THE INFLUENCE OF SOCIAL CAPITAL ON PROJECT SUCCESS OUTCOMES AND THE MODERATING ROLE OF PROJECT COMPLEXITY

by

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Dedication

I would like to dedicate this work to the memory of my Dad, Barrister Gbadebo Olaniyi Oyelade. He started this journey with me but could not be here at the end. I will forever cherish your words of wisdom. Sleep on dad!

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Most of all, I thank my Lord and Savior, Jesus Christ for His strength, grace and seeing me through this work. *Trust in the Lord with all your heart and lean not on your own understanding. In all your ways acknowledge Him, and He shall direct your paths* – Proverbs 3 vs 5-6.

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Abstract

THE INFLUENCE OF SOCIAL CAPITAL ON PROJECT

SUCCESS OUTCOMES AND THE

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Social capital has been found to benefit projects and project teams in organizations. However, the research literature is unclear about the extent to which these benefits may be negatively impacted by project complexity. Based on an extensive review of the extant literature and an exploratory case study, testable hypotheses were generated. Using the survey methodology with 302 project managers as respondents, support was found for the hypothesis that knowledge management effectiveness mediates the relationship between bonding capital and project performance as well as between bridging capital and performance. In contrast, our results suggest that creativity does not mediate these relationships. Furthermore, our study shows that both bonding and bridging capital have direct and significant effects on performance. This research disentangles the project complexity construct and shows that all the dimensions of project complexity

negatively impact the relationship between bonding capital and KME, while two of the dimensions negatively impact the relationship between bridging capital and KME. Finally, it was found that composite project complexity negatively impacts the relationship between bonding and KME while its effect on bridging capital and KME was not significant.

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Chapter 1

Introduction

Several thousands of dollars are spent by organizations in managing projects and several million are dependent on the success or failure of a project. In 2012, Mckinsey & company carried out a study on large-scale IT projects. They found that about 17% of large IT projects that fail have a high negative impact on the survival of these organizations, with 45% of all projects exceeding their costs, 7% exceeding their schedule and 56% underperforming. As organizations realize that projects can be used in achieving their strategic goals, they embark on more projects; however, only about 56% of these projects meet their strategic objectives (PMI, 2014). Poor performances of projects in organizations cost about $109 million for every $1 billion invested (PMI, 2014).

With increasing competition in the marketplace, companies are changing the strategies used in the management of these projects. Organizations are increasingly aware that projects are the means to implementing their strategic objectives, and, therefore, are paramount in their efforts to achieve and sustain a competitive advantage. Yet, it is distressing to note that only 42% of organizations align their projects with their strategic objectives (PMI, 2014). Not only do organizations have to ensure that the projects they undertake fulfill their strategic objectives, but they will also have to balance the risks across all these projects and articulate an open, standardized and systematic process to manage them. The portfolio approach to project management was evolved to address this imperative for managing projects efficiently and effectively.

A project usually consists of people (project team members) working together to create a product or service within a stipulated date. As project team members interact with one another, social networks that reflect their relationships and the strength of ties among them emerge (Burt, 1992; Bourdieu, 1986; Coleman, 1988; Nahapiet & Ghoshal, 1998, Krause et al 1998; Reagans & Zuckerman, 2001; Reagans & McEvily, 2003; Obstfeld 2005; Singh 2005; Wuchty et al 2007; Xu, 2011). Benefits such as social capital, human capital, intellectual capital and knowledge (Grant, 1996; Bourdieu, 1986; Coleman, 1988; Lin, 2001a; Nahapiet & Ghoshal, 1998) can potentially accrue to those who are embedded in these networks. Further, resources entrenched in such networks could be utilized by team members to enhance their creativity and manage their stock of knowledge more effectively. The structural patterns, as well as social capital within and across project teams, are critical to the success of the project.

Projects are inherently complex, and as the project unfolds, various levels of complexities are encountered. By definition, every project exhibits some level of novelty (i.e., uniqueness), involves diverse stakeholders whose interests are not always convergent, and is constrained by time, money, and scope (Kerzner, 2013). Further, projects have to contend with unexpected events, such as turnover of personnel, volatility of requirements, the need for novel technology (and their attendant tools and techniques), or the expansion of scope in ways that nobody anticipated (i.e., scope creep). Above all, organizations have a limited pool of resources to manage their portfolio of projects, many of which have dependencies that are often not well understood. Some of the contributors of project complexity are interdependence of elements, technical risks, team diversity, cultural diversity, uncertainty in methods and goals, number of elements (Williams, 1999; Bacarani, 1996; Vidal & Marle, 2008; Wallace et al., 2004). Further, they argue that project complexity is one of the main drivers of uncertainty and volatility in projects. It is, therefore, important to understand the level of complexity of a project and how it might affect a project team's ability to harness social capital to enhance their KME as well as their ability to evolve creative solutions to the myriad problems they encounter during the course of a project.

The literature is replete with studies that have examined the effect of social capital on knowledge (Inkpen & Tsang, 2005; Chow & Chan, 2008); and creativity (Burt, 2000; Chen et al., 2008; Reagans & Zuckerman, 2001). Also, research on the effect of social network on knowledge management (Tsai & Ghoshal, 1998; Tsai, 2001; Reagans & McEvily, 2003; Obstfeld, 2006; Obstfeld, 2007) and creativity (Perry-smith & Shalley, 2003; Leenders et al., 2003; Perry-smith, 2006; Zhou et al., 2009; Kratzer et al., 2010) abound. Interestingly, none of these studies considers how project complexity affects these relationships. This dissertation tries to fill this gap in the literature and provides a different view of how project complexity interacts with social capital in predicting creativity and KME in project team as well as the success rate of project outcomes.

1.1 Research Goals

Increasingly organizations are relying on projects to realize their strategic and operational objectives. During the course of projects, team members interact with one another as well as with members of other projects in the organization. By virtue of their interaction, network relationships are established (Burt, 2001), which leads to the accumulation of social capital (Adler & Kwon, 2002; Lin 2008; Nahapiet & Ghoshal, 1998). The management and operations management literature has argued that social capital leads to several benefits such as access to information, trust building, exchange of tacit and explicit knowledge, influence and power, solidarity, as well as learning in organizations (Burt, 1997; Coleman, 1988; Nahapiet & Ghoshal, 1998, Krause et al 1998). Further, it has been shown in the project management literature that the value derived from social capital can result in favorable project outcomes (Han & Hovav, 2013). These outcomes include delivering the desired product or service within time and budget, as well as increased KME and creativity in project teams. However, the extent to which these benefits are derived may be contingent on the extent of complexity involved in the project. To the best of my knowledge, the impact of project complexity and team diversity on the relationship between social capital and project outcomes has never been investigated. Therefore, this study seeks to clearly understand:

1. The relationship between social capital and creativity (innovativeness) of the project;
2. The relationship between social capital and knowledge management of the project;
3. The interaction of social capital and project complexity in predicting creativity and KME; and
4. The extent to which creativity and KME mediate the relationship between social capital and project performance

While it is reasonable to expect social capital to positively impact KME and creativity, it is not clear how project complexity might moderate these relationships. Given the impact that project success has on the long-term survival of the operations and the firm, it is paramount that we understand the role of project complexity in projects. The primary objective of this research, therefore, is to address this important need.

1.2 Contributions

Aware of the importance and benefits of effectively managing complexity in projects, organizations' are interested in the effects of these factors on project performance. The majority of the research on social capital and project outcomes focuses on the negative, positive or curvilinear relationships between these constructs. In this research, project complexity will be incorporated into the analysis of the relationship between social capital, knowledge management, creativity in projects and project outcomes.

One of the first contributions of this study is that it will help organizations manage project complexities because of its potential impact on project outcomes; this can be achieved by making improvements to the management of projects to enhance creativity, innovativeness, and KME. Second, this study will be helpful to project managers and leaders because it will provide insight into the management of intra and inter-project exchange networks within the organization. Thirdly, organizations use projects to change operations, meet business needs gain and sustain competitive advantage and respond to new markets. Effectively managing the influence of project complexity on project success factors can be a source of innovative and creative thinking, which may enhance the competitive position of the organizations'.

The remainder of the dissertation is organized in the following manner. Chapter 2 presents the theoretical foundation, extensive review of an extant literature and a qualitative study conducted in this dissertation. This chapter focuses on social capital theory, project complexity and its dimensions, creativity, KME and project success outcomes. Chapter 3 presents the theoretical framework for the social relations and complexities in projects which are the focus of this paper. The hypotheses are presented and supported by arguments from empirical studies. The result is the development of ten hypotheses. Chapter 4 presents the study design, constructs, measurement items and research methodology used in the study. Chapter 5 presents the data analysis results of the study and chapter 6 presents the discussion of the findings with implications for theory and practice. The limitations and suggestions for future research are also provided.

Chapter 2

Literature Review

2.1 Network Characteristics

Social network theory describes the position and interaction of actors or nodes (i.e. individual, team, business unit, and organization) in the network (Burt, 1992: Granovetter, 1982; Freeman, 1979). Social network examines the structure of the actors in a network as well as the ties between these actors. In the sociology, management and operations management literature, two main attributes of the structural pattern of the network have been studied. The first is centrality - the actor's position in the network (Brass & Burkhardt, 1993; Ibarra, 1993; Tsai, 2001). The second is tie strength (density or structural holes) – the extent to which the actors are connected to each other (Bourdieu, 1986; Burt, 1992; Nahapiet & Ghoshal, 1998; Reagans & Zuckerman, 2001; Reagans & McEvily, 2003; Obstfeld 2005; Singh 2005; Wuchty et al 2007; Xu, 2011). Density indicates the absence of structural holes in the network (Burt 1992) while a sparse network indicates the presence of structural holes.

The centrality of an actor in the network indicates the involvement of the actor in the network (Bell, 2005) and signifies the extent to which resources can be easily assessed in the network. Research on the centrality of the actor in the literature has been consistent and it has been empirically tested that the actors' centrality position positively enhances the performance of the actor (Brass & Burkhardt, 1993; Ibarra, 1993; Powell et al, 1996; Tsai, 2001; Sparrowe et al., 2001). Powell et al., (1996) argued that the central actor has more timely access to information, hence have control over information that can amplify creativity and innovation; Ibarra (1993) argued that network centrality implies a high hierarchy position and therefore a source of power and innovation; Sparrowe et al., (2001) argued that centrality enhances the actor to assimilate and transfer knowledge.

The effect of tie strength on the performance of actors in the network has been conflicting. The proponents of strong ties argue that dense networks are more beneficial than sparse networks because of the advantageous information channel access that they provide (Coleman, 1988) to get specific resources (Tsai & Ghoshal, 1998). For instance, Villena et al. (2011) argued that close ties within the buyer-supplier relationships encourage information sharing and quick problem clarification. Likewise, Koka & Prescott (2002) argued that organizations with strong ties have access flow of rich information. Moreover, Reagans & McEvily (2003) argued that strong ties create trust because of the frequent communication between individuals and thereby facilities the exchange of knowledge. Additionally, Krackhardt (1992) argued that strong ties establishes trust and encourages the availability of resources. Furthermore, Nelson (1989) argued that strong ties encourage faster conflict resolution between groups in organizations while Obstfeld (2005) argues that strong ties encourages more frequent communication that further enhances knowledge management and creativity in the organization. In summary, research touting the benefits of strong ties is based on the fact that they provide more opportunities for creativity and effectively transfer knowledge.

However, the proponents of weak ties argue that sparse networks are more beneficial than dense networks because of access to novel information which enhances creativity and innovation (Granovetter, 1973). For instance, Levin & Cross (2004) found that individuals with weak ties perceive transferred knowledge more effectively compared with individuals with strong ties while Koka & Prescott (2002) argued that organizations with weak ties have access to diverse information. Likewise, Ahuja (2000) argued that weak ties provide firms with bridging information channel that ensure the transmission of knowledge between firms. Additionally, Montgomery (1992) argued that weak ties can provide information for employment because it encourages people to venture out of their network. Furthermore, Hansen (1999) argued that weak ties facilitate the transfer of knowledge in a project team due to their access to redundant information. In sum, the benefits of weak ties are therefore derived from access to redundant and diverse information which enhances effective knowledge transfer, creativity, and innovation.

The structure of the network determines the ways actors in these networks obtain and exchange knowledge and information while the ties support the actors in bridging connection within and outside the networks (Gronovetter, 1973). Ample research in the literature has found that these actors form networks to access and benefit from resources (social capital, human capital and knowledge) available in the networks (Burt, 1992; Bourdieu, 1986; Coleman, 1988; Lin, 2001a; Nahapiet & Ghoshal, 1998, Krause et al 1998). The next section discusses one of the benefits (social capital) of an actor in a network.

2.2 Social capital

Adler and Kwon (2002) defined social capital as the favor and benefits available to actors as a function of their positions within the network. The perspective is that social capital adds value to both the actor and network in which the actor is embedded. Past literature on structural patterns of a network include the following authors; (Burt, 1992; Nahapiet & Ghoshal, 1998; Reagans & Zuckerman, 2001; Reagans & McEvily, 2003; Obstfeld 2005; Brass & Burkhardt, 1993; Ibarra, 1993; Tsai, 2001) and based on these patterns; resources are available to actors in the network. The resources available within these networks can be intellectual capital, knowledge, social capital, and human capital (Grant, 1996; Bourdieu, 1986; Coleman, 1988; Lin, 2001a; Nahapiet & Ghoshal, 1998). The main idea of the social capital theory is that actors (individuals, team members, and organizations) gain resources based on their social interactions and connections in a network (Bourdieu, 1986; Coleman, 1988; Nahapiet & Ghoshal, 1998) and use these resources to achieve their objectives (Lin, 2001).

Bourdieu (1986) distinguished between three forms of capital: cultural, social and economic. He further argued that social capital is different from other forms of capital because it is based on the positions and locations of actors in the network. Adler & Kwon (2002) expanded on this view arguing that the sources of capital are based on market relations, hierarchical relations or social relations. Additionally, they assert that the sources of social capital are social relations as a result of the position of the actors in the capital social structure. This has been asserted by the definitions of social capital in the literature: Bourdieu (1986) defined social capital as the accumulated resources that are available to members of a network; Portes (1998) defines social capital as the 'ability to secure benefits through memberships in networks"; Coleman (1998) defines it as "a valuable asset that stems from access to resources made available through social relationships"; Nahapiet & Ghoshal (1998) defines it as "the sum of actual and potential resources embedded within, available through and derived from the network of relationships possessed by individuals or sub-unit"; Adler & Kwon (2002) defines it as "the goodwill available to individuals or groups".

Ahuja (2000) argues that social capital is the resources embedded in these networks. Likewise, Coleman (1998) argues that social capital "is inherent in the structure of relations between and among actors" in a network. Additionally, Adler & Kwon (2002) also argues that structure and content of a network determine its social capital. This signifies that structural pattern of a network determines social capital. These authors in their definitions and conceptualizations all agree that resources available to actors in a network are based on their social relations in the network. Actors within a network can benefit from social capital in terms of leverage to information, influence, power and control over other actors in the network, solidarity of actors in compliance to norms and customs (Adler & Kwon, 2002) while information risks, dependency on focal actors and in-group are some of the risks of social capital (Adler & Kwon, 2002).

Nahapiet & Ghoshal (1998) proposed that there are three dimensions of social capital – cognitive, relational and structural. Cognitive dimension refers to the resources providing shared representations, interpretations, and systems of meaning (Krause et al, 2006). This can also be stated as shared norms and codes (Nahapiet & Ghoshal; 1998) between actors in a network. Relational dimension can be described as the personal relationships that actors in the network have which evolved based on a history of interactions. Relational social capital focuses on trust and friendship that can be built through personal relationships. Structural dimension refers to the connection and relationship involved between actors in the network. The facets of this dimension are the “centrality” and “structural holes” of the network (Granovetter, 1982; Bourdieu, 1986; Burt, 1992; Nahapiet & Ghoshal, 1998; Reagans & Zuckerman, 2001; Reagans & McEvily, 2003). These dimensions together with their interactive “ties” will be discussed in the next section.

Social capital consists of bonding and bridging social capital depending on the links of the focal actor in the network (Adler & Kwon, 2002). Bonding social capital refers to benefits accrued from the internal ties and links within a group and the focus is the “strong tie” relationships within collectivities (Granovetter, 1983; Portes & Sensebrenner, 1993; Coleman 1998). Bridging social capital refers to the benefits that are embedded in the external ties and links between the focal actor and other actors outside the collectivities with a focus on the “weak tie” (Granovetter, 1983; Burt, 1992). Additionally, Adler & Kwon (2002) argued that social capital can also consist of both bonding and bridging capital which can be interpreted as consisting of both the network and the assets available through the network (Nahapiet & Ghoshal, 1998). Kang & Kim (2009) suggested that the interaction of project team members with others within and / or outside the project group influences the effectiveness of the team. In this study, I draw on Adler & Kwon’s (2002) discussion of bonding and bridging capital to examine social capital within and across projects and their effects on project success outcomes.

2.2.1 Bonding Capital

In all projects, there is the need for consistent and quality interaction between members of the project team. This is important for the successful coordination and completion of the project as well as meeting specified project outcomes. The first key element of bonding capital is the frequent interaction among team members which creates a web of relations. Koka and Prescott (2002) assert that frequent interactions among social actors in a network foster high reliability and very diverse information sharing. It can be inferred that frequent interactions between project team members enhance the information sharing. Also, bonding capital helps create a cohesive network (Di-Vincenzo & Mascia, 2011) between the project team members which can enhance the creativity of the project team. Additionally, bonding capital can help create knowledge and intellectual capital as well as knowledge exchange (Nahapiet & Ghoshal, 1998; McFadyen & Cannella, 2004; Di-Vincenzo & Mascia, 2011, Krause et al., 2007) between team members. When teams create intellectual capital, this positively enhances the performance of project and organization and eventually helps create and or sustain competitive advantage. Bonding capital might additionally improve the culture of innovation and creativity in the project team.

The second key element of bonding capital involves the internal trust and shared norms among project team members based on the internal interactions and relationship developed during the course of the project. Tsai & Ghoshal

(1998) argued that frequent interactions between actors in a network foster trustworthiness in the relationships. They further argue that an actor that is centrally located in the network is most likely regarded as trustworthy. As project team members interact with each other, trust would be developed in the relationship. Additional with the frequent interactions between project team members, they develop norms which are shared between team members. Adler & Kwon (2002) asserted that within the network, members conform to rules and conducts with the need for formal controls. This is usually based on the trust and obligations developed due to frequent interactions between the actors.

The third key element of bonding capital involves the codes and languages (Nahapiet & Ghoshal, 1998) that are shared among actors in within the network.   Tsai & Ghoshal (1998) argued that interaction between actors within a network helps in configuring the values that will be shared by the members of the network. When team members interact with one another, they often build values that are accepted as the norm and shared within the project team.

2.2.2 Bridging Capital

Although there is the need for members of the project team to interact frequently, it is also necessary and beneficial for the organization for project team members interact with other people that are not part of the project because of the resources that available to them from external ties. Bridging capital refers to interactions between actors in a network and other actors that are not part of that network. Thus, bridging social capital is present when team members communicate, interact and access resources from other members of the organization that are not members of the project team. The key focus of bridging structural capital is the external ties that actors in a network have. In the literature, these external ties are also called “weak ties”. Granovetter (1973) argues that external ties facilitate the dissemination and access to information that cannot be accessed with internal ties. The existence of bridging social capital will enhance the firm to use the information accessed from external teams for effective knowledge management and creativity. Additionally, Hansel (1999) argued that project team members leverage on their weak ties to access knowledge that is available in other project teams or other parts of the organization.

Bridging capital also involves external trust and friendship that actors in a team have with people that are not part of the project team in completing the project. Maurer et al. (2011) assert that social capital facilitates the transfer of resources within the organization. As inter-project interactions occur and resources are transferred, more trustworthiness is developed across project teams and this enhances creativity and KME across teams.

The ability of the project team to share values and norms across teams in the organization is established by bridging capital. As interactions occur across projects in the organization, the interest for common goals and values begin is facilitated. Maurer & Ebers (2006) found that bridging capital could facilitate the integration of business orientation in their study of biotechnology firms. Shared goals and visions can provide access to quality knowledge (Chiu et al., 2006) and resources across teams in the organization.

2.3 Projects and Project Complexity

2.3.1 Projects

According to PMI (2013), a project is "a temporary endeavor undertaken to create a unique product, service, or result." Projects are used by organizations to achieve their goals on time, on budget and within schedule. Structuring of projects can be done using three main forms; the pure project structure, the functional project structure, and the matrix project structure. The pure project structure involves self-contained team working full time on the project, the functional project structure involves team members assigned from functional areas of the project where the project is located within a functional area; the matrix project structure which involves individuals from different functional area of the organization and it tries to combine the advantages of pure project structure and functional project structure. Hence, project team members are essentially a group of people with numerous resources with well-defined objectives coming together to achieve the overall objective of the project in terms of budget, schedule and time. The matrix project structure is therefore widely used for project management, it has also been used in different types of firms including engineering, research & development, healthcare, marketing, financial, aerospace, management information systems, aerospace etc.

