore how individual attributes relate to individual creativity. Network structures and individual networking roles will be considered as the mediating variables in this creativity model.

Possible benefits

This study will unite the fragmented body of creativity research, while also extending existing knowledge through the assessment of a unique combination of individual attributes and the application of network analysis. In turn, many important questions about creativity in workplaces will be answered. There are no specific benefits for the individuals who take part in this study.

What does the research involve?

The study involves participants completing a web based survey questionnaire.

How much time will the research take?

Participants will be asked to complete a short web based survey, circulated via email, which should take no more than about 20 minutes to complete. Responses will be automatically uploaded onto the Qualtrics website upon submission.

Can I withdraw from the research?

Being in this study is voluntary and you are under no obligation to consent to participation. However, if you do consent to participate, you may only withdraw prior to the survey

being submitted. This is because the survey is anonymous and once it is it collated with the rest of the participants' surveys there will be no way to distinguish it.

Confidentiality

Participants will not be required to provide any personal details. Thus, participants will not be identifiable in any reports/publications that are submitted from this research. Confidentiality will also be protected by limiting access to the collected data exclusively to the researchers.

Storage of data

In line with Monash University regulations the collected data will be kept on University premises in a locked cupboard/filing cabinet for five years.

Results

If you would like to be informed of the aggregate research findings, please contact Dr. Belinda Allen via email ███████████████████████

If you would like to contact the researchers about any aspect of this study, please contact the Chief Investigator:	If you have a **complaint** concerning the manner in which this research is being conducted, please contact:
Dr Belinda Allen Lecturer Department of Management ████████████ █████████████████	Human Ethics Officer Standing Committee on Ethics in Research Involving Humans (SCERH) Building 3e Room 111 Research Office Monash University VIC 3800 ████████████ ██ ██ █ ████ ███████████████████

Thank you.

███████████████████████
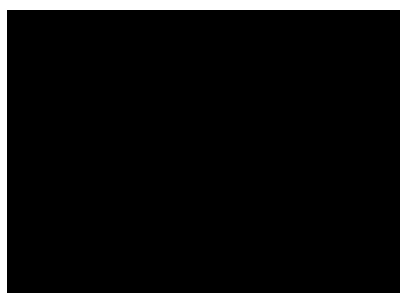
Olga Abeysekera

APPENDIX E: Ethics Approval

⚜ MONASH University

Monash University Human Research Ethics Committee (MUHREC)
Research Office

Human Ethics Certificate
of Approval

Date:	**20 September 2010**
Project Number:	**CF10/2339 - 2010001337**
Project Title:	**Analysis of individual differences and team process antecedents of creativity**
Chief Investigator:	**Dr Giles Hirst**
Approved:	**From: 20 September 2010 To: 20 September 2015**

Terms of approval

1. The Chief investigator is responsible for ensuring that permission letters are obtained, if relevant, and a copy forwarded to MUHREC before any data collection can occur at the specified organisation. **Failure to provide permission letters to MUHREC before data collection commences is in breach of the National Statement on Ethical Conduct in Human Research and the Australian Code for the Responsible Conduct of Research**.
2. Approval is only valid whilst you hold a position at Monash University.
3. It is the responsibility of the Chief Investigator to ensure that all investigators are aware of the terms of approval and to ensure the project is conducted as approved by MUHREC.
4. You should notify MUHREC immediately of any serious or unexpected adverse effects on participants or
   unforeseen events affecting the ethical acceptability of the project.
5. The Explanatory Statement must be on Monash University letterhead and the Monash University complaints clause must contain your project number.
6. **Amendments to the approved project (including changes in personnel):**   Requires the submission of a
   Request for Amendment form to MUHREC and must not begin without written approval from MUHREC. Substantial variations may require a new application.
7. **Future correspondence:** Please quote the project number and project title above in any further correspondence.
8. **Annual reports:** Continued approval of this project is dependent on the submission of an Annual Report. This is
   determined by the date of your letter of approval.
9. **Final report:** A Final Report should be provided at the conclusion of the project. MUHREC should be notified if the
   project is discontinued before the expected date of completion.

10. **Monitoring:** Projects may be subject to an audit or any other form of monitoring by MUHREC at any time.
11. **Retention and storage of data:** The Chief Investigator is responsible for the storage and retention of original data pertaining to a project for a minimum period of five years.

Professor Ben Canny
Chair, MUHREC

cc: Miss Olga Paritski

MONASH University

EMPLOYEE QUESTIONNAIRE
SURVEY OF THE RELATIONSHIPS BETWEEN INDIVIDUAL DIFFERENCES, NETWORKING AND CREATIVITY.
Department of Management
Faculty of Business and Economics
Monash University
Australia

What is this questionnaire?
This is a questionnaire of your views about your individual attributes at work, as well as your networks. This is not a test. There are no right or wrong answers. We want to know *your* personal views on the issues raised in the questionnaire in order to improve creative performance at your organisation.

Who will see my answers?
The information you provide is confidential. No one, within your organisation will be able to identify your answers. Results from the questionnaire will be presented in a way which completely protects your anonymity and confidentiality.

How long will it take?
The questionnaire will take approximately 20 minutes to complete.

How do I complete this questionnaire?
Please read each question carefully, and give your immediate response by marking the option which best matches your views. Please answer all questions as openly and honestly as possible.

RESEARCHERS:
Olga Abeysekera
Dr. Belinda Allen
Prof. Fang Cooke

SECTION ONE: INDIVIDUAL DIFFERENCES

Section One asks you about your perceptions of your individual differences at work. Please indicate how strongly you agree or disagree with each of the following statements by circling the most appropriate response.

	Strongly disagree	Disagree	Slightly disagree	Neither disagree nor agree	Slightly agree	Agree	Strongly agree
I always look for better ways to do things.	1	2	3	4	5	6	7
If I believe in an idea, no obstacle prevents me from making it happen.	1	2	3	4	5	6	7
Nothing is more exciting than seeing my ideas turn into reality.	1	2	3	4	5	6	7
No matter what the odds, if I believe in something, I make it happen.	1	2	3	4	5	6	7
Wherever I am, I am a powerful force for change.	1	2	3	4	5	6	7
I have confidence in my ability to solve problems creatively.	1	2	3	4	5	6	7
I feel that I am good at generating novel ideas.	1	2	3	4	5	6	7
I have a knack for further developing the ideas of others.	1	2	3	4	5	6	7
I am good at finding creative ways to solve problems.	1	2	3	4	5	6	7

SECTION TWO: YOUR SOCIAL NETWORKS

This section asks about your networking inside and outside of your organisation. Please respond to the following questions by writing the appropriate number next to each name in the personnel roster that is part of your social network.

Thinking back over the past two years, with whom do you communicate about work related topics?			
Person (names)	How frequently do you communicate with each person on average? 1 = less often 2 = several times a year 3 = once a month 4 = several times a month 5= several times a week 6 = daily	How many years has each relationship been in existence? 1= less than 2 years 2 = 2 to 5 years 3 = 5 to 10 years 4 = more than 10 years	How close are you with each person? 1 = acquaintance 2 = distant colleague 3 = friendly colleague 4 = good friend 5 = very close friend
Personnel Roster (x293)			

Please respond to the following questions by listing all of the appropriate names in the space provided and by writing the appropriate number next to each name listed.

Thinking back over the past year, who are the people outside of your workplace with whom you discuss any range of work related matters?			
Person (names)	How frequently do you communicate with each person on average? 1 = less often 2 = several times a year 3 = once a month 4 = several times a month 5= several times a week 6 = daily	How many years has each relationship been in existence? 1= less than 2 years 2 = 2 to 5 years 3 = 5 to 10 years 4 = more than 10 years	How close are you with each person? 1 = acquaintance 2 = distant colleague 3 = friendly colleague 4 = good friend 5 = very close friend
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SECTION THREE: DEMOGRAPHICS

This final section asks you about your background. Please fill in the following table, using crosses (x), numbers and notations as appropriate.