Projects in the organization have fostered communication, creativity and knowledge transfer within and across teams in an organization. Project team members form networks when they are assigned or involved in the execution of the project. Members of the project are embedded and derive resources from the project network. This can be attributed mainly to the structural patterns of the teams and the resources available to individuals in these project teams or networks. But in all projects, there is bound to be some level of complexity. Issues relating to this complexity could have been or could not have been anticipated to occur by the stakeholders of the project (Ramesh & Browning, 2014). Ramesh & Browning, (2014) argued that these are either unknown unknowns or known unknown risks within the project.

2.3.2 Project complexity

All projects deal with one form of complexity. Although complexity in projects has been studied in various contexts of the literature for more than two decades, it has no common, clear and distinct definition. While the extant project management literature identifies several dimensions that constituents project complexity, Jacobs (2013) argued that there is no common definition of complexity because it is a multidimensional construct. The extant literature on project complexity is, therefore, sparse with no common definition or operationalizing of project complexity. It could, therefore, be suggested that researchers and project practitioners really don't know the role project complexity plays in the success and or failure of projects. One of the main goals of this paper is to better understand what project complexity is, how project managers view project complexity and how complexity can be better managed in projects.

In the existing literature, project complexity has been defined and conceptualized in different ways as summarized in Table 2-1 below:

Table 2-1 Definition and Conceptualization of Project Complexity in the Extant Literature

Author	Definition of Project Complexity	Dimension of Project Complexity
Baccarini (1996)	"consisting of many varied interrelated parts which in complicated, involved and intricate"	• Organizational complexity ➢ By differentiation ➢ By interdependency • Technological complexity ➢ By differentiation ➢ By interdependency
Williams (1999)	"the variety of tasks, the degree of interdependencies within the tasks and uncertainty"	• Structural uncertainty ➢ Number of elements ➢ Interdependency of elements • Uncertainty ➢ Uncertainty in goals ➢ Uncertainty in methods
Tatikonda & Rosenthal (2000)	"the nature, quantity and magnitude of organizational subtasks and subtasks interactions"	• Technology interdependence • Objectives novelty • Project difficulty

Pich et al., (2002)	Project complexity refers interrelatedness and interdependence of elements	• Uncertainty • Ambiguity
Ribbers & Schoo (2002)		• Variety • Variability • Integration
Roberts et al. (2004)		• Technological task complexity
Little (2005)		• Structural complexity • uncertainty
Xia & Lee (2004, 2005)		• Structural organizational complexity • Dynamic organizational complexity • Structural information technology complexity • Dynamic information technology complexity
Vidal et al., (2008, 2011)	"the property of a project that makes it difficult to understand, foresee and keep under control its overall behavior…"	• Organizational • Technological
Geraldi et al., (2011)		• Structural complexity • Uncertainty • Dynamic • Pace • Socio-political
Jacobs & Swink (2011)		• Multiplicity • Diversity • Interrelatedness
Howell et al. (2012)	"the degree of differentiation and interdependence of project elements	
Ramesh & Browning (2014)		• Element complexity ➢ number and variety of project elements

		• Relationship complexity ➢ number, variety, and patterns of relationships among project elements

In the literature, several factors have been posited that contributes to the complexity of a project. These are listed in Table 2-2 below:

Table 2-2 Factors that contribute to project complexity

Author(s)	Factors that contribute to project complexity
Ramesh & Browning (2014); Baccarini (1996); Williams (1999)	Number and variety of people involved in the project
Little (2005); Ramesh & Browning (2014)	Size of the team
Ramesh & Browning (2014); Baccarini (1996); Williams (1999); Tatikonda & Rosenthal (2000)	Projects tasks and its interdependencies
Ramesh & Browning (2014); Baccarini (1996); Williams (1999); Tatikonda & Rosenthal (2000); Xia & Lee (2004); Little (2005)	Interdependencies between the project elements
Ramesh & Browning (2014); Wallace et al., (2004a, 2004b)	The risks associated with the project
Little (2005)	Team location, team capacity and domain knowledge gaps
Ramesh & Browning (2014)	Organizational decisions
Horwitz & Horwitz (2007); Miller et al, (1998); Hambrick et al., (1996); Pfeffer, (1983); Hambrick & Mason (1984); Kilduff et al., (2000); Jackson & Joshi, (2004)	Team diversity
Wallace et al., (2004a, 2004b);	Novel technology/ Immature technology/

Baccarini (1996); Williams (1999); Tatikonda & Rosenthal (2000); Xia & Lee (2004)	Technical complexity
Cox & Blake (1991)	Cultural diversity of the team members

Because Project complexity poses a significant concern to managers and can undermine both strategic and operational performance of the organization (Jacobs, 2013). It is, therefore, important to address the research question of what project complexity and the challenges it presents in the social interaction domain of project management, this study pursues an exploratory case study approach.

2.3.3 Case Study Design

Given the limited theory about how researchers and project manager practitioners define project complexity; we relied on inductive theory building (Eisenhardt, 1989; Yin, 2003). The qualitative data comes from multi-national manufacturing firm. Data collection involved multiple rounds of interviews over a six- week period. The case analysis triangulates the qualitative data with the literature to establish a link between the concept from the pieces of project management, project complexity, and management literature. Figure 2.1 gives the overview of the research method.

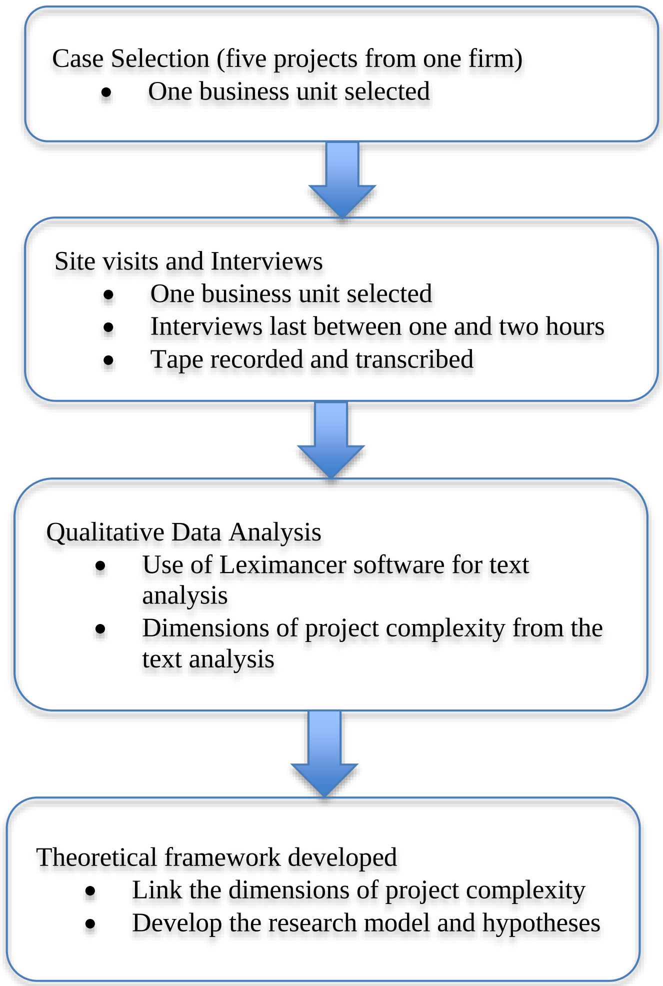


Figure 2-1 Overview of the qualitative research method

2.3.4. Case Study Setting

The Information Technology (IT) unit was selected for the research because the projects managed by the IT unit supports all the business units of the organization. Hence, it's a rich source of knowledge, network ties, and social interaction in the organization. Five projects were selected; three of which were research &development (R&D) projects, one is maintenance project and the last one is engineering infrastructure project. The study design seeks to triangulate the opinions from multiple perspectives - the project managers, project director and business leads involved in these projects.

Projects were selected in conjunction with the head of the project management office. The project duration ranges from 10 months to 61 months. The professionals participating in this study are all based in the United States. The participants were project managers. A summary of the project characteristics is provided in table 2-3 below:

Table 2-3 Summary characteristics of project used in the case study

	Project A	Project B	Project C	Project D	Project E	Project F
Team size	15	5	9	6	7	5
Duration	61 months	26 months	26 months	11 months	10 months	13 months
Project Type	Compliance	Operational	Operational	Operational	Compliance	Compliance
Organizational function	R&D	R&D	Infrastructure Engineering	R&D	R&D	MTO
Project cost	$1,013,000	$443,813	$517,000	$605,000	$350,000	$552,000

2.3.5. Case Study Methodology

The case study was conducted following the inductive approach (Eisenhardt, 1989; Yin, 2003). A multi-national firm in North Texas was approached to solicit participation in the study and they agreed to participate.

Data were collected primarily through semi-structured interviews and informal conservations with each participant. Before the interview, the areas to be covered were sent to one academic researcher and a Project Management Professional (PMP) certified project manager to refine the topics areas and ensure that relevant information would be gathered. The interviews lasted between sixty and one hundred and fifty minutes and were openly recorded for transcription and analysis. The areas covered during the interview are summarized in table 2-4 below. Secondary data was also collected in the form of project charters and progress reports.

Table 2-4 Interview topics

Topics
Project complexity on the project (its characteristics and dimensions)
Project management practices and Methodology used on the project
Interaction within and among team members and social capital
Creativity – ideas and innovations developed by the project team members
How knowledge is created, stored and transferred

The interviews began by asking participants questions about their background, experiences, industry and role in the firm. The participants were probed about project complexity, its dimensions, contributing factors and the roles it plays on projects. Open-ended questions were used to give participants the opportunity to express and articulate their answers. In order to gain complete information (Eisenhardt, 1989), the participants were prompted to provide more details when they descriptions were brief. Several steps were taken to address participants' bias; first, participants involved in the study were from different roles on the projects and in the organization. Second, the focus of the questions and answers were on projects involved in the case study. Third, open-ended questions were used to enhance accuracy. Fourth, data was triangulated from the participants, the project charters, and status reports.

2.3.5.1 Case Description

Six projects were used for the case study with three project managers, one business lead and one project director interviewed. One of the project manager interviewed manages four of the six projects, hence, the interview with this project manager was concentrated on the most complex amongst the four projects. During the interviews, the project managers were asked to describe what they understood by project complexity and what factors contribute to project complexity. Their answers are described as follows:

2.3.5.2 Interview One

This is an R& D project that has been going on for more than five years in the organization with a project budget of about $1.01 million dollars. The project was initially outsourced to a consulting firm. After four years of outsourcing the project, the firm decided to terminate the outsourcing contract and appoint an internal project manager due because the project was not meeting its specified requirements. The project Manager (PM) has about twenty years project management experience, has a bachelor's degree and had been working in the organization for more than ten years. During the interview when asked what project complexity is, the PM said "*I think of project complexity is more of technical, business process, and political complexities. I also think of project complexity as involving a global project with various people from different geographical regions.* Some factors that contribute to project complexity are the duration of the project, political issues, customers' requirements, and perceptions of stakeholders involved.

2.3.5.3 Interview Two

This is also an R& D project that has been going on for more than twenty six months in the organization with a project budget of about $443,000 dollars. The PM has about fifteen years of project management experience, has a bachelor's degree, PMP certified and has been working in this organization for two years. During the interview when asked what project complexity is, the PM said "*I think of project complexity is more of technical complexities, getting people involved and understanding what they are required to do and the complexity of different levels of knowledge and experience… It is not particularly* *new technology; it is just applying knowledge in the past on a particular project, it's applying it in a unique way".* Some factors that contribute to project complexity are the use of immature or new technology, diversity in the skill sets of project team members, cultural diversity and geographically dispersed teams.

2.3.5.4 Interviews Three and Four

This is an R& D project that has been going on for more than eleven months in the organization with a project budget of about $605,000 dollars. The PM has about twenty years of project management experience, PMP certified, has a masters degree and has been in the organization for about twenty years. During the interview when asked what project complexity is, the PM said "*project complexity has to do with the number of components in the project and their interrelatedness…., when requirements are not fully understood and unclear* as *well as the variety of skills of team members, availability of team members and time zones of the team members working on the project."*

The business lead of this project was also interviewed. According to the business lead, "*project complexity is probably highly cross-functional, probably international or global in scope and it increases based on changing processes and systems……., it involves more than one geographical location and cross-functional. Project complexity also involves varying levels of experience by the team members; in fact, I think experience is a huge component, but it has to* *more than internal experience. People who have only in one company for the entire career have great historical knowledge of that company. But, they haven't necessarily seen how anything works anywhere else. I think the experiential level is on two folds- internal and external. You have to have subject matter knowledge, but you also have to have broader experience".*

From the interviews of the PM and business lead, some factors that contribute to project complexity are diverse and varying experience of the team members, the interrelatedness of the project components, the cultural diversity in the skill sets of project team members as well as cross-geographical projects.

2.3.5.4 Interview Five

The project director was interviewed after the all the other interviews were complete. The project director has about twenty-five years of project management experience, PMP certified and has an MBA degree. During the interview when asked what project complexity is, the project director said "*project complexity involves more than one functional area, and involves delivering something to a multifunctional team. The budget for a project is higher than the medium complex project; it involves a long project durations - likely spanning many years and the technology may be newer. In fact, the technology may not be ready yet……"* Factors that contribute to project complexity are the lack of risk assessment, lack of support from the management and project sponsors and lack of knowledge management.

2.3.6. Qualitative Data Analysis

The qualitative data analysis began by cross-case analysis. I familiarized myself with about 48 pages of transcribed interviews. Text analysis of the transcripts was done with the aid of Leximancer software and figure 2.1 shows the result of the analysis. The text analysis also included the top ten dimensions of project complexity and this is shown in table 2-5. Figure 2.3 also shows the similarity of the description of project complexity between the interview participants while figure 2.4 shows the correlation of the transcripts of interviews of the participants. The summary of the text analysis is shown in Appendix B

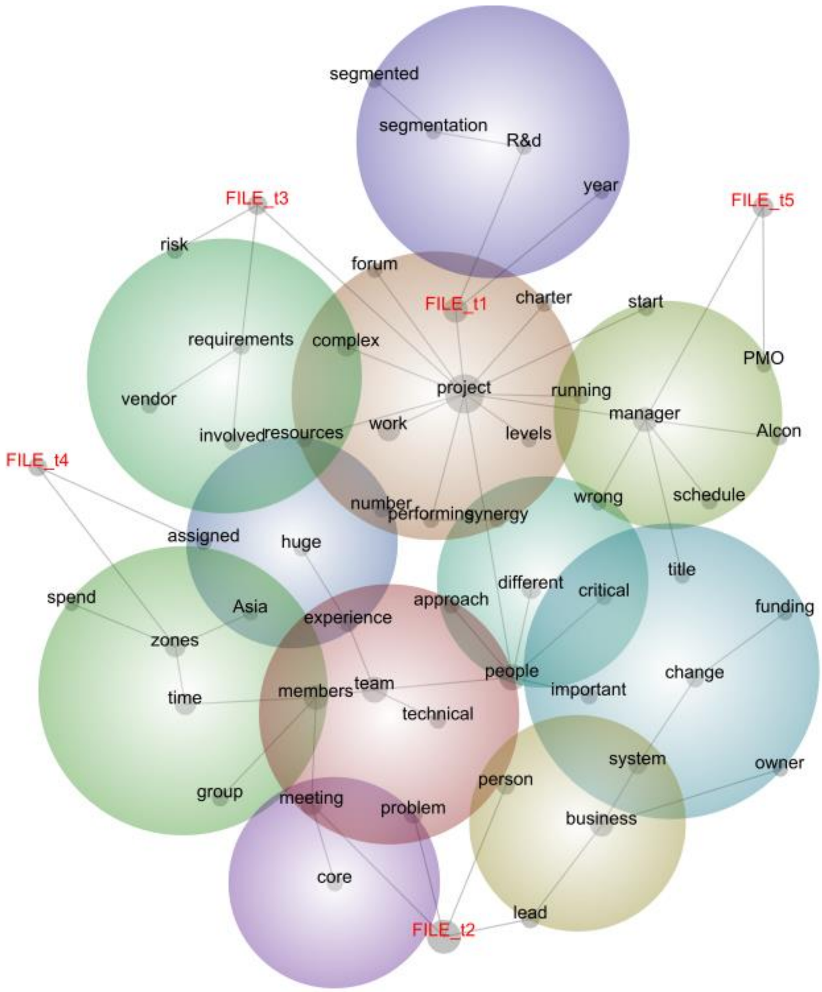


Figure 2-2 Text analysis of transcribed interviews

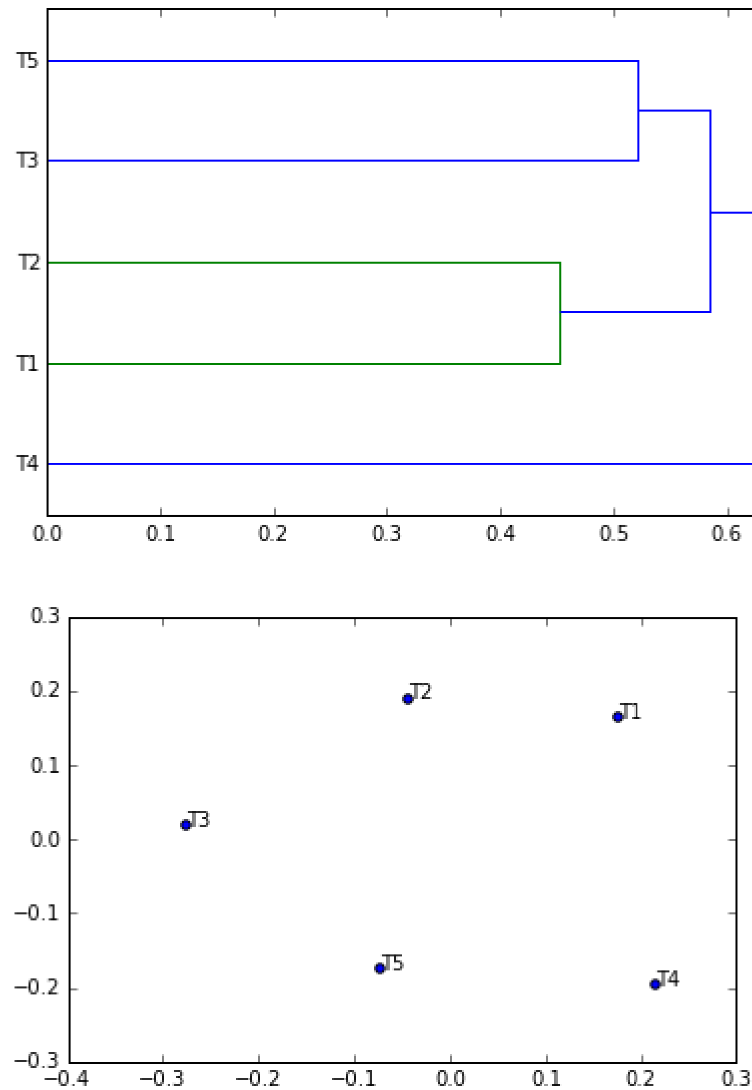


Figure 2-3 Text analysis results that show the correlation between transcripts of interviewees

Based on the result of the qualitative data analysis and extensive literature review, four dimensions of project complexity were identified and would be studied in this research. These are interdependencies, team member diversity, team distribution and team virtuality.

2.3.2.1 Task Interdependence

In the broad sense, interdependence in project teams in project teams can take two different forms: task and goal interdependence (Campion et al., 1993). For the purpose of this study, the focus will be on task interdependence.

Task interdependence refers "to the extent to which project team members are dependent upon one another to perform their individual jobs" (Van de Ven et al., 1976). It involves the exchange of resources by team members and their ability to complete their tasks which are dependent on the action of others in the group (Van de Vliert , 2002; Saavedra et al., 1993; Thompson, 1967). The extant literature on task interdependence dates back to the work of Thompson (1967) which conceptualized the hierarchy of workflow or tasks as (i) *pooled interdependence* (independent work flow such that there no direct interaction among project team members); (ii) *sequential interdependence* (the workflows in an established way such that project team members have different roles); (iii) *reciprocal interdependence* (workflows in a two-way flexible manner). Van der Ven et al., (1976) suggested that *team interdependence* is an extension of Thompson's hierarchy of workflow. Team interdependence refers to a workflow such that project team members jointly diagnose, problem solves and collaborates on the project (Van der Ven et al., 1976).

Kiggundu (1981) argued that there are two types of task interdependencies: initiated and received. He further suggested that task interdependence is a multidimensional concept comprising of scope, resources and criticality. Task interdependence have been studied at multiple levels, for example, it has been studied at the individual level (Kiggundu 1983; Brass 1985; Perace & Gregersen, 1991) and group level (Thompson, 1967; Jehn 1995; Campion & Higgs, 1993; Saavedra et al., 1993; Wageman, 1995; Campion et al., 1996). Task interdependence at the group level is important to study because of its impact on projects. For instance Campion et al., (1993) argued that that task interdependence has been found to increase motivation, group effectiveness, and group accomplishment. It has also been suggested that task interdependence increases as the work difficulty increases (Dan Der Vegt et al 2000; Van de Vliert, 2002) among project team members.

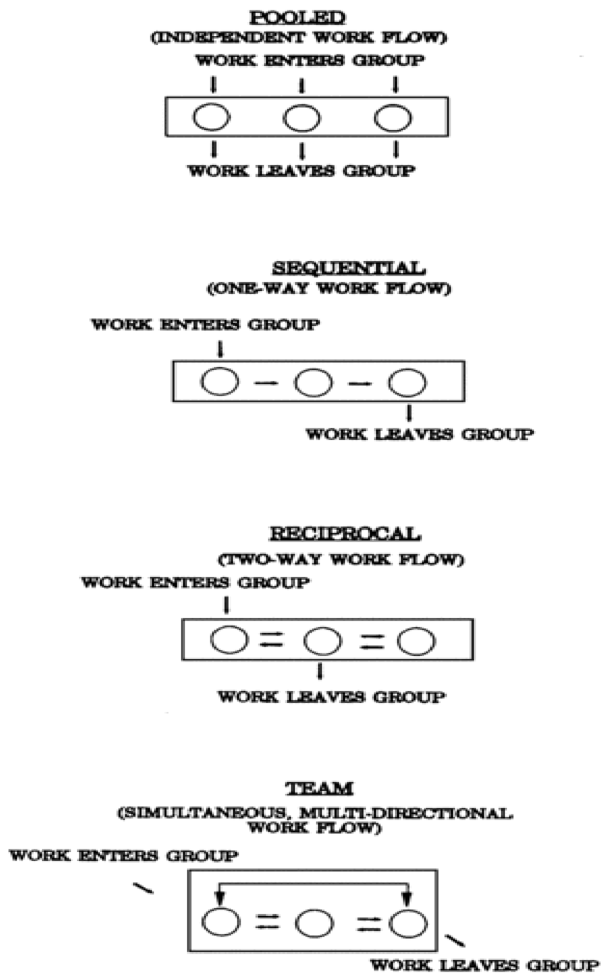


Figure 2-4 Models of task interdependence in work groups
(adapted from Complex interdependence in task-performing groups. By: Saavedra, Richard, Earley, P. Christopher, Van Dyne, Linn, Journal of Applied Psychology, Vol. 78, Issue 1, pp 61-72)

2.3.2.2 Team Diversity

Team diversity refers to the uniqueness of each individual of the team and ample research on team diversity has been done in the management literature. A team can either be homogeneous or heterogeneous. In the extant literature, team diversity has been conceptualized in terms of *cognition* (Bryne, 1971; Horwitz & Horwitz, 2007; Miller et al, 1998; Cox & Blake, 1991; Hambrick et al., 1996) which is the extent of differences between members of a team in relation to their experiences, expertise and perspectives (Miller et al,,1996) and *demography* which studies diversity with variables such as gender, age, organizational tenure and nationality (Pfeffer, 1983; Hambrick & Mason 1984; Kilduff et al., 2000; Jackson & Joshi, 2004). Harrison et al., (1998) classified team diversity as either *surface-level* or *deep-level* diversity. Surface-level diversity refers to the differences among team members that are immediately observable and simple to measure (Jackson et al., 1993; Harrison et al., 1998) such as age, gender, and ethnicity. Deep-level diversity refers to the differences among team members' attitudes and values (Harrison et al., 1998) that are evident over time due to the interaction of members' (Horwitz & Horwitz, 2007) such as functional expertise, education, and organizational tenure.

In the extant literature, the effect of team diversity on the performance of the team has been conflicting. Using the cognitive diversity paradigm, proponents of heterogeneity argue that team diversity enhances performance because of the ability of the members' to bring unique and diverse perspective to the team (Cox & Blake, 1991; Horwitz & Horwitz, 2007) and enhance productivity, creativity, learning, increased information and decision making (Ancova & Caldwell, 1992; Williams & O'Reilly, 1998; Hambrick et al., 1996; Miller et al, 1998; Cox & Blake, 1991; Jackson & Joshi, 2004; Østergaard et al., 2011). However using similarity-attraction paradigm, the proponents of team homogeneity argue that homogeneity is more beneficial than heterogeneity of the team (Horwitz & Horwitz, 2004). For instance, Milliken & Martins (1996) argued that functional diversity enables bridging between teams and which enhances the performance of the team while Østergaard et al., (2011) argued that heterogeneity increases transaction costs, conflict and competitive behavior in the teams. Others researchers have argued also argued that that team heterogeneity has an adverse effect on innovation or creativity (Bryne, 1971; Tziner, 1985). In sum, the positive effects of team heterogeneity are derived from the combination of knowledge and better solving capability while the negative effects of team heterogeneity are derived from conflict and lack of trust.

2.3.2.3 Team distribution

Team distribution is composed of the cultural differences between team members (cultural diversity) as well as the geographical location and means of communication (team virtuality) of the team members. These are discussed in the following sections.

2.3.2.3.1 Cultural Diversity

According to Hofstede (1997), culture can be defined as “the collective programming of the mind that distinguishes the members of one group or category of people from another." A cultural diverse team encompasses a group of people from different cultural backgrounds working towards a common goal or deliverable for the organization or stakeholder (Stahl et al., 2010). Ample theoretical and empirical research has been conducted to examine the impact of cultural diversity on work groups' performance. According to Cheng et al., (2012) cultural diversity can be classified as either "surface-level" or "deep-level." Surface-level cultural diversity refers to differences in ethnicity or nationality while deep-level cultural diversity refers differences in norms and values (Cheng et al., 2012). The effect of cultural diversity in the literature have been inconsistent. Some authors found that a culturally diverse team enhances creativity (Cox & Blake, 1991), produces better decisions (Cox & Blake, 1991) and therefore have access to diverse expertise and skills (Watson et al., 1993; Ely & Thomas, 2001). Others have found that cultural diversity has an adverse effect on performance due to interpersonal conflict and complicated communication (Polzer et al., 2002). Cheng et al. (2012) argued that cultural orientation of an individual affect their social interaction with others. Due to the diverse perspective of a culturally diverse project team (heterogeneous team), heterogeneous teams will contribute to the complexity of that project compared with homogeneous teams. This will, therefore, have an impact on both the KME and creativity of the project.

2.3.2.3.1 Team Virtuality

A virtual team consists of people that are geographically dispersed; depend on electronic gadgets to accomplish their job functions and goals. The extant literature is replicate with studies on team virtuality; for instance, Chudoba et al., (2005) refers to virtual teams as group of people that work in different geographical locations; while Gassmann & Von Zedtwitz (2003) describe a virtual team as a group of people that perform interdependent task using information, communication and transport technologies that enable them to achieve their goals. Additional, Powell et al., (2004) describe a virtual team as a group of people that achieve organizational goals even though they may be geographical, organizational and time dispersed.

The concept of virtuality can be described in the context of differing forms of computer-mediated communication (Ebrahim et al.,2009; Peters & Manz,2007; Anderson et al., 2007; Hertel et al., 2005) time zones (Ebrahim et al., 2009; Raisinghani, 2000; Leenders et al., 2003), geographical location (Chudoba et al., 2005; Ebrahim et al.,2009; Raisinghani, 2000; Leenders et al., 2003), organizational boundaries (Raisinghani, 2000; Powell et al., 2004), and cultural environments (Chudoba et al., 2005; Ebrahim et al., 2009) that allows members to coordinate their individual efforts and activities to accomplish organizational tasks. Ebrahim et al., (2009) suggest that there are four different forms of virtuality based on the number of people on the team and the degree of interaction between members of the team – *teleworkers, remote team, matrixed teleworkers and matrixed remote teams*.

The benefits of using virtual team in the organization include gaining and maintaining trust (Anderson et al., 2007); increase collaboration and productivity at a distance (McDonough et al., 2001; Ebrahim et al., 2009); foster and manage creativity (Prasad & Akhilesh, 2002; Leenders et al., 2003); facilitate the accumulation and sharing of knowledge (Zakaria et al., 2004; Sridhar et al., 2007); flexibility of team members (Prasad & Akhilesh, 2002); reduce travel and relocation costs and time (Boudreau et al., 1998; McDonough et al., 2001; Prasad & Akhilesh, 2002). The challenges of the virtual teams are vulnerable to trust issues, conflicts and power struggles (Jarvenpaa & Leidner 1999; Kayworth & Leidner, 2002; Kirkman et al., 2002; Rosen et al., 2007); lack of social interaction and communication breakdown (Jarvenpaa & Leidner 1999; Cascio 2000; Kirkman et al., 2002; Rosen et al., 2007; Ebrahim et al., 2009); isolation and lack of physical interaction (Cascio 2000; Ebrahim et al., 2009); language and accent barriers (Dekker et al., 2008; Ebrahim et al., 2009) and extra training and encouragement for team members (Ebrahim et al., 2009). Effectively managing team virtuality involves regular and prompt communication, role definitions and clarity, effective leadership skills as well as shared understanding of goals and objectives by the members of the team.

2.3.2.5 Technology and Technical Risks

Technology and technical risks refer to the use of novel or relatively new technology on a project and the associated risks that are involved in the use of these technologies. The novelty of the technology used on a project can contribute to the project complexity. For instance, McFarlan (1994) argues that to the lack of experience in the use of new technology on a project increases the project risk and contributes to project complexity while Tatikonda & Rosenthal (2000) argued and found that technology novelty negatively impacts the individual success factors of a project. Wallace et al., (2004) asserted that the combination of the use of a new technology on a project and immature technology on a project are some of the factors that contribute to project complexity risks. Likewise, Xia & Lee (2005) proposes that technology platform contributes to project complexity.

Jacobs (2013) argued that project complexity is a multi-dimensional construct and because the focus of this study is projects; it is therefore necessary to conceptualize the dimensions of project complexity as team diversity, task interdependencies, technical risks and team distribution. In sum, based on the triangulation of the literature and the case study, task interdependencies, technical risks and team distribution are all factors that contribute to project complexity.

2.4 Creativity

Organizations encourage their employees to work in collaborative groups (Paulus, 2000) and collaborative work increases the performance of the organization. The basic resources of a project team are the individual members of the team (Nijistad & Paulus, 2003). These individuals interact with each other (Shani, 2014) as well as with other project team members in the organization to generate novel and useful ideas. These ideas are beneficial for the various projects in the organization as well as the overall performance of the organization. The novel and useful ideas generated by project team members have been referred to as creativity (Amabile, 1996; Perry-Smith & Shalley, 2003).

The management and psychology literature have a vast number of studies on creativity. Although creativity and innovation are sometimes used interchangeably in the literature, these are two different constructs. Newell & Shaw (1972) defined creativity as the generation of imaginative new ideas; Amabile (1996) argues that creativity involves the idea generation while innovation involves both the generation and implementation of ideas; Perry-Smith & Shalley (2003) define it as the generation of new and relevant ideas, processes or solutions; Stokes (2006) defines it as the development of something unique, beneficial, productive, or influential; Anderson et al (2014) define it as the generation of new and useful ideas. Woodman et al., (1993) have an encompassing definition of creativity and they define creativity as generation of “valuable, useful new product, service, idea, procedure or process by individuals working together in a complex system.” Paulus (2000) argued that the creative potential of idea-generating groups is based on social and cognitive stimulation. Social stimulation involves comparison of the group with other groups and holding the group accountable while cognitive stimulation involves the interaction of members of the group.

Amabile (1996) argues that there are three components that contribute to individual or team creativity: *expertise*, which is knowledge and understanding of the individual, *creative thinking skills* which is approach of solving problems by the individual and *motivation* (intrinsic and/or extrinsic), which is the desire (internal or external) for behaving in a certain manner. The team creativity within a group depends to a large extent on these three components. As members of a project interact and share information within and across other teams in the organization, trust is built and novel ideas on how the project could be executed will be generated. This will, therefore, create value for the organization.

Two paradigms of the negative effect of intra-team communication on creativity have been theorized – the distraction conflict theory (Baron, 1986) and the creativity blocking. Using the distraction-conflict theory and creative-blocking paradigm, some authors argued against the positive effect of intra-team communication on creativity (Baron, 1986; Lovelace, 1986). But other authors have argued for the positive effect of intra-team communication on team creativity (West, 1990; Jia et al., 2014). Social relationship between team members and across teams in an organization can help generate creativity due to the interactions and resources within the teams and across teams in the organization. The “novel ideas” or “something new” generated by team creativity can give the organization competitive advantage (Shani, 2014) through interactions and communications between team members. According to Leenders et al., (2003), for creativity to occur within a team, there must be interaction and exchange of information and ideas between the members of the team and the organization. Jia et al., (2014) argues for a dense communication for team creativity because it facilitates the exchange of information that can help generate ideas.

2.5 Knowledge Management Effectiveness

Knoweldge management effectiveness is how well an organization creates, stores, transfers and reuses its knowledge (Song et al., 2008). Effective knowledge management in the organization involves the integration of knowledge from different sources (Ramesh & Tiwana, 1999) and it impacts process innovation and improvement, executive decision making and organization adaptation (Earl, 2001). In the business environment, the difference between a successful firm and an unsuccessful organization can be the way knowledge is managed. As project team members interact within and across teams, information is shared which leads to the creation, storage and transfer of knowledge. Therefore, it is imperative for organizations to have a mechanism for effective management of knowledge.

Grant (1996) in his classic piece on knowledge argues that the management of an organization is tasked primarily with the integration of knowledge. Knowledge management involves an effort to gain useful knowledge within the organization by encouraging communication and the free flow of ideas between employees, work units, and business units. KME involves coding, storing, transfer and application of knowledge between individuals, work unit, business unit and the overall organization as a whole (Song et al., 2008). There are two dimensions of knowledge (Nonaka & Takeuchi 1995) - codified which is also known as *explicit knowledge* and personalized knowledge which is also known as *tacit knowledge*. *Tacit knowledge* refers to personal, intangible knowledge that cannot be easily or identically duplicated while *explicit knowledge* refers to recorded, codified knowledge that is tangible and that can be easily shared or duplicated. It is important that both tacit and explicit knowledge is properly managed within and across teams in the organization.

Nonaka & Takeuchi (1995) devised the knowledge conversion model (SECI) based on the conversion of tacit or explicit knowledge to tacit or explicit knowledge. The conversion of tacit knowledge to tacit knowledge is known as *socialization*, the conversion of tacit knowledge to explicit knowledge is known as *externalization*, the conversion of explicit knowledge to explicit knowledge is known as *combination* and the conversion of explicit knowledge to tacit knowledge is known as *internalization* (Nonaka & Takeuchi 1995). These conversions show how knowledge is created from existing knowledge. Management of knowledge within and outside an organization can be done using the SECI model (Rice & Rice, 2005).

Once knowledge is created by the firm, it needs to be stored to prevent its loss (Alavi & Leidner, 2001). Knowledge storage in an organization involves the storage, organization, and retrieval of organizational knowledge (Alavi & Leidner, 2001) for its use. Knowledge transfer involves activities of exchanging knowledge between individuals, work units, business units, and organizations. According to Alavi & Leidner (2001), the flow of information between units/groups in an organization determines the level of knowledge transferred between its entities. Knowledge transfer in the organization depends on the perceived value of the knowledge source, sources' willingness to share knowledge, transmission channels, recipients' willingness to acquire knowledge and absorptive capacity of the recipient (Gupta & Govindarajan, 2000).

The management of knowledge in any organization can facilitate better and faster decision process (Garvin, 2003) and information thereby leading to the achievement and sustainability of its competitive advantage (Porter &

Millar, 1985). Hence, for any organization to thrive and be sustained over time, there must be a very good knowledge management system. A stream of literature have argued and identified the benefits of an effective knowledge management system; Song et al., (2008) argued that work units must exchange knowledge with other work units in the organization in order to enjoy the benefit of collaborative problem-solving; Gray (2000) argues that a knowledge management system assists in analyzing complex problems and increases employee specialization; North et al., (2004) found empirical evidence that knowledge management leads to reduction of work errors and transaction costs, savings of time when the work is routine and increase productivity of employees. Alavi & Leidner (2001) argues that when knowledge is viewed as a capability it creates intellectual capital. It is, therefore, imperative that knowledge within and across project is managed effectively because of its overall ability to achieve and sustain the competitive advantage of the organization

2.6 Project Success Outcomes

When teams are involved in projects, outcomes can be derived based on the project performance, lessons learned and customer satisfaction metrics of the project. Project performance measures can either be objective or subjective. The Project Management Body of Knowledge (PMBOK) defines project success on the ability to complete the project “on time, on budget and to scope”. This signifies that the indicator of a successful project depends on its measurement with regards to the time to completion, the budget of the project and the scope of the project.

A project is always deemed successful when it completed on time, within budget and scope. Ample research has been conducted on project success factors in the project and project management literature and over the years, several measures have been used in determining the Performance of projects. The arguments that there is a distinction between project success and project management success have also been well documented in literature (de Wit, 1988; Munns and Bjeirmi, 1996; Cooke-Davies, 2002) with project management success measured during the course of the project and project success measured at the end of the project.

Project success measures used in the literature are as follows: Rubin & Seeling (1967) used technical Performance as a measure of project performance in their study of the relationship between project manager characteristics and project characteristics; de Wit (1988) studied development projects and identified three criteria for the measurement of project success namely technical performance, cost performance and schedule performance; Cooper & Kleinschmidt (1987) argued that successful product innovation drives the need for better project selection and effective process management, therefore the dimensions of new product success are the financial performance, opportunity window, and market impact; Dvir et al., (1998) argued that project success factors are not universal and using multivariate methods they found that project success factors are dependent on the project type; Lipovetsky et al. (1997) studied defense projects and found that meeting design goals, benefits to the customer, benefits to the developing organization, and benefits to the defense and national infrastructure are the four dimensions of performance with benefits to the customer as the most important measure.

Project management success involves the assessment of the project during and after the completion of the project. It is evaluated by assessing its performance based on it meeting the predefined schedule, cost, and specified scope. Bardhan et al., (2013) indicated that three dimensions can be used to evaluate project performance of teams namely quality of the project, cycle time of the project and on-time completion rate of the projects. Han & Hovav (2013) argued that project performance can also be evaluated by assessing the perceptions of members of the project about the schedule, cost, and scope. Studies that measure project management success use the perceived measures of project performance (Han & Hovav, 2013; Liang et al., 2012; Hsu et al., 2011; Liu et al., 2011; Wang et al., 2011). This dissertation is focused on the performance of the projects, hence, the project management success measures would be most appropriate to use.

Despite the broad conceptualization and past research on social capital, network characteristics, creativity, knowledge management and project success, no research have studied the influence of project complexity on these constructs. Thus, this dissertation fills that gap by drawing upon case studies as well as validated instruments in the literature. It focuses on project complexity factors and how they interact with social capital and network characteristics to predict creativity, knowledge management and project performance. The model is therefore presented and hypotheses developed in the next chapter.

Chapter 3

Model and Hypotheses Generation

3.1 Model Development

Social capital has been suggested to impact project performance positively but unexpected challenges may emerge from projects that are complex. These events have a direct impact on not only creativity and KME within and across projects but also on performance outcomes of the project. Although bonding capital encourages quick problem solving and bridging capital boost access to novel information, the case study suggests that the dimensions of project complexity (technical risks, task interdependence, team diversity and team distribution) poses various challenges to projects and may impact the relationship between social capital, creativity, KME and project performance. The overall model for this study is shown on the next page with hypothesized relationships stated in the next section.