YOUR PERSONAL DETAILS		
Gender ☐ Female ☐ Male	**Age** _____ years old	**Highest level of education attained** ☐ Completed secondary school (Year 12) ☐ Basic Vocational qualifications [pre-vocational certificates, other certificates] ☐ Skilled vocational qualification [Trade certificate, apprenticeship or TAFE qualification] ☐ Undergraduate degree or diploma [3 year full-time study or equivalent] ☐ Post-graduate degree or diploma ☐ Other (please specify) _____
Years in this organisation _____ years	**Your function (please choose one)** ☐ Production/Operation ☐ Research & development ☐ Information Technology ☐ Engineering ☐ Other (please specify _____	

Thank you very much for your participation!

MONASH University

SUPERVISOR QUESTIONNAIRE

SURVEY OF THE RELATIONSHIPS BETWEEN INDIVIDUAL DIFFERENCES, NETWORKING AND CREATIVITY.

Department of Management

Faculty of Business and Economics

Monash University

Australia

What is this questionnaire?
This is a questionnaire of your views about the creativity of each individual in your work team. This is not a test. There are no right or wrong answers. We want to know *your* personal views on the issues raised in the questionnaire in order to improve creative performance at your organisation.

Who will see my answers?
The information you provide is confidential. No one, within your organisation will be able to identify your answers. Results from the questionnaire will be presented in a way which completely protects your anonymity and confidentiality.

How long will it take?
The questionnaire will take approximately 20 minutes to complete.

How do I complete this questionnaire?
Please read each question carefully, and give your immediate response by marking the option which best matches your views. Please answer all questions as openly and honestly as possible.

RESEARCHERS:
Olga Abeysekera
Dr. Belinda Allen
Prof. Fang Cooke

SECTION ONE: INDIVIDUAL CREATIVITY

Section One asks you about the creativity of individual employees. Please indicate how strongly you agree or disagree with each of the following statements by circling the most appropriate response.

This particular worker...	Strongly disagree	Disagree	Slightly disagree	Neither disagree nor agree	Slightly agree	Agree	Strongly agree
Suggests many creative ideas that might improve working conditions at TSG.	1	2	3	4	5	6	7
Often comes up with creative solutions to problems at work.	1	2	3	4	5	6	7
Suggests new ways of performing work tasks.	1	2	3	4	5	6	7
Is a good source of creative ideas.	1	2	3	4	5	6	7

SECTION TWO: DEMOGRAPHICS

This final section asks you about your background. Please fill in the following table, using crosses (x), numbers and notations as appropriate.

YOUR PERSONAL DETAILS		
Gender ☐ Female ☐ Male	**Age** _____ years old	**Highest level of education attained** ☐ Completed secondary school (Year 12) ☐ Basic Vocational qualifications [pre-vocational certificates, other certificates] ☐ Skilled vocational qualification [Trade certificate, apprenticeship or TAFE qualification] ☐ Undergraduate degree or diploma [3 year full-time study or equivalent] ☐ Post-graduate degree or diploma ☐ Other (please specify) _____
Years in this organisation _____ years **Years in current position** _____ years	**Position in organisation** ☐ Executive (*e.g.* Director) ☐ Middle Manager (*e.g.* Department Head) ☐ First Line Manager ☐ Non-management ☐ Other (please specify) _____	