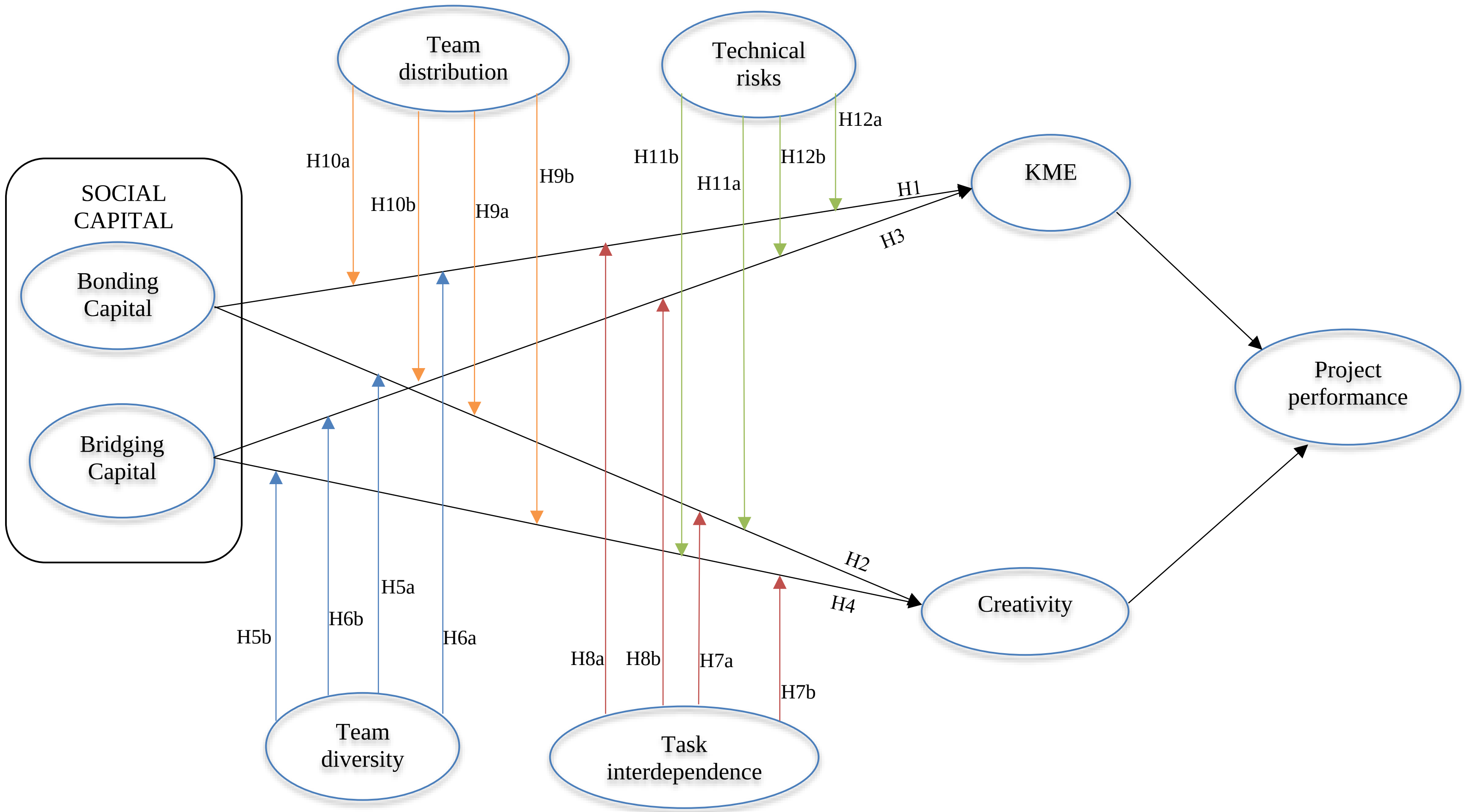


Figure 3-1 Overall Research Model

3.2 Hypotheses generation

3.2.1. Bonding Capital and KME

Social capital ensues as a result of resources available to actors due to their positions/relationships in a network (Bourdieu, 1992; Burt, 1992; Coleman 1994; Tsai & Ghoshal, 1998). Bonding capital refers to the web of relationships and the connections involved within a work unit or project team, personal relationship that has evolved within the project team based on the history of friendship, interactions and trust as well as shared goals, mental models and common interests (Tsai & Ghoshal, 1998). Bonding capital is inherent in a project network, and members of the team have control over these resources. Social network researchers have discussed the benefits of both weak (bridging capital) and strong (bonding capital) ties on creativity and knowledge (Hansen, 1999; Levin & Cross, 2004; Song et al., 2007; Zhou et al., 2009; Baer, 2010; Reagans & McEvily, 2003).

As project members collaborate and work together on a project, they have access to diverse information available in the network. It has been suggested that teams with high bonding capital are expected to be more participative (Robert et al., 2008) and have a high tendency to share knowledge. Huang (2009) argued that a team- based work structure would acquire and manage knowledge effectively because of the information made available to members of that group. Adler & Kwon (2002) argues that access to information by project team members improves the quality, relevance, and timeliness of the information, which, in turn, improves KME of the project team. Effective knowledge management is also expected between team members as they exchange information (Inkpen & Tsang, 2005) and ideas during the duration of the project. As project team members interact and share information constantly, it is expected that they develop a habit of cooperation to share knowledge, which evidently leads to effective knowledge management. Furthermore, McFadyen & Cannella (2004) argues that the cooperation, habits, and trust shared by the project team is as a result of strengthened relationship developed from frequent interactions. Likewise, Chiu et al., (2006) showed empirically that constant interaction increases both the quantity of knowledge shared and the quality of knowledge by the project team. Finally, Newell et al., (2004) in their case study of an ERP project found that bonding capital enhances knowledge creation of a project team.

Trust within a project is important to have because it helps the project team overcome learning barriers and positively influences the transfer of knowledge within the project team (Bartsch et al., 2013). Thus, when members of the project team are trustworthy, it facilitates intra-project team information sharing (Tsai & Ghoshal, 1998); reduces personal gain (Uzzi, 1997; Krause et al., 2007); generates reciprocity (Krause et al., 2007) and enhances the integration of knowledge (Robert et al., 2008) within the project team. Evidently, trust is very important in a project team because it enhances the free flow of useful information among project team members (Robert et al., 2008), which is critical to the exchange of knowledge and collaboration of the project team.

Team norms, which evolve because of social interactions, have also been argued to enhance cooperation between team members (Robert et al., 2008), knowledge accumulation (Krause et al., 2007) and knowledge exchanges (Chui et al., 2006) of the project. Using digitally enabled teams, Robert et al., (2008) empirically demonstrated that team norms can facilitate team discussion and therefore reduce personal gains which eventually enhance knowledge integration of the project. Likewise, Chiu et al., (2006) showed empirically that relational capital within the project team enhances both the quantity of knowledge shared and the quality of knowledge accumulated within the project team. Finally, Bakker et al., (2006), in their study of product development projects, found that trust within the project team positively affects knowledge sharing.

Social patterns within the work unit or project team influences the perceptions of members of the project team. The perceptions of team members on a project are aligned when bonding capital exists in the team (Inkpen & Tsang; 2005). This would enhance integration and effective management of knowledge in the project team. Naphiet & Ghoshal (1998) argued that shared mental models are required for effective information sharing which helps to provide team members with a mental map of how information should be organized. Robert et al., (2008) argued that mental models ensure the integration of shared knowledge that is needed for effective knowledge transfer. Shared goals and common understanding between project team members fosters the exchange of information and knowledge (Cheng, 2013), enables the sharing of resources and access to useful information (Chui et al., 2006), enhances knowledge acquisition (Parra-Requena et al., 2010) and reduces the potential for personal gains (Uzzi, 1997). Chiu et al., (2006) argued that shared vision and language improves the communication of project team members because of the exchange of ideas. They also showed empirically that shared language and vision positively influences both the quantity of knowledge sharing and the quality of knowledge in the project team. Likewise, Robert et al., (2008) empirically demonstrated that cognitive capital is positively related to knowledge integration. Consistent with these findings, I hypothesize a positive relationship between bonding capital and KME. Formally stated:

H1: There is a positive relationship between bonding capital and KME

3.2.2. Bonding Capital and Creativity

Creativity within a project team can be achieved as the team communicates and share useful information. Although the literature on the effect of bonding capital and creativity has been equivocal, strong evidence suggests that frequent interactions among project team members will have a positive effect on creativity. Frequent interaction between the project team members encourages the sharing of useful information which leads to the generation of new ideas (Chen at al., 2008), structuring of collaborative work (Mumford, 2002), cooperative behavior (Putman, 1993), and learning and innovation (Uzzi, 1997) which is suggested to positively influence the creativity of the project. Tsai and Ghoshal (1998) argued that creativity is enhanced when there are diverse resource inputs and combinative capabilities within the work unit, while Chen et al., (2008) provided empirical evidence that social interaction between members of R&D project team enhances team creativity.

Creativity within a project helps develop trust within the project team. It can be suggested that the clarity of objectives by the project team can be a reflection of the trust amongst them. Merlo et al. (2006) argued and showed empirically that shared trust enhances creativity, while Chen et al., (2008) argued that trust enhances knowledge sharing in a project team which then positively affects the creativity of the team.

Furthermore, trust within a project team fosters cooperative behavior (Fisher at al., 2004), integration of diverse ideas and expertise (Tiwana & Mcleam, 2005) as well as creativity (Chen et al., 2008) of the project team. Also, Tsai et al., (2012) - using sixty-eight R&D teams from high technology firms found that team trust enhances team creativity.

Also, as members of the project team communicate, useful information is shared which enhances the integration of resources among the members of the project team. Shared goals within a project team would reduce conflict (Chen 2006), helps focus the project team members on generating useful ideas (Merlo et al., 2006) and foster creative thinking of the members of the project team (Chen et al., 2008). Merlo et al., (2006) using retail stores found that shared goals enhances creativity.

In sum, greater exchange of useful information among members of the project team, trust within the project team and shared goals with the project would lead to the generation of useful and novel ideas within the project. Consistent with the findings above, I hypothesize a positive relationship between bonding capital and creativity. Formally stated:

H2: There is a positive relationship between bonding capital and creativity

3.2.3. Bridging Capital, KME, and Creativity

Bridging capital is the web of relationships and the connections involved across work units or project teams; a personal relationship that has evolved across teams based on the history of friendship and interactions in the organization and shared norms and values that are created as a result of interactions across project team or work units in an organization. In any organization, people interact with one another and when interactions occur across project teams, it fosters high reliability and very diverse information sharing (Walker et al., 1997). This eventually could enhance the inter-unit or inter-group creativity and knowledge management across groups and units in the organization. Amabile et al., (1996) argue that actors who have access to a variety of alternatives, solutions, potentially relevant ideas due to interactions across teams are more likely to make connections that would lead to creativity. Also, Han & Hovav (2013) argues that information diversity across project teams could increase idea generation while Levin & Cross (2004) argued that more frequent communication across work units enhances knowledge sharing. Additionally, Wuchty et al., (2007) and Singh (2005) argued that knowledge creation and knowledge transfer respectively are positively related to a collaborative environment in any organization.

Mutual trust between partners has been argued to foster partnership commitment and partnership creativity (Bidault & Castello, 2009), promote learning capabilities between strategic alliances (Kale et al., 2000), facilitate collective learning (Capello & Faggian, 2005) and enhance innovative performance (Autry & Griffis, 2008). As project team members communicate with other project teams, skills are acquired which can eventually be used for the creation and generation of innovative ideas. In fact, Chang et al., (2010) argued that network bridging capital of supply chain networks fosters the ability of members of the network to access creative and useful ideas. Also, Bartsch et al., (2013) argued and provided empirical evidence that bridging capital would aid learning across project teams because of its ability to create goal congruence.

Levin & Cross (2004) argues that existence of trust in relationships positively affects knowledge transferred during interactions. Likewise, Inkpen & Tsang (2005) argued that knowledge transfer is enhanced when trust is present in the relationship. Also, Tsai (2000) argued that trustworthiness between project team enhances the exchange of fine-grained information that helps the integration of inter- project knowledge while Carmeli & Azeroual (2009) argued that relational capital across inter-unit teams enhances the integration of knowledge bases in the organization. Further, Tsai & Ghoshal (1998) argued that the existence of trust diminishes the likelihood of opportunistic behavior between partners; it can therefore be inferred that when interactions occur across project teams frequently, cooperative relationships are built which leads to trust and reciprocity, thus enhancing creativity within the organization. Finally, Makela & Brewster (2009) argued that bridging capital is instrumental for the exchange of information and knowledge sharing.

Tsai & Ghoshal (1998) argued that shared goals enable members of the organization to see the benefits of frequent interactions. Congruent goals and values between project teams enhance information sharing (Krause et al., 2007), resource exchange (Tsai & Ghoshal, 1998), creativity (O'Reilly, 1989) and team innovation effectiveness (Perace & Ensley, 2004). Han & Hovav (2013) also argued that participative activities are enhanced by the shared norms and shared understanding, which could lead to idea generation and creative thinking. Additionally, Chen et al (2008) argued that shared goals can limit the probability of inter-partner conflict and thereby increase creativity within the team.

Bridging social capital across project teams has been argued to enhance knowledge diversity and richness (Reiche et al., 2009), increase the efficiency and effectiveness of knowledge integration (Chui et al., 2006), knowledge absorption (Yang et al., 2011), and knowledge sharing (Li et al., 2007; Yang et al., 2011). Li et al., (2007) and Li (2005) found that shared vision enhances knowledge sharing between inter-unit teams. Consistent with the literature, I suggest that bridging capital is instrumental in enhancing creativity and KME across projects. Formally stated:

H3: There is a positive relationship between bridging capital and KME

H4: There is a positive relationship between bridging capital and creativity

3.2.4. Moderating effect of project complexity

Although social capital within and across team will enhance creativity and KME, it is suggested that dimensions of project complexity make it extremely difficult to manage, control and predict the outcomes of the project.

The effect of project complexity on projects has been argued to be detrimental (Vidal & Marle, 2008). Uncertainty in the project drives the unpredictability and non-decidability of project system (Vidal & Marle) and would negatively impact the outcomes and benefits of the social capital in the organization. Ramesh & Browing (2014) suggested and proposed that project complexity has a domino effect of increasing the unknown unknowns during the life cycle of the project due to unanticipated project outcomes. Using one hundred and twenty high-tech new product development projects, Tatikonda & Rosenthal (2000) found that project complexity negatively impacts the project execution success. It, therefore, sequential to argue that project complexity would undermine the benefits of social capital within and across teams in the organization. In this research, project complexity dimensions are characterized by these four factors - interdependencies of tasks, team diversity, team virtuality (cultural diversity & geographical dispersion) and technology novelty & risks. The impacts of the dimensions of project complexity are discussed in the next section.

3.2.4.1 Team Diversity

Hypotheses two and four conceptualize the positive relationship between social capital and creativity. But, proponents of similarity-attraction theory (William & O'Reilly, 1998) argues that heterogeneous teams are less productive compared to homogeneous teams because of intrinsic tensions between members of the team (Bowers et al., 2000) which negativity impacts the creativity within and across projects. Team diversity also contributes to project complexity and aggravates the effect of project complexity on creativity within and project across teams.

Based on the case study discussed in chapter two of this research, it has been suggested that heterogeneity within and across teams negatively impacts creativity. The following quote from the interview data illustrates how team diversity can contribute to project complexity and inhibit creativity:

"I think varying experience is a huge component of project complexity. When you have people with varying skills on the project, it slows down the project because some people are still learning and this will impact innovation and creativity of the project and the organization as a whole".

As mentioned earlier, past authors have also highlighted the impact of team diversity on innovativeness and creativity within and across teams in the organization. For instance, using the similarity-attraction paradigm (Byrne, 1971; Tziner, 1985; Hulsheger et al., 2009) argues that team diversity negatively impacts team outcomes. Likewise, Anderson et al., (2014) argued that team diversity reduces team cohesions and negatively impacts innovativeness of teams. Choi (2007) also found that team diversity negatively impacts the creativity of teams. Finally, diversity is detrimental to cohesion, abates communication and produces conflict within and across project teams (Ibarra, 1993a; Ely & Thomas, 2001). In sum, team diversity attenuates the positive relationship between social capital (bonding and bridging) and creativity. Formally stated:

H5a: The positive relationship between bonding social capital and creativity is negatively moderated by team diversity

H5b: The positive relationship between bridging social capital and creativity is negatively moderated by team diversity

As discussed in the previous sections, team diversity is higher when members vary widely in their areas of expertise, backgrounds, experiences, skills and abilities. I, therefore, suggest that team diversity will exacerbate the problems of knowledge creation, transfer, and storage. For example, as team diversity increases, problems with communication, trust, shared norms and values become likely; this could create conflict and negatively impact effective knowledge management. Ramasesh & Browning (2014) suggested that increased amount of variety in project team will fragment knowledge; leave gaps of information and negatively affect the shared goals and norms within and across projects in the organization. In sum, I posit that team diversity negatively affects the relationship between social capital and KME. I synthesize these into the following hypotheses:

H6a: The positive relationship between bonding social capital and KME is negatively moderated by team diversity

H6b: The positive relationship between bridging social capital and KME is negatively moderated by team diversity

3.2.4.2 Task Interdependence

Task interdependence occurs when members of the team share resources within the group and interact with other teams in the organization to achieve the objective(s) of the group. Increases in task interdependence have been suggested to detrimental to the group performance. For instance, Earley & Northcraft (1989) argued that task interdependence can be exploited by powerful members of the team while Raven (1989) suggested that task interdependence increases the tendency of the members of the team to withhold information and resources needed to accomplish required tasks. The management of task interdependencies is very important to the success of a project team (Ancova & Caldwell, 1992) and Kratzer et al., (2005) suggested that shaping or reshaping interdependencies negatively affect the team's creativity. Additional, Van Der Vegt et al., (1999) argued that task interdependence within and across project teams could be detrimental to team performance. This causes conflicts and minimizes creation and sharing of knowledge within and across projects in the organization. Therefore:

H7a: The positive relationship between bonding social capital and creativity is negatively moderated by task interdependence

H7b: The positive relationship between bridging social capital and creativity is negatively moderated by task interdependence

H8a: The positive relationship between bonding social capital and KME is negatively moderated by task interdependence

H8b: The positive relationship between bridging social capital and KME is negatively moderated by task interdependence

3.2.4.3 Team Distribution (Cultural diversity and Team Virtuality)

A cultural diverse team involves people in different geographical regions (Ely & Thomas, 2001) working to achieve the common objectives of the project. A cultural diverse team contributes to project complexity because of the divergence of the team that pertains to the communication style, rules, norms, shared meanings (Ely & Thomas, 2001); which could suppress creativity within and across teams. For instance, Hulsheger et al., (2009) argued that a culturally diverse team inhibits creativity of teams in the organization. Cultural diversity might inhibit interpersonal processes and team performance due to salient social identities (Jackson & Joshi, 2004), which can be attributed to the fact that people favor members of their own group (Stahl et al., 2010). This negatively impacts the ability of team members to manage knowledge effectively and/or generate ideas. Additionally, Rosen et al., (2007) suggested members of culturally diverse teams are hesitant to share ideas and information and have different expectations for project outcomes. Cultural diversity also inhibits the transfer of information due to misinterpretation (Lin & Berg, 2001). Additionally, social interaction anxiety may be higher in diverse groups due to cultural diversity, this could inhibit idea generation and the ability of team members to create or transfer knowledge managing effectively.

In virtual teams, various problems could arise such as conflicts, lack of accountability, informal contacts, and cohesion, and lack of proximity (Jarvenpaa & Leidner, 1999; Rosen et al., 2007; Staples & Webster, 2008; Ebrahim et al., 2009). These problems all pose various disadvantages and would impact the outcomes of the project. For instance, Chen (2006) argued that the presence of conflict in a team decreases the team's creativity thinking while Webster & Staples (2006) suggests that virtuality promotes restricted communication and may increase misunderstanding and wrong conclusions by members of the project team. Also, Rosen et al., (2007) argued that team virtuality constricts trust and trust building among members of the team. Additionally, virtual teams have difficulties in managing conflicts (Ebrahim et al., 2009) which could inhibit the sharing of knowledge and creative ideas (Webster & Staples, 2006; Staples & Webster, 2008). Face to face teams facilitates greater cooperation compared with virtual teams (Staples & Webster, 2008) because of the frequent informal communication and close personal contacts by the members of the team. Virtual teams are also burdened with requirements for special training for team members (Ryssen & Godar, 2000) and unable to create and share tacit knowledge (Staples & Webser, 2006). In sum, team distribution would be detrimental to information sharing, trust, shared values within and across projects. Therefore, the following hypotheses are proposed:

H9a: The positive relationship between bonding social capital and creativity is negatively moderated by team distribution

H9b: The positive relationship between bridging social capital and creativity is negatively moderated by team distribution

H10a: The positive relationship between bonding social capital and KME is negatively moderated by team distribution

H10b: The positive relationship between bridging social capital and KME is negatively moderated by team distribution

3.2.4.4 Technology and Technical risks

The information system (IS) literature suggests that the use of immature technology and technical risks on projects contributes to project complexity and negatively impacts project outcomes. For instance, the use of immature technology on the project affects the knowledge transfer (Lin & Berg, 2001) and project success (Charette, 2005) and inhibits the effective management of knowledge within project teams and across project teams while Kim &

Wilemon (2003) argued that technological newness contributes to complexity because it requires different skill sets and knowledge base.

Also, Xia & Lee (2005) argued and found that technical complexity in terms of the use of technology negatively affects the user satisfaction. Technical risk also creates knowledge barriers (Sharma & Yetton, 2007) that would inhibit the exchange of information. Likewise, Chen (2006) suggested that the presence of conflict in a team decreases the team's creativity thinking, hence, when the project involves the use of new technology, it is likely to increase the incidence of conflict between the team members and increase negative attitudes towards the project, which might reduce the creativity of the project. Thus, the following hypotheses are proposed:

H11a: The positive relationship between bonding social capital and creativity is negatively moderated by technical risks

H11b: The positive relationship between bridging social capital and creativity is negatively moderated by technical risks

H12a: The positive relationship between bonding social capital and KME is negatively moderated by technical risks

H12b: The positive relationship between bridging social capital and project team KME is negatively moderated by technical risks

3.2.5 Mediating effects of KME and creativity on project Performance

Although the potential project complexity contingencies have been discussed in the previous section, it is also important to discuss the mediation models. Social capital (bonding and bridging) have been suggested to enhance creativity and knowledge management on projects, likewise, considerable evidence also suggests that that creativity within and across teams would enhance perceived project Performance.

For instance, Hoegl & Parboteeah (2007) argued that collaboration is needed among team members to enhance the performance of the team due to the intricate ability of team members to combine information. This suggests that as the project team generates creative ideas, the probabilities of errors are reduced and the quality of tasks performed on the project increases. As the quality of tasks performed on the project increases, the probability of completing the project on time, within budget and scope also increases. Therefore, creativity enhances project performance.

Furthermore, considerable evidence also suggests that KME would have a positive impact on project performance. For instance, shared knowledge contributes to the performance of the group (Nelson & Cooprider, 1996), ensures successful collaboration of the project team (Kotlarsky & Oshri, 2005), facilitates project quality (Haas 2006) and enhances the innovative capabilities and financial performance of the organization (Darroch, 2005). Cheng & Huang (2009) argued that effective knowledge management enhances the performance because it allows individuals in the organization to acquire knowledge make fewer mistakes and reduce uncertainty. They further provided empirical evidence that effective knowledge management enhances technical innovation. Darroch (2005) also showed empirically that effective knowledge management enhances innovative performance. Additionally, effective knowledge management could reduce the time involved in the performing project tasks and increase the probability of completing the project within the specified time, cost and scope. Thus, I assert the following hypotheses:

H13a: Creativity mediates the relationship between bonding capital and project performance

H13b: Creativity mediates the relationship between bridging capital and project performance

H14a: KME mediates the relationship between bonding capital and project performance

H14b: KME mediates the relationship between bridging capital and project performance

Chapter 4

Research Methodology

The main focus of this research is to understand what project complexity is and how it impacts social capital within and across projects in organizations. Since project complexity is a multi-dimensional construct with no unified definition (Jacobs & Swink, 2013), this study began with a qualitative study to gain a clear understanding of its underlying facets. The qualitative study involved interviewing three project managers, a project business lead and a project director working on six projects in a multi-national firm located in the southwest, USA. The interviews were transcribed and text analysis was performed using the Leximancer software. The results of the text analysis are described in Appendix B.

4.1 Survey Design

The survey design was selected for data collection and testing the proposed hypotheses. Survey designs have been widely used in management, operations management, information systems, and project management studies to examine a variety of phenomena, including social capital, creativity, project performance and KME (Ellison et al., 2007; Han & Hovav, 2012; Villena et al., 2011; Bakker et al., 2006; Chen et al., 2008; Kale et al., 2000; Jia et al., 2014;

Merlo et al., 2006; Zhou et al., 2009; Chui et al., 2006; Choi & Chow, 2008; Hansen, 1999; Song et al., 2007).

Different measures were taken to ensure content and face validity. First, all the constructs were measured using multi-item scales adapted from prior research. Second, to ensure the appropriateness of the survey questionnaire, the survey was sent to two PMP[1] certified project managers and two professors who have taught project management for several years. Third, respondents were asked to complete the survey based on the most complex project that they had completed in the last 12 months or were still working on. The data collection was done in two parts: the pilot study and the main study.

4.2 Unit of Analysis and Pilot Study

The unit of analysis is the project and the target population is the project manager. The main reason for selecting the project manager as the respondent is that they are uniquely positioned to understand all aspects of a project, from its inception to planning, execution, monitoring and control to closing. In their capacity as managers, they manage the interface between their team members and senior management, continually monitor the status of the project, handle any disruptions that might occur, and manage the interactions with

[1] Project Management Professional

all stakeholders. Furthermore, the project manager has a holistic view of the project and appreciates how it aligns with the strategic objectives of the organization. Last, but not least, they understand the factors that contribute to the complexity of a project and are ideally suited to responding to questions about project performance, knowledge management practices and the creativity of their teams.

4.3 Pilot Study and Scale Development

The pilot study was conducted to identify issues in the survey design and to polish up the wording of the items in the survey. It was also conducted to refine the scales and ascertain the variability across constructs in the research. For the pilot study, undergraduate and graduate students taking a project management course in a large southwest university approached project managers, project leads and team members to complete the survey. A total of 168 questionnaires were distributed to the students. After eliminating a few surveys that had incomplete responses, we were left with 105 surveys for the pilot study, giving us a response rate of 62.5%. In the pilot study, about 46.7% were project managers and 53.3% project team members; about 55.2% of the projects lasted between 0 and 12 months; and about 32.4 % use the traditional project management methodology. The descriptive statistics of the pilot study are shown in Appendix A. Based on feedback from the respondents; minor modifications were made to the questionnaire.

All the research variables used to measure the constructs in this study are from previously validated scales. Each item was measured using a seven-point Likert scale (from 1- “strongly disagree to 7- “strongly agree). Appendix A provides a list of all the measures used in this research.

4.4 Scale Development

4.4.1. Project Performance

The dependent variable in this research is perceived project performance. The five-item scale used to measure project performance was based on the work of Malach-Pines et al. (2009) and adapted from Han & Hovav (2013). These five items capture the extent to which participants perceive that the overall objectives of the project are met. Specifically, it focuses on the project management performance in terms of budget, schedule, specifications and customers’ stated requirements/ specifications. During the measurement model assessment, all the items showed convergent validity and were used in further analysis.

4.4.2. Social Capital

The scales to measure bonding social capital were based on the work of Seashore (1954). These were contextualized to the domain of projects and project teams. These four items assess team cohesion, which is a measure of social interaction (O’Reilly et al., 1989; Harrison et al., 1998) among members of a project team. Team cohesion assess are appropriate measures of bonding capital because bonding social capital measures the perception of social and emotional support within the project team. Team cohesion also enhances interactions among members of the project team and would lead to better coordination, trust, cooperation, information channel, and channel of information (Krackhardt, 1992; Coleman 1998; Gulati & Garguilo, 1999; Ahuja, 2000; Poerll et al., 1996). BR3, a measurement item of bridging capital loaded on the bonding construct. All the items had factor loadings of 0.579 and above.

The bridging social capital construct was measured by an eight-item scale adapted from the work of Ellison et al., (2007). These items address the extent of interaction across project teams in the organization. In the factor analysis, BR3 loaded on bonding construct and was removed from further analysis.

4.2.3 Knowledge Management Effectiveness

The measure for KME was adapted from the works of Song et al., (2007). The three-item scale taps into the perception of effectiveness as well as satisfaction of how knowledge is managed by project team members. All the items loaded on the KME construct and were used in further analysis.

4.2.4 Creativity

Creativity was measured by a six-item scale adapted from the work of Jia et al., (2014). The scale focuses on how the project team generates new ideas, applications, and inventions. Two items (CR1 and CR2) did not load on the construct and were removed from further analysis.

4.2.5 Project Complexity

Project complexity was conceptualized in terms of four dimensions, namely, technical risk complexity, task interdependence, team diversity and team dispersion. Technical risk complexity was adapted from the eight-item scale of Wallace et al. (2004a). These items measure the inherent risks that are associated with novel and/or immature technology used on the project, the number of links to other systems in the organization, and the number of external stakeholders on the project. One item (CP8) did not load on the construct and was removed from further analysis.

Task interdependence was adapted from a five–item scale developed by Van Der Vegt (2000) that measures the extent to which project team members work together and exchange information in order to complete their tasks. One item (CP25) did not load on the construct and was removed from further analysis. Team distribution was assessed by a four-item scale adapted from Chudoba et al. (2005) that measures both virtuality and cultural diversity of the project team. All the items loaded on the construct and were used in further analysis. Team diversity, which measures the heterogeneity of team members, was adapted from a three-item scale used by Campion et al. (1993). One item did not load on the construct and was removed from further data analysis.

4.2.6 Control Variables

Control variables are variables that are held constant that could influence or bias the effect of other variables in the model. The selection of the control variables was mostly guided by existing literature in operations and project management. Following other empirical studies, this study uses gender (Jia et al., 2014; Qinghua et al. 2015; Levin & Cross, 2004), duration of project (Liu, 2015), cost of project (Liu, 2015), years of experience as a project manager (Lin et al, 2012; Qinghua et al. 2015) and age (Lin et al., 2012) as control variables.

Using hierarchical regression analysis (regressing the control variables on the project performance produces the following model summary (R^2 = 0.035, F = 2.171, p = 0.057). When model constructs were added, the change in R^2 is 0.510 and gives the following model summary (R^2 = 0.545, F Δ = 81.715, p = 0.000). With the exception of project duration (DOP), none of the variables were significant. Duration of project was only marginal statistically significant (β = -0.079, t = -1.786, p = 0.075).

Table 4-0-1: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F Change	Sig
1	.188[a]	.035	.019	.8511	2.171	0.057
2	.738[b]	.545	.531	.5886	81.715	0.000

a. Predictors: (Constant), Gen, DOP, Age, COP, PME

b. Predictors: (Constant), Gen, DOP, Age, COP, PME, KME, Bonding, Creativity, Bridging

4.3 Data Collection

The main study data collection was done using Qualtrics, Inc. survey panel. The target population was project managers and respondents were asked to focus on the most complex project that they had managed in the last 12 months. This is to ensure that respondents could reliably recall events and respond appropriately to the questionnaire items. A filter question at the beginning of the survey asked the respondents their role on the project, thus ensuring that only surveys filled out by project managers would be considered. To ensure the quality of data collected, four attention filters / quality control questions were added to the survey. Respondents who failed to respond correctly to any of the attention filter questions were eliminated from the survey. Out of the 746 persons who filled out the survey, 246 were not project managers and 197 of them failed the attention filter questions, thus yielding 303 responses that were finally used in this study. The descriptive statistics are shown in Table 4-2 below.

Table 4-2 Descriptive statistics of respondents

	Frequency	Percent	Valid Percent	Cumulative Percent
Project Managers	303	40.6	40.6	40.6
Non-Project Managers	246	33.0	33.0	73.6
Failed quality question	197	26.4	26.4	100.0
Total	746	100.0	100.0	

4.4 Data Screening

The data was screened to ensure that it is clean before conducting any statistical analysis. First, the data was screened for missing data, and none was recorded. Second, influential cases were examined by looking at the Cook's distance. One influential case shown in Figure 4.1 was detected (Cook's distance of 1.18597) and subsequently removed, resulting in a final sample size of 302. Removing the influential case will strengthen the regression that would be observed both in hierarchical regression analysis and moderated mediation regression analysis. Third, multicollinearity was assessed by looking at the variance inflation factor (VIF). The VIFs were less than 3; thus there was no evidence of multicollinearity.

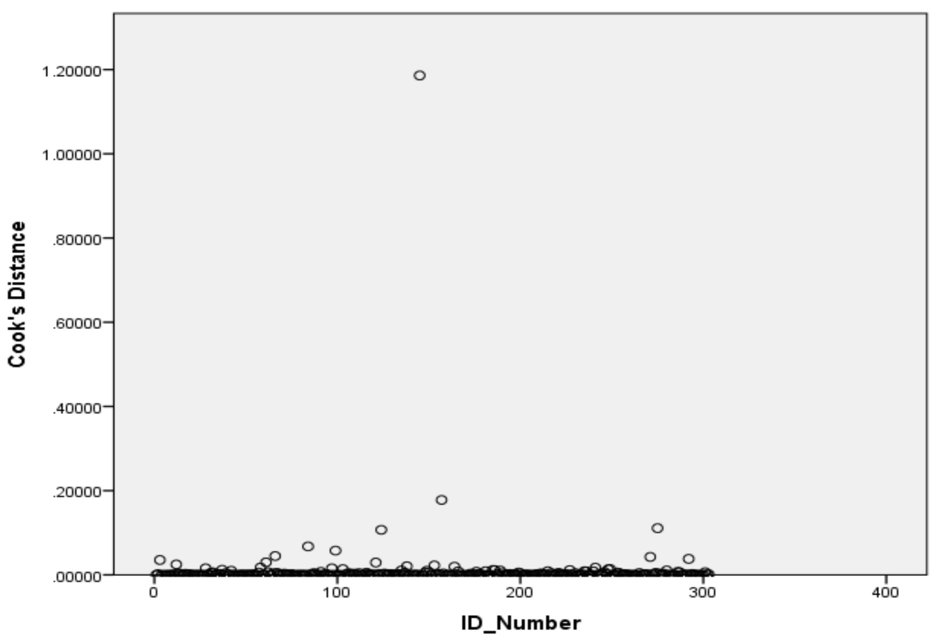


Figure 4-1 Cook's Distance that shows influential point

4.5 Data Analysis

The survey instrument used in this dissertation collects multivariate data that measures all the constructs in the research model. In order to assess the multivariate data, explanatory factor analysis (EFA) needs to be performed. The EFA is an interdependence technique that is used to define the underlying structure among variables in a multivariate dataset. Once the EFA is completed, reliability tests should be done to determine the extent to which each variables is consistent in what it is intended to measure (Hair et al., 2006). Finally, the suggested hypotheses can be tested using appropriate multivariate tools.

In the EFA, factors were derived with orthogonal methods. In particular, varimax rotation with latent-root criterion (i.e., latent-root or eigenvalue greater than 1) were used to extract the factors. The Kaiser-Meyer-Olkin statistic 0.925 and Barnett's test ($p<0.000$) indicates that sufficient correlations exist among the variables. Measurement items that had loadings less than 0.5 on the constructs they were intended to measure were dropped (Hair et al., 2006). Cronbach's alpha was then computed for each construct to test for internal consistency. All the Cronbach's alpha values computed ranged from 0.7 to 0.89, indicating that the measures are highly reliable (Hair et al., 2006). Then, the average of the measurement items that load on each construct was calculated to obtain the overall construct values. Appendix A shows the loadings of each measurement item and the alpha values.

4.5.1 Common Method Variance

Since a single respondent answered all the questions in the questionnaire, I assessed the potential for common method bias. First, using Harmans's one–factor test for common method bias (Podsakoff and Organ, 1986; Podsakoff et al., 2003; Hochwarter et al., 2004), revealed ten distinct factors with eigenvalues above 1.0, explaining 64.1% total variance. The first factor explained 24.5% of the variance, which was not majority of the total variance. Second, I included three marker variables in the survey questionnaire, and EFA shows that the two items load together without cross loading on other measurement items in the survey questionnaire. The last marker variable did not load on any of the constructs used in this study. Hence, there is no evidence of common method bias.

Chapter 5

Research Results

This chapter details the results from hypothesis testing using multiple regression and moderated mediation regression bootstrapping technique. The hypotheses were tested at a significance level of $\alpha = 0.05$. Some hypotheses were reported to be supported marginally at a significance level of $\alpha = 0.1$. Before the regression analysis was performed, the data was checked for violations of normality assumptions, outliers, and multicollinearity. No significant violations were found and it was concluded that the data is amenable to multiple regression.

5.1 Sample Characteristics

As mentioned Chapter 4, a total of 302 usable responses were used in the data analysis. A profile of the respondents - presented in Table 5.1 - indicates that they represent a variety of industries. In addition, 67.9% of respondents have 5 or more years of experience in the role of project manager, 48% were female and about 54.3% of the respondents were 35 years or older. The inter-construct correlations matrix and descriptive statistics of the study variables are also presented in Table 5.2.

Table 5-1 Demographics of respondents

Characteristics	Value	Frequency	Percent	Cumulative percent
Gender	Male	157	52.0%	52.0%
	Female	145	48.0%	100.0%
Experience in role of project manager	< 1 year	1	0.3%	33.1%
	1-2 years	35	11.6%	11.9%
	3-4 years	61	20.2%	32.1%
	5-10 years	158	52.3%	84.4%
	11-15 years	31	10.3%	94.7%
	> 15 years	16	5.3%	100.0%
Age	under 18	0	0	0
	18-24	9	3.0%	3.0%
	25-34	129	42.7%	45.7%
	35-44	114	37.7%	83.4%
	45-54	36	11.9%	95.4%
	55+	14	4.6%	100.0%
Industry	Agriculture, farming or ranching	5	1.66%	1.66%
	Computer or telecommunication hardware / software products or services	39	12.91%	14.57%
	Consumer products or services	51	16.89%	31.46%
	Construction	73	24.17%	55.63%
	Defense	4	1.32%	56.95%
	Entertainment, sports and recreation	14	4.64%	61.59%
	Financial products or services	20	6.62%	68.21%
	Government or public sector	16	5.30%	73.51%
	Health care products or services	20	6.62%	80.13%
	Manufacturing or Industrial	22	7.28%	87.42%

	Not-for-profit	12	3.97%	91.39%
	Transportation	6	1.99%	93.38%
	Others	20	6.62%	100.00%

Table 5-0-2 Inter-Construct Correlation Matrix

	Mean	Standard deviation	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	2.07	0.905	1													
2	2.65	1.068	-.161**	1												
3	7.08	5.33	.183**	-.033	1											
4	36.33	8.902	.083	.097	.566**	1										
5	1.48	0.500	-.012	.089	-.066	-.102	1									
6	5.88	0.859	-.176**	-.004	.006	.018	-.027	1								
7	5.75	0.931	-.087	-.082	.019	-.032	-.046	.615**	1							
8	5.218	1.137	-.063	-.179**	.054	-.101	-.024	.381**	.591**	1						
9	5.75	0.846	-.157**	-.056	.041	.038	.002	.655**	.555**	.426**	1					
10	4.52	1.473	.121*	-.231**	-.054	-.183**	-.059	.133*	.241**	.434**	.218**	1				
11	5.51	1.012	.105	-.147*	-.044	-.072	-.049	.363**	.431**	.301**	.422**	.332**	1			
12	4.72	1.169	.185**	-.289**	.011	-.103	-.128*	.264**	.357**	.563**	.281**	.557**	.389**	1		
13	5.74	0.891	-.125*	-.058	.085	.002	-.041	.596**	.582**	.482**	.658**	.309**	.414**	.334**	1	
14	5.64	0.953	-.100	-.085	-.012	-.021	-.010	.406**	.471**	.420**	.420**	.199**	.295**	.355**	.492**	1

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

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

1- Duration of project, 2- Cost of project, 3- Project management experience, 4- Age, 5- Gender, 6- Project performance , 7- KME, 8- Creativity, 9- Bonding capital, 10- Team distribution, 11- Task interdependence, 12- Technical risk, 13- Bridging capital, 14- Team diversity

5.2 Results

5.2.1 Hypotheses 1-4

Multiple regression analysis in SPSS was used to test hypotheses 1 through 4. The results of the analysis are presented in Figure 5.1 and Table 5.2. As can be seen from the results, there is strong evidence to support the hypotheses that bonding capital ($\beta = 0.336, p = 0.000$) and bridging capital ($\beta = 0.402, p = 0.000$) are positively related to KME after controlling for gender, age, type of project, methodology, project manager's work experience, cost of project and duration of project. Therefore, hypotheses 1 and 3 were supported.

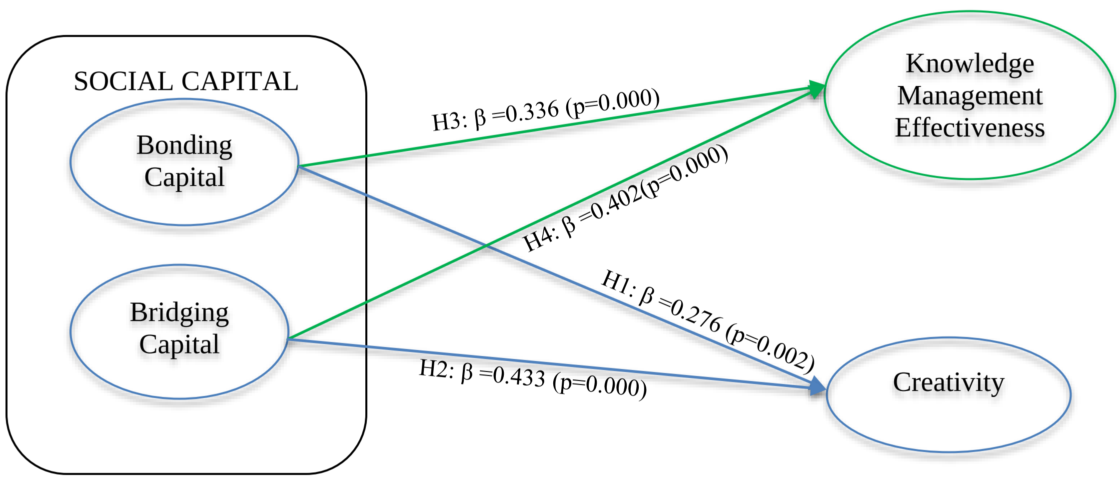


Figure 5-0-1 Regression Results for Hypotheses 1-4

Likewise, both bonding capital ($\beta = 0.276, p = 0.002$) and bridging capital ($\beta = 0.433, p = 0.000$) are positively related to creativity after controlling for gender, age, type of project, methodology, project manager's work experience, cost of project and duration of project. Therefore, hypotheses 2 and 4 were supported.