Thank you for your participation!
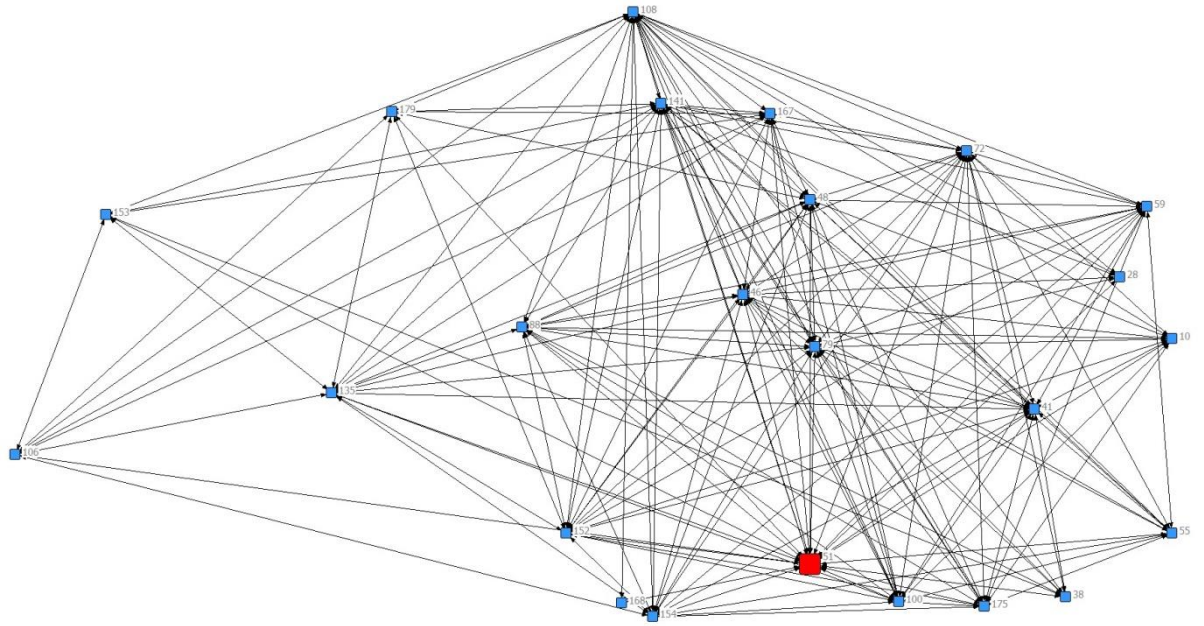
APPENDIX H: Sociogram