Table 5-3 Regression Results for KME and Creativity

Dependent Variable	Independent Variables	
KME	Bonding Bridging	.402 (0.000)*** .336 (0.000)***
Creativity	Bonding Bridging	.276 (0.002)** .433 (0.000)***

**p<0.005 ; ***p<0.0001

5.2.2 Test for overall model

The most conservative way of testing the hypotheses presented in chapter 3 is to test the full model with regression. Hierarchical ordinary least squares (OLS) regression was used to test the full model. Table 5-4 presents the results when KME is the predictor variable. Model 1, which includes only the control variables, explained 1.7 percent of the variance in KME. Bonding and bridging capital were both introduced in model 2 and their introduction explained an additional 38.2 percent of the variance in KME. The result of model 2 indicates that both bonding and bridging capital are positively associated with KME. In model 3, the dimensions of project complexity were introduced and their introduction explained an additional 5.6 percent of the variance in KME. Task interdependence and team diversity were both positively associated with KME, technical risk was marginally associated with KME and team distribution was not associated with KME. In model 4, the interaction terms were introduced and they contributed an additional 1.9 percent of the variance in KME. None of the interaction terms were significant except the interaction term between bonding capital and task interdependence. The results of the interaction term ($\beta = -0.179$, $t = -2.204$, $p = 0.028$) shows that task interdependence negatively moderates the relationship between bonding social capital and KME.

Table 5-4 Results of Hierarchical Regression Analysis: KME

Variable	**Model 1**	**Model 2**	**Model 3**	**Model 4**
DOP	-.127 (0.069)	-.019 (0.055)	-.046 (0.053)	-.026 (0.055)
COP	.037 (0.041)	.042 (0.032)	.015 (0.032)	.012 (0.032)
PME	.011 (0.012)	-.002 (0.01)	.002 (0.010)	.002 (0.010)
Age	-.007 (0.007)	-.004 (0.006)	-.003 (0.006)	-.003 (0.006)
Gen	-.076 (0.109)	-.048 (0.086)	-.027 (0.083)	-.036 (0.084)
Intercept	6.188***(0.33)	1.67*** (0.420)	.969* (0.425)	-0.403(0.974)
Bonding		.336*** (0.067)	.245*** (0.067)	1.327* (0.532)
Bridging		.402*** (0.064)	.274*** (0.067)	-.531 (0.531)
Interdependence			.136** (0.048)	.440 (0.314)
Team distribution			-.022 (0.034)	-.166 (0.271)
Team diversity			.166*** (0.051)	.266 (0.296)
Technical risk			.084 (0.046)	.046 (0.315)
Bonding x team diversity				.004 (0.081)
Bonding x team distribution				-.035 (0.048)
Bonding x technical risk				-.003 (0.065)
Bonding x task interdependence				-.179* (0.081)
Bridging x task interdependence				.120 (0.077)
Bridging x technical risk				.010 (0.056)
Bridging x team distribution				.058 (0.044)
Bridging x team diversity				-.022 (0.072)
R^2	0.017	0.399	0.455	0.474
ΔR^2		0.382	0.056	0.019

F for ΔR^2	1.009	93.295***	7.470***	1.260

Unstandardized coefficients are reported, the figures in parentheses are standard errors
* p < 0.05
**p < 0.01
*** p < 0.001

Tables 5-5 shows the results when creativity is the predictor variable. Model 1 with just the control variables explained 3.7 percent of the variance in creativity. Bonding and bridging capital were both introduced in model 2 and their introduction explained an additional 24 percent of the variance in creativity. The result of model 2 indicates that both bonding and bridging capital are positively associated with creativity. In model 3, the dimensions of project complexity were introduced and their introduction explained an additional 19.4 percent of the variance in creativity. Team distribution, team diversity and technical risk were all positively associated with creativity while task interdependence was not associated with creativity. In model 4, the interaction terms were introduced and they contributed an additional 1.5 percent of the variance in creativity. None of the interaction terms were significant except the interaction term between bonding capital and team distribution that was marginally significant. The results of the interaction term ($\beta = -0.103$, $t = -1.78$, $p = 0.076$) shows that team distribution negatively moderates the relationship between bonding social capital and creativity.

The analysis of the full model borders on the edge of statistical power and significant, it is therefore necessary to use the PROCESS macro in SPSS to nuance other interaction effects.

Table 5-5: Results of Hierarchical Regression Analysis: Creativity

Variable	**Model 1**	**Model 2**	**Model 3**	**Model 4**
DOP	-.129 (0.083)	-.027 (0.073)	-.100 (0.064)	-.089 (0.065)
COP	.035 (0.049)	.042 (0.043)	-.048 (0.038)	-.050 (0.039)
PME	.037* (0.015)	.023 (0.013)	.026 (0.011)	.023 (0.011)
Age	-.025* (0.009)	-.022* (0.008)	-.012 (0.007)	-.012 (0.007)
Gen	-.060 (0.132)	-.029 (0.115)	.063 (0.100)	.040 (0.102)
Intercept	6.111***(0.379)	1.759*** (0.562)	.833 (0.510)	1.380 (1.174)
Bonding		.276** (0.089)	.178* (0.08)	1.131* (0.642)
Bridging		.433*** (0.085)	.191* (0.08)	-.882 (0.640)
Interdependence			-.039 (0.058)	.077 (0.379)
Team distribution			.110* (0.041)	.364 (0.327)
Team diversity			.1448* (0.061)	-.036 (0.357)
Technical risk			.380*** (0.056)	.036 (0.380)
Bonding x technical risks				-.068 (0.098)
Bridging x technical risks				-.097 (0.058)
Bonding x team diversity				.123 (0.078)
Bonding x team distribution				-.136 (0.098)
Bonding x interdependence				.114 (0.092)
Bridging x interdependence				-.066 (0.067)
Bridging x team distribution				.053 (0.054)
Bridging x team diversity				.103 (0.087)
R^2	0.037	0.277	0.471	0.486
ΔR^2		0.240	0.194	0.015

F for ΔR^2	2.292**	48.693***	26.654***	1.049

Unstandardized coefficients are reported, the figures in parentheses are standard errors
* p < 0.05
**p < 0.01
*** p < 0.001

5.2.3 Test for mediation and moderation using Hayes PROCESS macros in SPSS

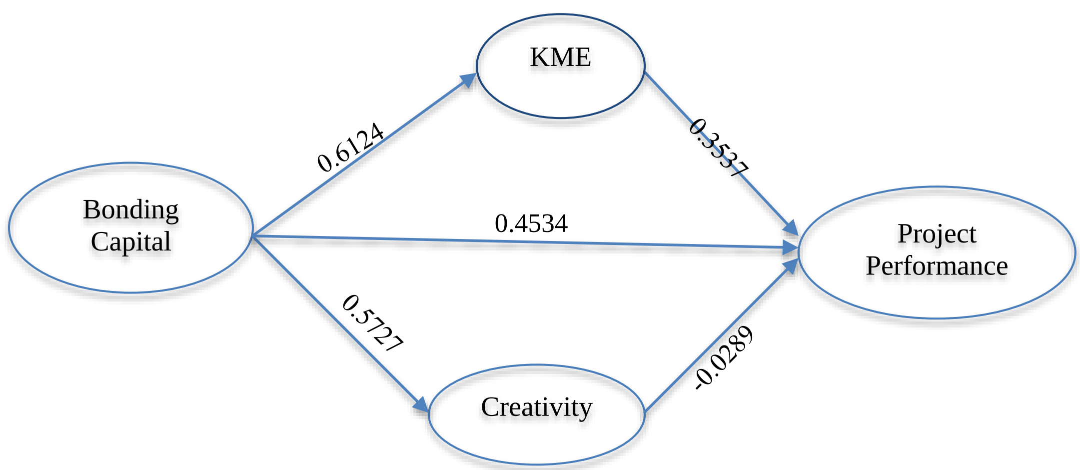
To test for mediation, the predictor variable must be related to the mediator, the predictor variable must be related to the response variable, and the mediator must affect the response variable after controlling for the predictor variable (Barron & Kenny, 1986). There is evidence of full mediation if the effect of the response variable disappears and non-significant while there is evidence of partial mediation if the effect of the response variable remains but the beta coefficient is reduced but still significant (Barron & Kenny, 1986). Mediation tests can also be carried out using the Preacher and Hayes moderated mediation PROCESS SPSS Macro bootstrapping method. This method estimates the effect of the predictor variable on the response variable through the mediator. This method also allows custom analyses to be conducted, providing direct (effect of predictor variable on response variable outside the mediator), indirect (effect of predictor variable on response variable through the mediator), total (effect of predictor variable on response variable through both indirect and direct effects) and conditional indirect (test of interaction) effects for the moderated mediation models (Preacher et al. 2007). Because the moderated mediation Macro is a bootstrapping method, no assumptions need to be made about the shape of the sampling distribution (Preacher et al. 2007).

The serial multiple mediator models can also be tested using the PROCESS Hayes macro where the assumptions of no causal relationship between the mediators are relaxed (2013). Such serial models have been tested in the literature (Bizer et al., 2012; Krieger & Sarge, 2013) using the PROCESS macro. When the PROCESS Hayes bootstrapping method is used for testing mediation, there is full mediation if the indirect effect is significant but the direct effect is not, while there is evidence of partial mediation if both the direct and indirect effects are significant.

It is also important to note that the model for this dissertation has more than one independent variable. In PROCESS Hayes macro, multiple IVs can be analyzed separately or simultaneously. When IVs are correlated and analyzed simultaneously, there is a possibility that they will cancel out each other's effects (Hayes, 2013); therefore, the IVs are analyzed separately in this study (Gibbs et al., 2010). Also, I am interested in the estimate of the direct and indirect effect of the IV on the DV excluding the effect of other IVs in the model.

5.2.3.1 Hypothesis 13a and 14a

From the mediation analysis conducted using the OLS path analysis, bonding capital indirectly influenced project performance through its influence on KME. As seen in Figure 5-2 and Table 5-7, bonding capital on a project is positively associated with KME (a = 0.6124) and KME also enhances project performance (b=0.3537). A bias-corrected bootstrap confidence interval for indirect effect (ab=0.2166) based on 10,000 bootstrap samples was entirely above zero (0.1321 to 0.3236). This provides empirical evidence that KME partially mediated the relationship between bonding capital and project performance, thus, partially supporting Hypothesis 14a. Interestingly, the results of the analysis provide no evidence that the effect of bonding capital on project performance is mediated by creativity (c = -0.0289, p = 0.4556). Hence, hypothesis 13a was unsupported.



*Covariates Gender, Age, PME, DOP and COP

Figure 5-2 Mediation testing for hypotheses 13a and 14a

Table 5-6 Results of Preaches and Hayes Mediation for Hypotheses 13a and 14a

Variables	Regression Results Outcome Variable: **Creativity**		Regression Results Outcome Variable: **KME**	
	coefficient	***P-value***	***coefficient***	***P-value***
Bonding	0.5724	0.0000	0.6124	0.0000

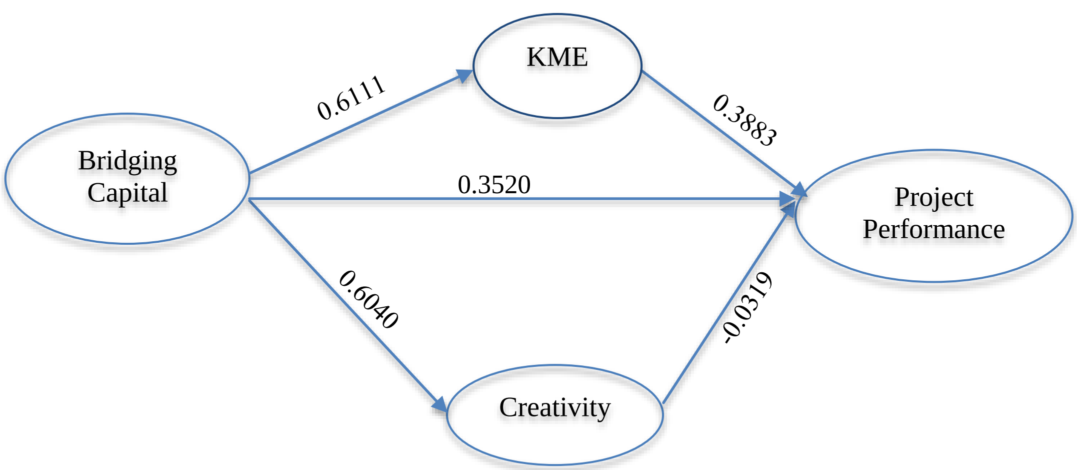
	Regression Results Outcome Variable: **Performance**	
	coefficient	***P-value***
Creativity	-0.0289	0.4556
KME	0.3537	0.0000
Bonding	0.4534	0.0000

	Direct effects (IV on Performance)		
	Effect	95% Lower CI	95% Upper CI
Bonding	0.453***	0.354	0.552

	Indirect effects (Through Creativity)			**Indirect effects** (Through KME)		
Variables	Effect	95% Lower CI	95% Upper CI	Effect	95% Lower CI	95% Upper CI
Bonding	-0.017	-0.068	0.026	0.217	0.132	0.324

5.2.3.2 Hypothesis 13b and 14b

From the mediation analysis conducted using the OLS path analysis, bridging capital indirectly influenced project performance through its influence on KME. As seen in Figure 5-3 and Table 5-5, bridging capital is positively associated with KME (a = 0.6111) and KME is positively related to project performance (b=0.3883). A bias-corrected bootstrap confidence interval for indirect effect (ab=0.2373) based on 10,000 bootstrap samples was entirely above zero (0.1342 to 0.3195). This provides empirical evidence that KME partially mediates the relationship between bridging capital and project performance. This partially supports Hypothesis 14b. Interestingly, the results of the analysis provide no evidence that the effect on bridging capital on project performance is through creativity (c = -0.0319, p = 0.4371). Therefore, hypothesis 14a was unsupported.



*Covariates Gender, Age, DOP, PME and COP

Figure 5-3 Mediation testing for hypotheses 13b and 14b

Table 5-7 Results of Preaches and Hayes Mediation for Hypotheses 13b and 14b

Variables	Regression Results Outcome Variable: **Creativity**		Regression Results Outcome Variable: **KME**	
	coefficient	***P-value***	***coefficient***	***P-value***
Bridging	0.6040	0.0000	0.6111	0.0000

	Regression Results Outcome Variable: **Performance**	
	coefficient	***P-value***
Creativity	-0.0319	0.4371
KME	0.3883	0.0000
Bridging	0.3520	0.0000

	Direct effects (IV on Performance)		
	Effect	95% Lower CI	95% Upper CI
Bonding	0.352	0.2500	0.4541

	Indirect effects (Through Creativity)			**Indirect effects** (Through KME)		
Variables	Effect	95% Lower CI	95% Upper CI	Effect	95% Lower CI	95% Upper CI
Bonding	-0.019	-0.076	0.029	0.2373	0.1503	0.3460

5.2.3.3 Hypotheses 5 -12

This section shows the results of using Hayes PROCESS macro to test hypotheses 5(a & b) through to 12 (a & b). These hypotheses predict that the dimensions of project complexity negatively moderate the relationship between bonding/bridging capital and creativity as well as between bonding / bridging capital and KME. If the interaction is significant, the interaction term and the conditional indirect effect must be significant.

The results of the analyses show that the moderating effect of the dimensions of project complexity in the model is supported for the most part, and the directions of the interactions are all consistent with predicted hypotheses. The results of the interaction between social capital and all the four dimensions of project complexity in predicting KME are shown in Table 4.6. Upon testing the conditional indirect effect, the effect of bonding capital on KME was found to be contingent on team diversity, as evidenced by the statistically significant interaction between bonding and team diversity ($\beta = -0.0701$, $t = -2.2866$, $p=0.0229$) in the model. This provides evidence that the effect of interaction between bonding and team diversity on project performance is mediated by KME. Thus, hypothesis 6a is supported.

There is also evidence to suggest that the effect of bridging capital on KME is contingent on team diversity as evidenced by the statistically significant interaction between bridging capital and team diversity ($\beta = -0.0576$, t

$= -1.9579$ $p = 0.0512$) in the model. This provides evidence that the effect of interaction between bridging capital and team diversity on project performance is mediated by KME. Hence, hypothesis 6b is supported.

Additionally, the results of the data analysis provides evidence to suggest that the effects of both bonding capital and bridging capital on KME are indeed conditional on task interdependence as evidenced by the statistically significant interactions between bonding and task interdependence ($\beta = -0.0945$, $t = -3.045$, $p = 0.0025$) and bridging capital and task interdependence ($\beta = -0.0704$, $t = -2.3674$, $p = 0.0186$). Therefore, hypotheses 8a and 8b are supported.

The interaction between bonding capital and team distribution was significant ($\beta = -0.0570$, $t = -1.8302$, $p = 0.0682$) at $\alpha = 0.1$. This provides weak evidence that the effect of bonding capital on KME is dependent on team distribution. Thus, the relationship between bonding capital and knowledge management is weakly moderated by team distribution. Thus, hypothesis 10a was marginally supported. The data does not provide empirical support for hypothesis 10b ($\beta = 0.0272$, $t = 0.8906$ $p = 0.3739$). This suggests that the effect of bridging capital on KME is not moderated by team distribution.

Table 5-8: Results of Preaches and Hayes Moderation (interaction effects)

Variables	DV: KME		
	Coefficient	95% Lower CI	95% Upper CI
Bonding	0.5073*****	0.3947	0.6198
Technical complexity	0.1856*****	0.1010	0.2703
Bonding x Technical risk	-0.0640*	-0.1305	0.0024
Bonding	0.4439*****	0.3261	0.5618
Interdependence	0.1965***	0.0995	0.2935
Bonding x Interdependence	-0.0977**	-0.1595	-0.0359
Bonding	0.5490*****	0.4351	0.6628
Team distribution	0.0774**	0.0112	0.1436
Bonding x Team distribution	-0.0579*	-0.1200	0.0042
Bonding	0.4447*****	0.3301	0.5593
Team diversity	0.2566*****	0.1579	0.3553
Bonding x Team diversity	-0.0701**	-0.1304	-0.0098
Bridging	0.5270*****	0.4208	0.6333
Technical complexity	0.4672***	0.0611	0.2319
Bridging x Technical risk	-0.0434	-0.1058	0.0191
Bridging	0.4731*****	0.3640	0.5821
Interdependence	0.1930****	0.0981	0.2880
Bridging x Interdependence	-0.724**	-0.1313	-0.0134
Bridging	0.6145*****	0.4966	0.7323
Team distribution	0.0268	-0.0407	0.0942
Bridging x Team distribution	0.0256	-0.0348	0.0860
Bridging	0.4580*****	0.3450	0.5710
Team diversity	0.2061****	0.1020	0.3101
Bridging x Team diversity	-0.0583**	-0.1164	-0.0002

*p<0.1; **p<0.05; ***p<0.005; ****p<0.0005; *****p<0.00005

The data provides marginal support for hypothesis 12a, that is, the effect of bonding capital on KME is partially dependent on technical risk as evidence by the marginally statistically significant interactions between bonding capital and technical risk in the model ($\beta = -0.0642$, $t = -1.91775$, $p = 0.0561$). The results of the analysis do not support hypothesis 12b because the interaction term between bridging capital and technical risk ($\beta = -0.0428$, $t = -1.3682$, $p = 0.1723$) was not statistically significant.

Additionally, the results of the interaction between the social (bonding and bridging) capital and all four dimensions of project complexity in predicting creativity are shown in Table 4.7.