of Reciprocated Weak Ties
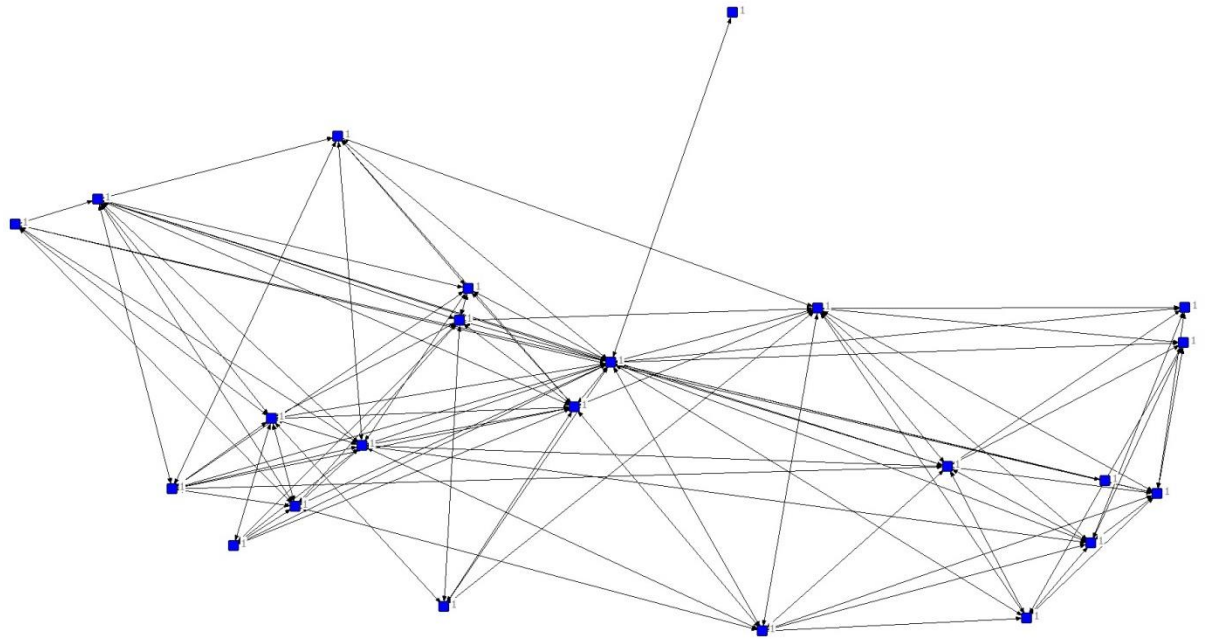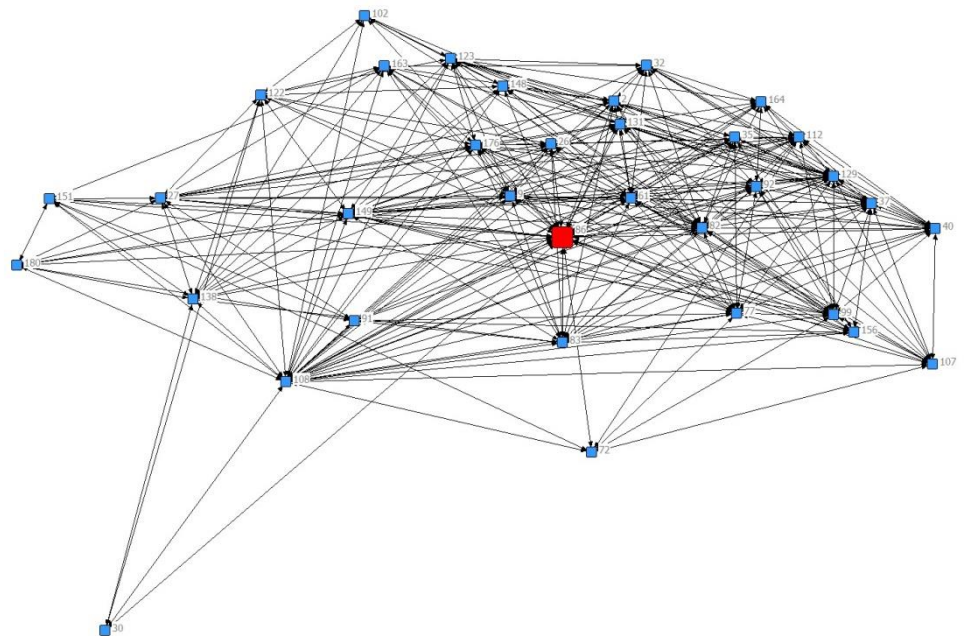
APPENDIX I: Individual Ego Networks
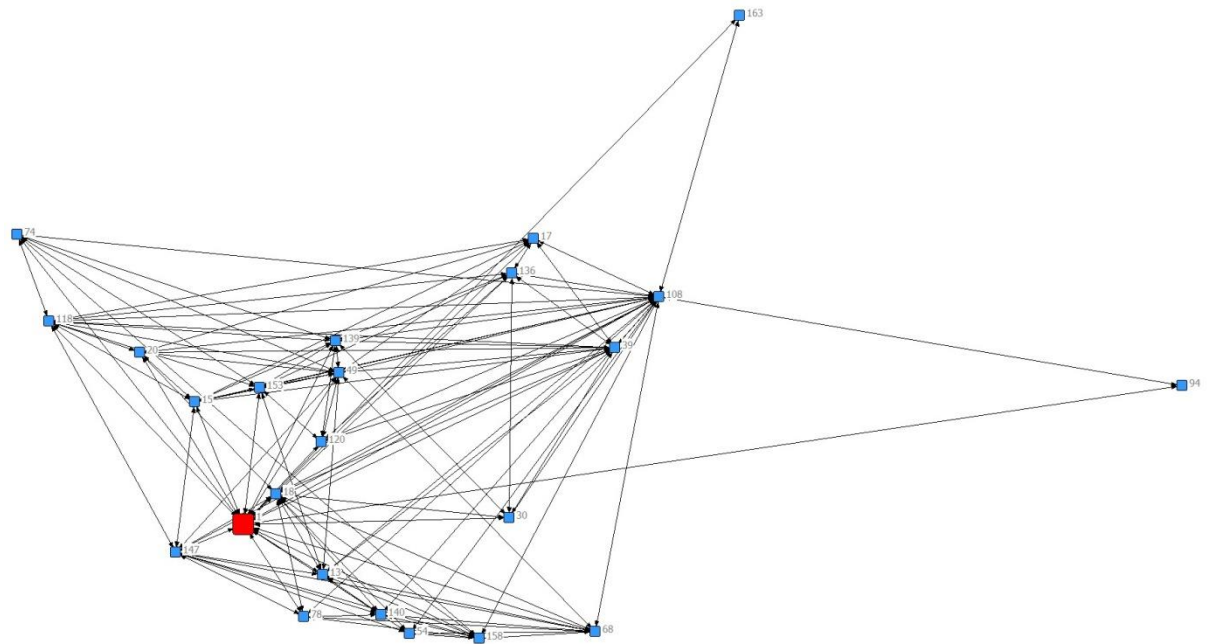