Hypothesis 5a posits that team diversity negatively moderates the relationship between bonding capital and creativity, but the interaction term ($\beta = 0.0242$, $t = 0.5985$, $p=0.5499$) was not statistically significant. Hence, hypothesis 5a was not supported. Also, hypothesis 5b, posits that team diversity negatively moderates the relationship between bridging capital and creativity but the interaction term ($\beta = 0.00317$, $t = 0.8268$, $p=0.4090$ was not statistically significant; hence, hypothesis 5b was not supported. Hypothesis 7a postulates that task interdependence negatively moderates the relationship between bonding capital and creativity ($\beta = -0.0216$, $t = -0.5099$, $p=0.6105$) while hypothesis 7b suggests that task interdependence negatively moderates the relationship between bridging capital and creativity ($\beta = 0.0111$, $t = 0.2752$, $p=0.7834$), the interaction terms were not statistically significant. Thus, both hypotheses 7a and 7b were not supported.

The interaction term between bonding capital and team distribution (*β = -0.0223, t = -0.5823, p=0.5608*) was not statistically significant; hence, hypothesis 9a that suggests that team distribution negatively moderates the relationship between bonding capital and creativity was not supported. Hypothesis 9b suggests that team distribution negatively moderates the relationship between bridging capital and creativity. The interaction term (*β = 0.0511, t = 1.3615, p=0.1744*) was not statistically significant; hence, hypotheses 9a and 9b were both not supported. The results of the interaction between bonding capital and technical complexity (*β = 0.0243, t = 0.6255, p=0.5321*) was not statistically significant; hence, hypothesis 11a was not supported. Hypothesis 11b was also not supported because the interaction term (*β = 0.013, t = 0.359, p=0.7198*) between technical complexity and bridging capital was not statistically significant.

Table 5-9: Results of Preaches and Hayes Moderation (interaction effects)

	DV: Creativity		
Variables	Coefficient	95% Lower CI	95% Upper CI
Bonding	0.3569*****	0.2269	0.4870
Technical complexity	0.4927*****	0.3949	0.5905
Bonding x Technical risk	0.0193	-0.0575	0.0960
Bonding	0.4565*****	0.2981	0.6148
Interdependence	0.1403**	0.0099	0.2707
Bonding x Interdependence	-0.0370	-0.1200	0.0461
Bonding	0.4324*****	0.2928	0.5720
Team distribution	0.2650*****	0.1838	0.3462
Bonding x Team distribution	-0.0301	-0.1062	0.0460
Bonding	0.4073*****	0.2569	0.5577
Team diversity	0.3397*****	0.2102	0.4693
Bonding x Team diversity	0.0159	-0.0633	0.0950
Bridging	0.3761*****	0.2533	0.4988
Technical complexity	0.4672*****	0.3685	0.5658
Bridging x Technical risk	0.0057	-0.0664	0.0778
Bridging	0.5279*****	0.3826	0.6732
Interdependence	0.1224*	-0.0040	0.2489
Bridging x Interdependence	0.0005	-0.0780	0.0790
Bridging	0.5074*****	0.3629	0.6518
Team distribution	0.2222*****	0.1395	0.3049
Bridging x Team distribution	0.0445	-0.0295	0.1185
Bridging	0.4583*****	0.3115	0.6051
Team diversity	0.2917*****	0.1566	0.4268
Bridging x Team diversity	0.0317	-0.0437	0.1071

*p<0.1; **p<0.05; ***p<0.005; ****p<0.0005; *****p<0.00005

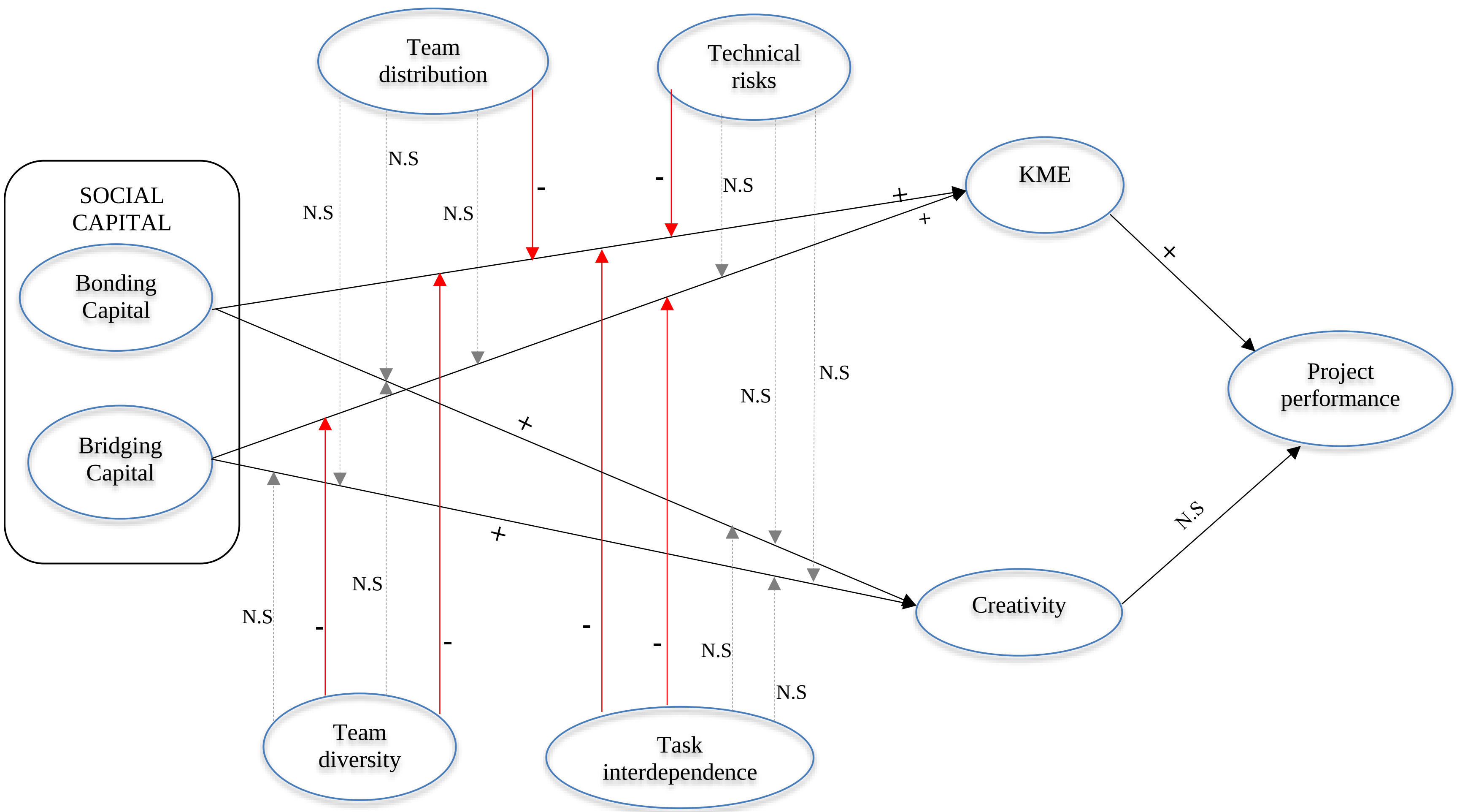


Figure 5-4: Overall Research Model results

5.2.3.4 Probing the interaction effects

To further facilitate the interpretations of the significant interactions, the effects of bonding / bridging capital on KME for low and high levels of each significant moderation factor (one standard deviation below and above the means) were plotted. As shown in figure 5.5, team diversity weakened the positive effect of bonding capital on knowledge management effectiveness. Specifically, at low levels of bonding capital, teams that are highly diverse managed knowledge more effectively compared with teams that have low diversity. However, as bonding capital increases, teams with less diversity tend to manage knowledge more effectively compared with teams that have high diversity. This is consistent with hypothesis 5a.

Figure 5.6 shows the moderating effect of team distribution on the relationship between bonding capital and KME such that as team distribution increases, the effect of bonding capital on KME is reduced. At low levels of bonding capital, teams that are virtual and culturally diverse manage knowledge more effectively compared with teams that are co-located. However, as bonding capital increases, co-located teams manage knowledge more effectively compared with virtual teams. This also suggests that when the project team is colocated and less culturally diverse, the effect of bonding capital on KME is higher compared with a virtual and highly culturally diverse team.

Figure 5.7 depicts the moderating effect of task interdependence on the relationship between bonding capital and KME. The positive effect of bonding capital on KME is reduced in the presence of high task interdependence compared with low task interdependence. Specifically, at low levels of bonding capital, knowledge is effectively managed when task interdependence is high, while at high levels of bonding capital, knowledge is effectively managed when task interdependence is low. Figure 5.8 provides evidence to suggest that technical complexity reduces the positive effect of bonding capital on KME such that bonding capital has a smaller positive effect on KME when technical complexity is high than when it was low. That is, as bonding capital increases, the rate of KME increase is higher in teams with low technical complexity as compared with teams with high technical complexity.

Figure 5.9 shows that team diversity weakened the relationship between bridging capital and KME. Specifically, bridging capital across project groups has a smaller positive effect on KME when team diversity was high than when it was low. Thus, as bridging capital increases, projects with members who are less diverse in their skills and experiences manage knowledge more effectively compared with project teams with diverse experiences and skills. Task interdependence negatively moderates the relationship between bridging capital and KME as shown in Figure 5.10. That is, at low levels of bridging capital, teams with high task interdependence manage knowledge better compared with teams that have low task interdependence. But as bridging capital increases, projects with low task interdependence manage knowledge more effectively compared with projects with high task interdependence.

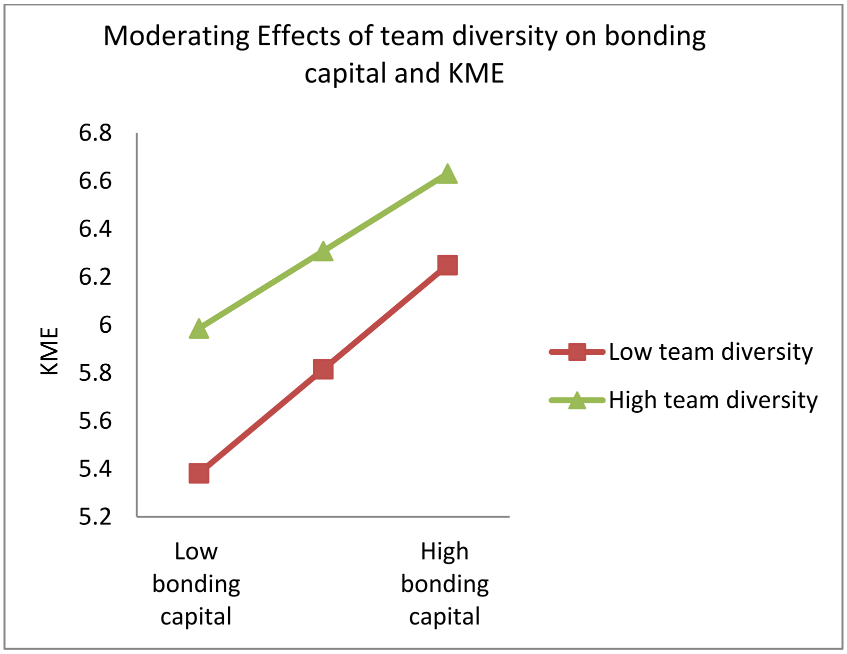


Figure 5-5: The Moderating Effect of Team Diversity on Bonding Capital and KME

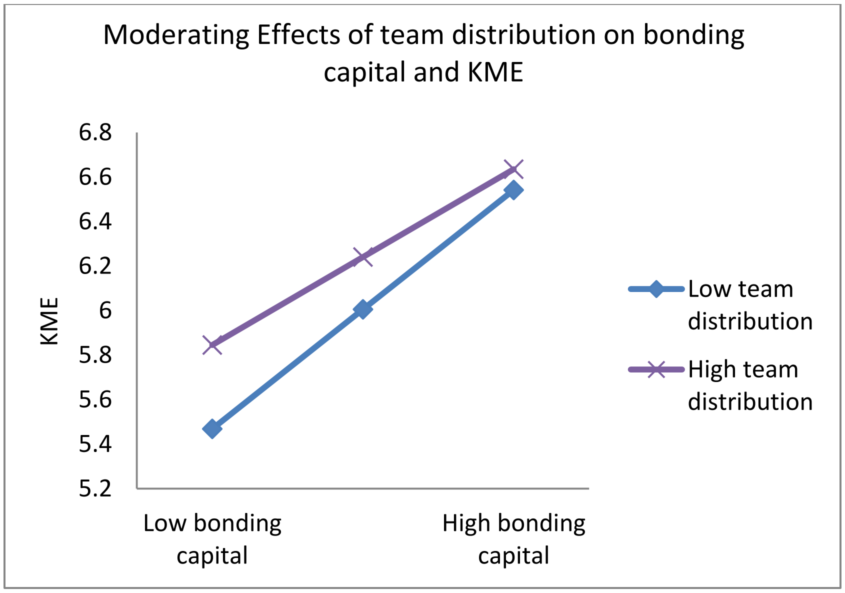


Figure 5-6: The Moderating Effect of Team Distribution on Bonding Capital and KME

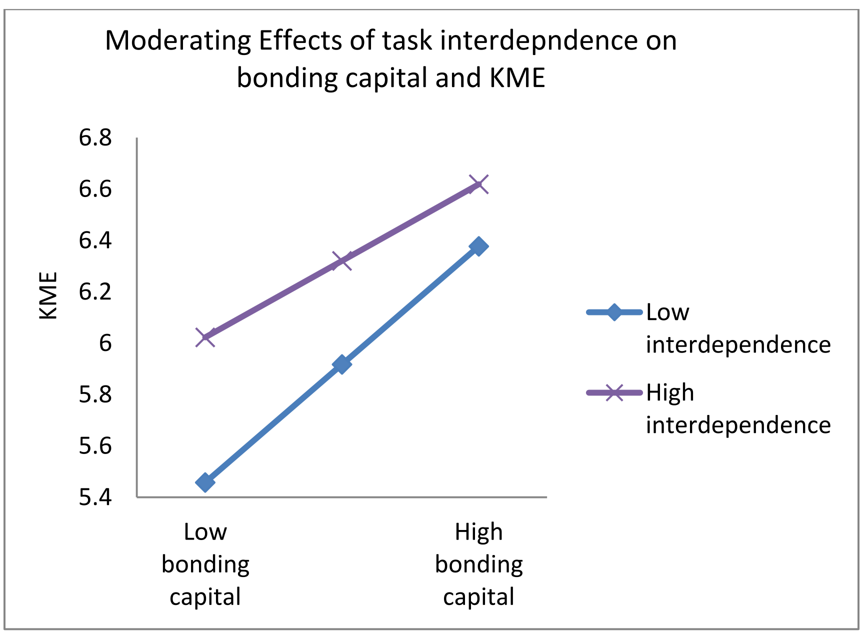


Figure 5-7: The Moderating Effect of Task Interdependence on Bonding Capital and KME

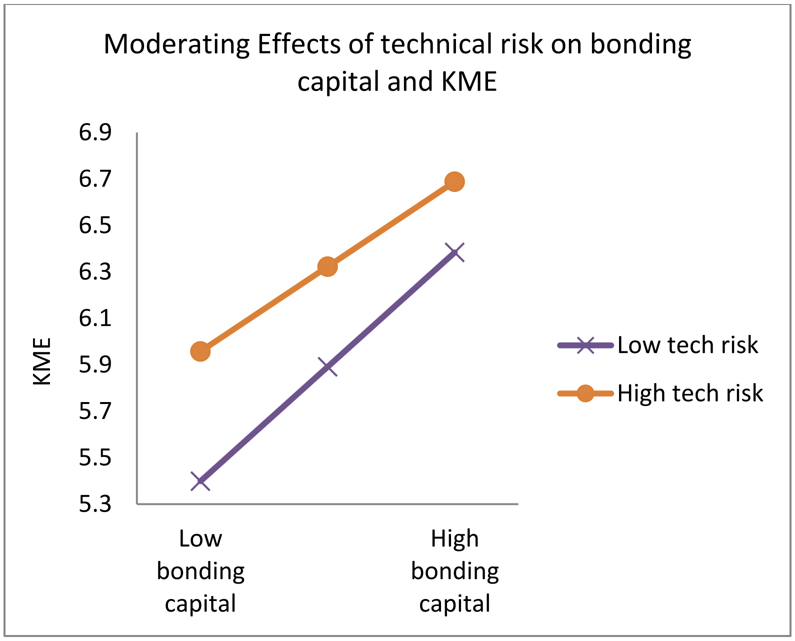


Figure 5-8: The Moderating Effect of Technical Risk on Bonding Capital and KME

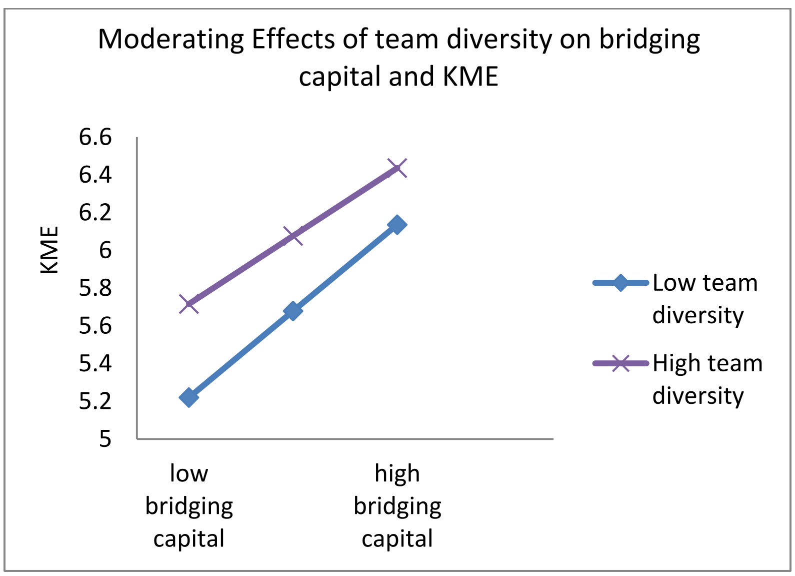


Figure 5-9: The Moderating Effect of Team Diversity on Bridging Capital and KME

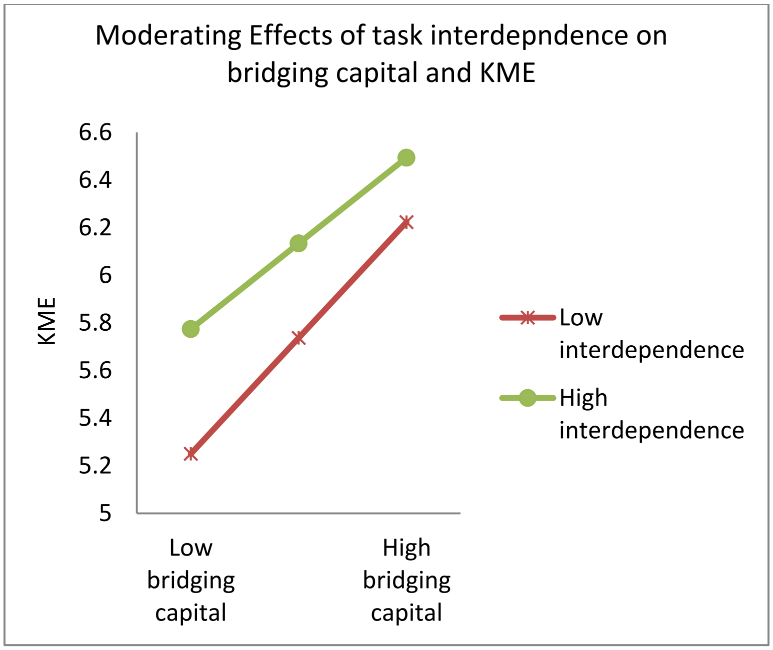


Figure 5-10: The Moderating Effect of Task Interdependence on Bridging Capital and KME

5.4 Ad-hoc Analysis

5.4.1 Moderating Effects of Composite Project Complexity

Next, a post-hoc analysis was conducted by combining all the four dimensions of project into a composite project complexity measure. Then, project complexity was used as a moderator in both hierarchical regression and Hayes PROCESS macro for moderated mediation regression. The results of both tests are as follows.

From the results of the hierarchical regression analysis, the interaction term between bonding capital and project complexity is statistically significant, thus providing evidence that project complexity does negatively moderate the relationship between bonding capital and KME (*β = -0.175, t = -2.116, p=0.035*). However, the remaining three interaction relationships are not statistically significant. Specifically, project complexity does not moderate the relationship between bridging capital and KME (*β = 0.105, t = 1.252, p=0.212*), between bonding capital and creativity (*β = -0.058, t = -0.568, p=0.570*), as well as between bridging capital and creativity (*β = 0.097, t = 0.934, p=0.351*).