Ego network- Node 1
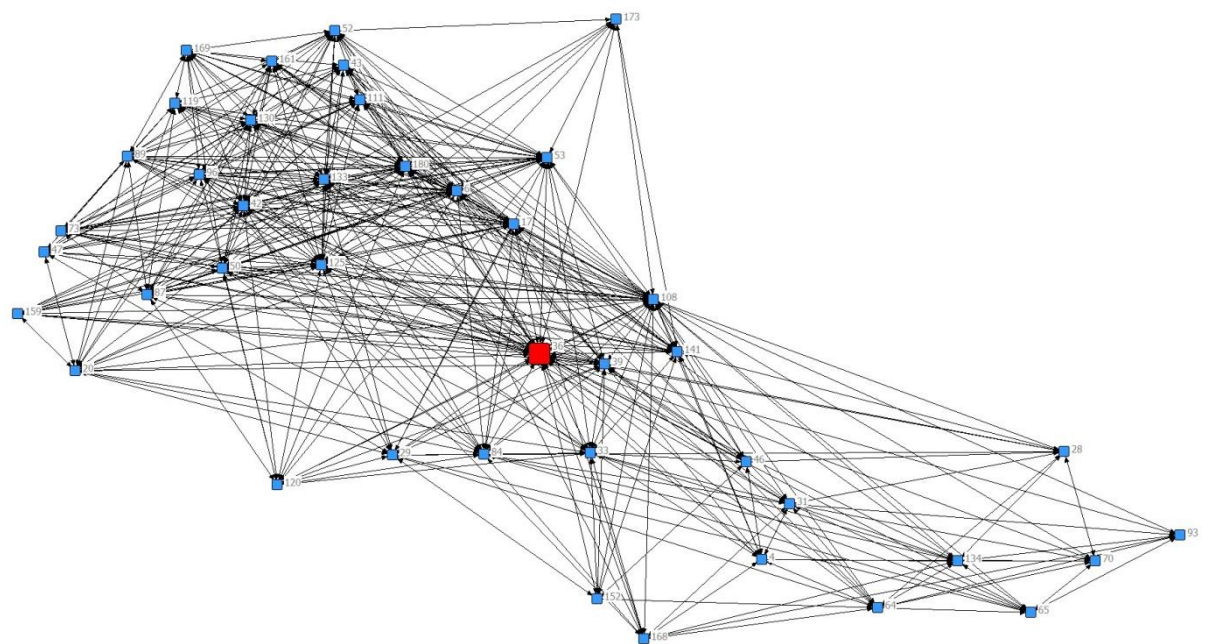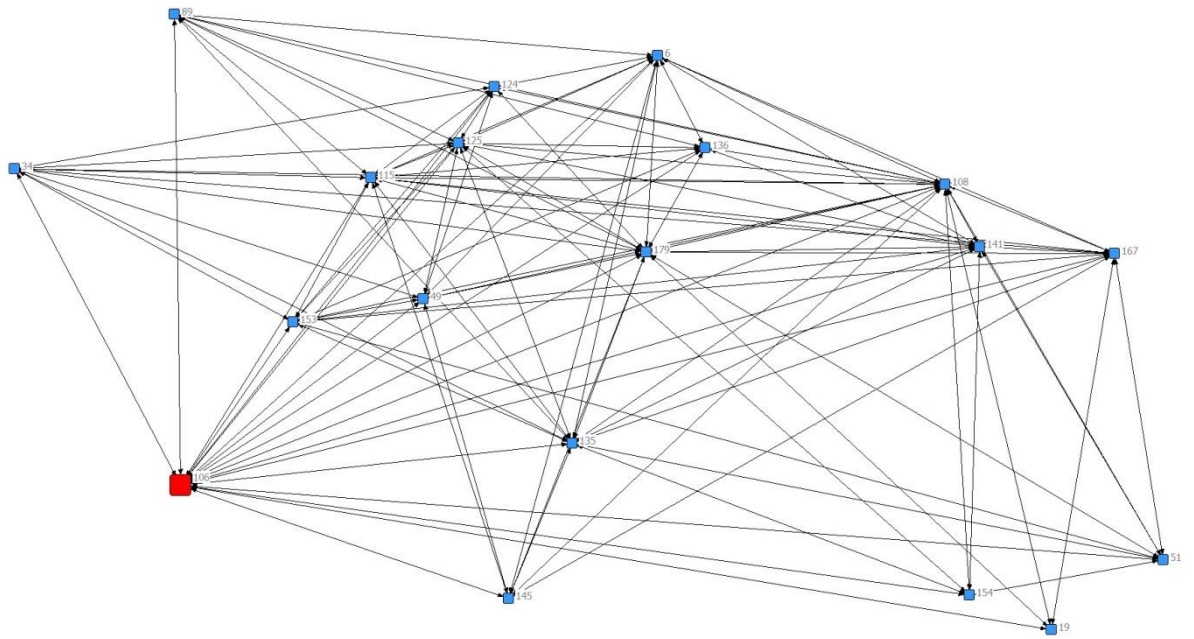

Ego network- Node 36
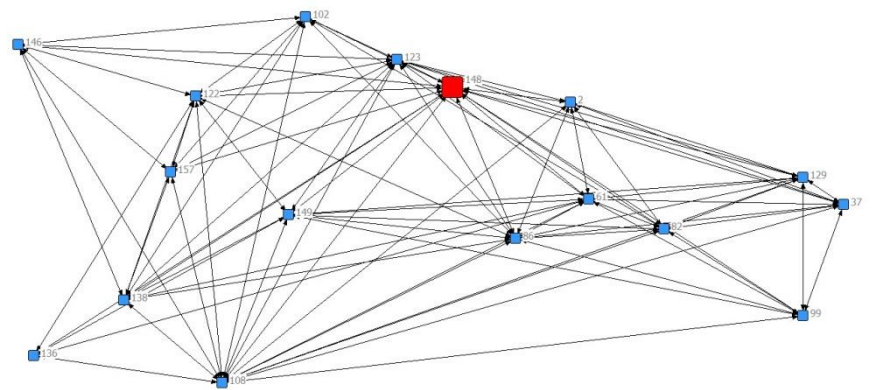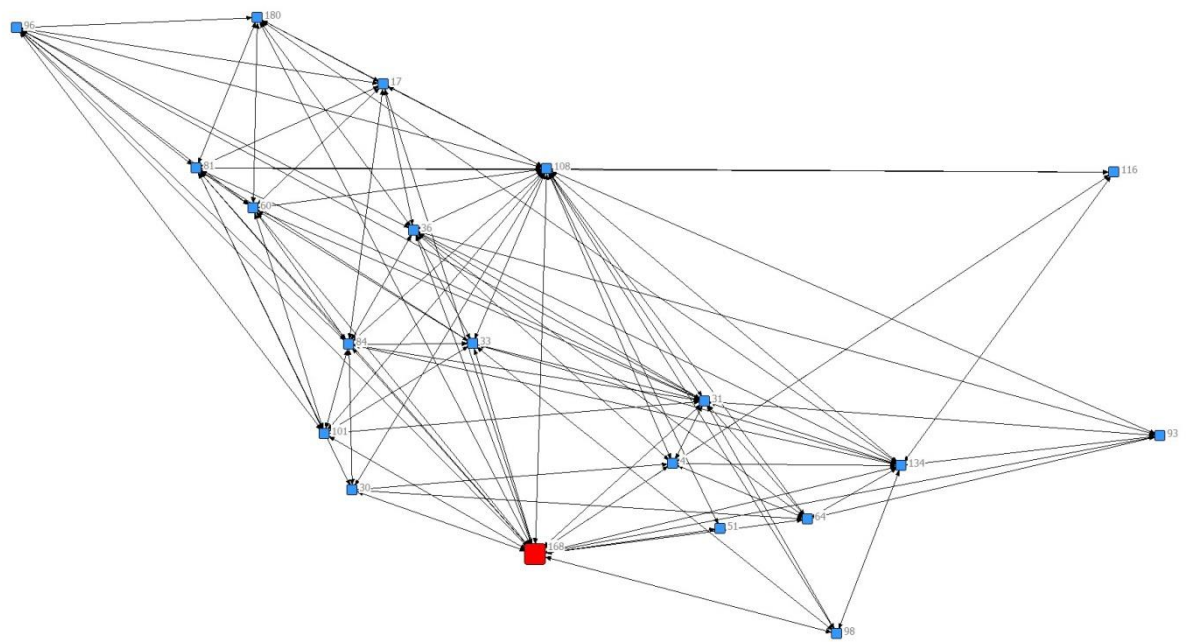
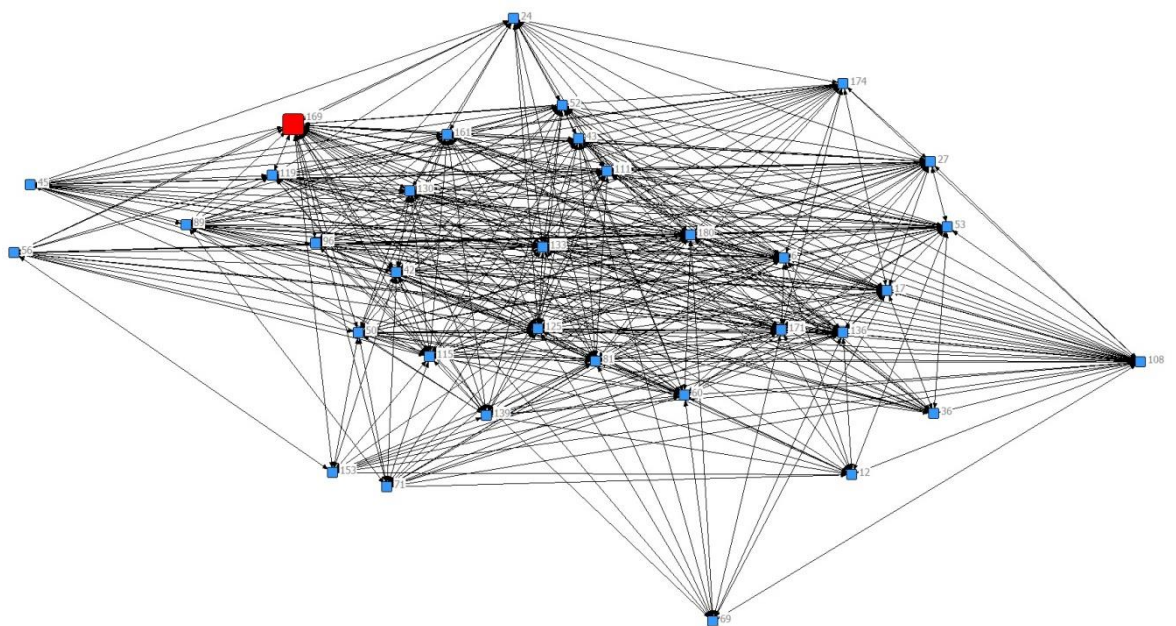Ego network- Node 51

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Ego network- Node 106

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Ego network- Node 168

Ego network- Node 169