Consistent with hierarchical regression analysis, the results of the analyses using PROCESS macro provide empirical evidence of the negative impact of project complexity on the relationship between bonding capital and KME (*β = -0.0961, t = -2.7564, p=0.0062*). The result of the analysis also provides marginal support for the prediction that project complexity negatively moderates the relationship between bridging and KME (*β = -0.0648, t =-1.8188, p=0.07*). The interaction terms between bonding and project complexity (*β = 0.0195, t =0.4629, p=0.6438*) as well as bridging capital and project complexity (*β = 0.0389, t =0.9115, p=0.3628)* are not statistically significant.

Overall, the results of the hierarchical regression and PROCESS macro are consistent and somewhat similar; thus, we can trust the PROCESS macro approach.

Chapter 6

Discussion and Conclusion

Over the last several decades, social capital has changed the operations management discipline in buyer supplier relationship (Villena et al., 2011; Carey et al., 2011; Krause et al., 2007); project management (Easton & Rosenzweig, 2015) and sustainable operations (Gualandris et al., 2015). The social capital theory has been studied in the domain of project management and its impact on project performance been documented. Yet, to date, no one has empirically examined the dynamics of the interaction between project complexity and social capital. This study attempted to explore the extent to which project complexity dimensions moderate the relationship between social capital and process outcomes such as knowledge management effectiveness and creativity of projects.

As in related studies, it is observed that bonding and bridging capital are both valued resources that not only affect the creativity and knowledge management effectiveness of projects in the organization but also impact perceived project performance (meeting schedules, budget, customers' need and cost). Bonding and bridging capital will empower team members to be more creative and adaptive, help in acquiring, marshalling and deploying knowledge over time, generate new applications and inventions, and improve the effectiveness of the project team. The ability of the project team to manage knowledge effectively will enhance the performance of the project.

Project complexity is a multi-dimensional construct that could impact projects negatively. Its dimensions include team distribution, task interdependence, team diversity and technical complexity risks that could be attributed to the use of immature and novel technology on the project. Although bonding capital enhances the ability of the project team to effectively manage knowledge, its effect is attenuated by all the four dimensions of project complexity. Furthermore, the positive effect of bridging capital on KME is reduced by task interdependence and team distribution.

6.1 Mediating Effects of KME and Creativity

As a foundation for enhancing project success outcomes, the model confirms that bonding and bridging capital are beneficial to KME and creativity. The model also supports the view that bonding and bridging capital have a direct, positive impact on project performance. It was also observed that bonding and bridging capital effects on project performance are partially mediated by KME.

Overall, although bonding and bridging capital positively impact project performance, their effects are not mediated by creativity. Perhaps, these findings are due to the inconsistent and mixed results of creativity in the extant literature.

Both bridging and bonding capital are exposed to have smaller effects on creativity compared with KME. Another insight is that this study, overall, provides empirical support for the claims that bonding capital has a slightly higher impact on knowledge management and performance compared with bridging capital. This can be attributed to the fact that members of project with high bonding capital tend to be more cooperative, which facilitates knowledge transfer (Reagans & McEvily, 2003). Also high bonding capital within the project team provides access to information channel, which also encourages information and knowledge sharing (Tsai & Ghoshal, 1998; Koka & Prescott, 1998; Obstfeld, 2005; Villena et al., 2011). Therefore, high bonding capital positively influences knowledge management effectiveness in projects compared with high bridging capital.

Finally, the last insight of this study is that bridging social capital has a higher impact on creativity compared with bonding social capital. This can be explained in terms of the fact that bridging capital "weak ties" has been associated with access to novel ideas and information (Granovetter, 1973; Koka & Prescott, 2002), and, therefore, are likely to lead to more creativity compared to high bonding capital.

6.2 Moderating Effects of Project Complexity

This study examined the impact of the dimensions of project complexity - task interdependence, technical risk, team distribution and team diversity - on the relationship between social capital and KME as well as between social capital and creativity. While it is clearly challenging to perform such a comprehensive examination, I believe the exploratory efforts of this dissertation provide a useful starting point.

While bonding capital is positively associated with KME, its effect is weakened by the four dimensions of project complexity and the composite project complexity measure. At low levels of bonding, highly diverse teams manage knowledge more effectively than teams with low diversity, but at high levels of bonding, the rate of KME increase is higher in teams with low diversity compared with highly diverse teams. A plausible reason for this is that at lower levels of bonding, where neither of the teams (i.e., high or low diversity teams) benefits from bonding, highly diverse teams may have varied experiences and a larger repretoire of skills to help them with their knowledge management activities. As levels of bonding increase, diverse teams may expend more time and effort on communication and coordination than on leveraging their distinctive experiences and skills to effectively manage their knowledge. Also, it is perhaps pertinent to look at the influence of bridging on these dynamics between bonding and KME.

Although virtual and culturally diverse teams tend to manage knowledge better at both low and high levels of bonding capital compared with co-located teams, at high levels of bonding capital, the rate of increase change in managing knowledge is faster with the co-located teams. The finding is perhaps due to less communication occurring at low levels of bonding. Thus, members of the project don't have to be co-located to manage knowledge effectively but when bonding capital is high, teams tend to communicate frequently and share resources often and projects in which team members are co-located benefit from the increase and upsurge in communication.

It was also found that task interdependence and technical risks negatively impact the relationship between bonding and KME. This again is possibly because of the need to spend more time and effort on coordination and communication, thereby detracting from activities that can result in managing knowledge effectively.

Both task interdependence and team diversity negatively impact the relationship between bridging capital and KME. The impact is greater at high bonding compared to low bonding. These findings are consistent with existing literature about the pool of knowledge being limited at low bridging and access to diverse information at high levels of bridging capital.

Overall, this study provides support that project complexity has a negative impact on the relationship between bonding capital and KME but has a weak impact on bridging capital and KME. The access to novel and/or diverse resources and information that bridging social capital affords may be a plausible reason for the attenuated impact of project complexity on the relationship between bridging social capital and KME.

This study fails to find statistical interaction effects of social capital (bonding and bridging) and all the dimensions of project complexity in predicting creativity. As discussed earlier, the findings might be due to the mixed results of creativity in the extant literature or the findings might be that creativity is not impacted by project complexity because of the resources that are available to members both within and across teams.

6.3 Implications for Theory

The extant project management literature has lacked a definition of project complexity, much less an assessment of its impact on projects within organizations. This study extends the existing research on project management in several important ways. First, it adds to the literature by providing empirical evidence that project complexity is a multi-dimensional construct that consists of team diversity, team distribution, task interdependence and technical risks. Task interdependence was also found to be the dimension that most impacts projects negatively.

Second, this research shows that both bonding and bridging capital are positively associated with project performance but that their influence on performance is partially mediated by KME. The influence of bonding and bridging capital on project performance is, however, not through creativity. It also adds to the literature by empirically testing the moderation effect of project complexity on the relationship between social capital and KME. In including the interactions, this study adds to greater richness to the project complexity literature and enhances the understanding of its impact on KME and project performance. Third, the findings extend the social capital literature by indicating its levels that are most impacted by project complexity and its dimensions.

6.4 Implications for Practice

Over the years, organizations have enjoyed the benefits of social capital. It is therefore important that project managers recognize that their stock of knowledge must be well managed. Recognizing that project complexity has a negative impact on project knowledge management and project performance is also very insightful. Project managers faced with differing complexities on their projects must learn to vary the frequency of communication and levels of information sharing within and across projects in the organization to suit the needs of the project. For instance, the larger the complexity of the project, the less diverse the team should be, the less distributed the team should be, the less task interdependence should be used and the less technical risk should be encouraged. Project managers must understand that social capital is needed on projects but project complexities must be well managed to enjoy the benefits of social capital.

6.5 Limitations of this Study and Suggestions for Future Study

While this study makes significant contributions to the project management literature and has implications for the practice of project management, it has some limitations. First, in the qualitative study, interviews were conducted with project managers of a single organization. A multi-organization study may be appropriate in future studies. Further research should include several organizations with interviews conducted across several organizations.

Second, because data were collected from the project managers (single respondent), future studies can broaden their scope by collecting data from project team members, sponsors, business leads and stakeholders. Third, because data were collected from different industries and company sizes, these relationships may not be the same for all industries and company sizes. Future research should examine these contextual factors.

Fourth, although several attention filter questions were included in the online Qualtrics survey during the data collection, there is the possibility that the data is unreliable. This is because online surveys are susceptible to limited sampling and respondent availability. Future study would involve collecting data using both self-administered and online survey to address the issue of unreliable data and limited sampling.

6.6 Conclusions

Despite the limitations discussed in the previous section, this research provides compelling evidence to support the importance of bonding capital, bridging capital and KME in project management. It supports the view that both bridging and bonding capital is important to have on projects. This research also provides evidence that project complexity is a multi-dimensional construct that must be properly managed to minimize its impact on project success factors. In sum, bonding capital is more impacted by project complexity compared with bridging capital.

Appendix A

Survey Items, Descriptive Statistics and Summary Statistics

Table A-1 Factor loadings of survey items and Cronbach's alphas of constructs

Result of Explanatory Factor Analysis and Scale items				
Construct	Coding	Items	Loadings	Cronbach's alpha (α)
Bridging Capital	BR1	My project team members feel they are part of the organization	0.707	0.886
	BR2	My project team is interested in what goes on in the organization	0.714	
	*BR3	My project team is willing to contribute extra time to meet deadlines		
	BR4	Interacting with people in our organization makes my project team feel like a part of the organization	0.671	
	BR5	The project team is willing to spend time to support general organization activities	0.645	
	BR6	In my organization, my project team come into contact with new people all the time	0.704	
	BR7	Interacting with people in our organization reminds my project team that everyone in the world is connected	0.673	
	BR8	Interacting with people in our organization makes my project team want to try new things	0.632	
Bonding Capital	BO1	My project team members defend one another from criticisms	0.577	0.814
	BO2	My project team members help each other on the project	0.569	
	BO3	My project team members along with each other	0.781	
	BO4	My project team member stick together	0.681	
Project Performance	PF1	I believe my team is meeting the project schedule goals	0.712	0.839
	PF2	I believe my team is meeting the project budget (man-hour) goals	0.703	
	PF3	I believe my team is meeting the project functional requirements and specifications	0.782	
	PF4	I believe our project answer customer's needs	0.659	
	PF5	I believe customers are satisfied with our project	0.648	

Creativity	*CR1	My project team seeks new ideas and ways to solve problems		0.830
	*CR2	My project team tries new ideas or methods first		
	CR3	My project team generates ground-breaking ideas	0.674	
	CR4	My project team is a good role model for creativity	0.618	
	CR5	My project team generates new applications	0.604	
	CR6	My project team generates new inventions	0.726	
KME	KME1	The way knowledge is managed has made my project team more creative and adaptive	0.608	0.808
	KME2	The way knowledge is managed has improved the effectiveness of my project team	0.599	
	KME3	Overall, I am satisfied with knowledge management in my project team	0.703	
Technical risk	CP1	The project involves the use of technology that has not been used in prior projects	0.654	0.826
	CP2	The project requires large number of links to other systems	0.629	
	CP3	High level of technical complexity is involved	0.600	
	CP4	The project is one of the largest projects attempted by my organization	0.722	
	CP5	The project involves the use of new technology	0.617	
	CP6	Many external stakeholders are involved in the project	0.502	
	CP7	The project involves the use of immature technology	0.503	
	*CP8	The project involves highly complex task being automated		
Team diversity	CP9	The members of my project team vary widely in their areas of expertise	0.715	0.738
	CP10	The members of my project team have a variety of different backgrounds and experiences	0.758	

	*CP11	The members of my project team have skills and abilities that complement each other		
Team Distribution	CP12	The project involves collaborating with people in different time zones	0.768	0.752
	CP13	The project involves working with people via internet based conferencing applications	0.731	
	CP14	The project involves collaborating with people I have never met face to face	0.653	
	CP15	The project involves collaborating with people who speak different native languages	0.551	
Task Interdependence	CP16	The project involves obtaining information and advice from my colleagues to complete my work	0.676	0.814
	CP17	The project involves depending on my colleagues for the completion of my work	0.754	
	*CP18	The project involves a one-person job; rarely do I have to check or work with others		
	CP19	The project involves working closely with colleagues to do my work properly	0.710	
	CP20	In order to complete their work on this project, my colleagues have to obtain information and advice from me	0.742	
Marker Variables	MV1	My project team members understood the old system well	0.797	
	MV2	The old system provided poor quality information for my project team members	0.786	
	*MV3	My project team members thought the old system was unreliable		

* These are items dropped and were not used for further analysis

Table A-2 Descriptive Statistics of Main Study

Control Variables				
Characteristics	**Value**	**Frequency**	**Percent**	**Cumulative percent**
Duration of Project	0 to 6 months	91	30.0%	30.0%
	7 to 12 months	126	41.6%	71.6%
	13 to 24 months	62	20.5%	92.1%
	over 24 months	24	7.9%	100.0%
Methodology	Agile	52	17.2%	17.2%
	Traditional (water fall)	86	28.4%	45.5%
	Hybrid	86	28.4%	73.9%
	No established PM methodology	76	25.1%	99.0%
	Others	3	1.0%	100.0%
Cost of Project	Less than $100,000	84	27.7%	27.7%
	$100, 000 to < $250,000	76	25.1%	52.8%
	$250,000 to < $500,000	67	22.1%	74.9%
	$500,000 to <$750,000	35	11.6%	86.5%
	$750,000 to <$1,000,000	14	4.6%	91.1%
	Greater than $1,000,000	27	8.9%	100.0%
Other Variables				
Primary Functional Area	Production Operations	129	42.6%	54.5%
	Finance and Accounts	4	1.3%	55.8%
	Human Resources	4	1.3%	57.1%
	Administration	40	13.2%	70.3%
	Purchase	4	1.3%	71.6%
	Research & Development	54	17.8%	89.4%
	Customer Service	13	4.3%	93.7%
	IT Support	19	6.3%	11.9%
Highest level of Education	High School	26	8.6%	8.6%
	Associate Degree	28	9.2%	17.8%
	Bachelors	124	40.9%	58.7%
	Graduate Degree	83	27.4%	86.1%
	PhD	15	5.0%	91.1%
	Some College	27	8.9%	100.0%

Number of employees in the organization	< 100	95	31.4%	31.4%
	100 - 500	65	21.5%	52.8%
	501 - 1,000	47	15.5%	68.3%
	1,001 - 5,000	33	10.9%	79.2%
	5,001 - 10,000	43	14.2%	93.4%
	10,001 or more	20	6.6%	100.0%

Table A-3 Descriptive Statistics of Pilot Study

Characteristics	Value	Frequency	Percent	Cumulative percent
Gender	Male	86	81.9%	81.9%
	Female	19	18.1%	100.0%
Role on the project	Others	49	46.7%	46.7%
	Project Manager	56	53.3%	100.0%
Years of working experience	< 1 year	9	8.6%	8.6%
	1-2 years	19	18.1%	26.7%
	3-4 years	11	10.5%	37.1%
	5-10 years	22	21.0%	58.1%
	11-20 years	18	17.1%	75.2%
	> 20 years	26	24.8%	100.0%
Age	under 18	4	3.8%	3.8%
	18-24	3	2.9%	6.7%
	25-34	47	44.8%	51.4%
	35-44	43	41.0%	92.4%
	45-54	6	5.7%	98.1%
	55+	2	1.9%	100.0%
Duration of Project	0 to 6 months	28	26.7%	26.7%
	7 to 12 months	30	28.6%	55.2%
	13 to 24 months	25	23.8%	79.0%
	over 24 months	22	21.0%	100.0%

Methodology	Agile	27	25.7%	25.7%
	Traditional (water fall)	34	32.4%	58.1%
	Hybrid	14	13.3%	71.4%
	No established PM methodology	19	18.1%	89.5%
	Others	11	10.5%	100.0%
Cost of Project	Less than $100,000	21	20.0%	20.0%
	$100, 000 to < $250,000	18	17.1%	37.1%
	$250,000 to < $500,000	10	9.5%	46.7%
	$500,000 to <$750,000	14	13.3%	60.0%
	$750,000 to <$1,000,000	7	6.7%	66.7%
	Greater than $1,000,000	35	33.3%	100.0%
Number of people on the core project team	2 to 4	24	22.9	22.9
	5 to 7	34	32.4	55.2
	8 to 10	19	18.1	73.3
	More than 10	26	24.8	98.1
	Missing	2	1.9	100.0
Highest level of Education	High School	4	3.8%	3.8%
	Associate Degree	3	2.9%	6.7%
	Bachelors	47	44.8%	51.4%
	Graduate Degree	43	41.0%	92.4%
	PhD	6	5.7%	98.1%
	Some College	2	1.9%	100.0%
Ever worked together on any project?	Yes	74	70.5	70.5
	No	31	29.5	100.0

Table A-4 Data Analysis Results for Mediation Effects

************** PROCESS Procedure for SPSS Release 2.15 ***************

Model = 4
Y = Performance
X = Bonding
M1 = KME
M2 = Creativity

Statistical Controls:
CONTROL= COP PME Gen Age DOP

Sample size
302

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Outcome: KME

Model Summary

R	R-sq	MSE	F	df1	df2	p
.5627	.3166	.6048	22.7801	6.0000	295.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	2.5714	.4200	6.1217	.0000	1.7447	3.3981
Bonding	.6124	.0538	11.3774	.0000	.5065	.7184
COP	.0282	.0341	.8260	.4095	-.0389	.0953
PME	.0056	.0104	.5395	.5899	-.0149	.0261
Gen	-.0859	.0913	-.9403	.3478	-.2656	.0939
Age	-.0079	.0062	-1.2778	.2023	-.0200	.0042
DOP	-.0227	.0581	-.3909	.6962	-.1371	.0916

****

Outcome: Creativity

Model Summary

R	R-sq	MSE	F	df1	df2	p
.4618	.2132	1.0379	13.3241	6.0000	295.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	2.7288	.5502	4.9593	.0000	1.6459	3.8117
Bonding	.5727	.0705	8.1223	.0000	.4339	.7115
COP	.0266	.0447	.5954	.5520	-.0613	.1145
PME	.0317	.0136	2.3260	.0207	.0049	.0586
Gen	-.0695	.1196	-.5806	.5619	-.3049	.1660
Age	-.0259	.0081	-3.2209	.0014	-.0418	-.0101
DOP	-.0311	.0761	-.4088	.6830	-.1809	.1187

****

Outcome: Performance

Model Summary

R	R-sq	MSE	F	df1	df2	p
.7266	.5280	.3581	40.9631	8.0000	293.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	1.4742	.3461	4.2599	.0000	.7931	2.1552
KME	.3537	.0506	6.9897	.0000	.2541	.4532
Creativity	-.0289	.0386	-.7471	.4556	-.1049	.0472
Bonding	.4534	.0503	9.0177	.0000	.3544	.5523
COP	.0099	.0263	.3758	.7073	-.0418	.0616
PME	-.0033	.0081	-.4077	.6838	-.0192	.0126
Gen	-.0142	.0704	-.2018	.8402	-.1527	.1243
Age	.0025	.0048	.5249	.6001	-.0069	.0120
DOP	-.0785	.0447	-1.7557	.0802	-.1665	.0095

************************* TOTAL EFFECT MODEL ***********************

Outcome: Performance

Model Summary

R	R-sq	MSE	F	df1	df2	p
.6606	.4364	.4247	38.0678	6.0000	295.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	2.3048	.3520	6.5483	.0000	1.6121	2.9975
Bonding	.6534	.0451	14.4875	.0000	.5647	.7422
COP	.0191	.0286	.6673	.5051	-.0372	.0753
PME	-.0022	.0087	-.2553	.7987	-.0194	.0149
Gen	-.0426	.0765	-.5563	.5785	-.1932	.1080
Age	.0005	.0052	.0964	.9233	-.0096	.0106
DOP	-.0857	.0487	-1.7594	.0796	-.1815	.0102

**************** TOTAL, DIRECT, AND INDIRECT EFFECTS ***************

Total effect of X on Y

Effect	SE	t	p	LLCI	ULCI
.6534	.0451	14.4875	.0000	.5647	.7422

Direct effect of X on Y

Effect	SE	t	p	LLCI	ULCI
.4534	.0503	9.0177	.0000	.3544	.5523

Indirect effect of X on Y

	Effect	Boot SE	BootLLCI	BootULCI
TOTAL	.2001	.0452	.1223	.2996
KME	.2166	.0484	.1321	.3236
Creativity	-.0165	.0235	-.0684	.0258
(C1)	.2331	.0612	.1278	.3693

************** PROCESS Procedure for SPSS Release 2.15 ***************

```
Model = 4
    Y = Performance
    X = Bridging
   M1 = KME
   M2 = Creativity

Statistical Controls:
CONTROL= COP      PME      Gen      Age      DOP

Sample size
        302
```

****

Outcome: KME

Model Summary

R	R-sq	MSE	F	df1	df2	p
.5887	.3466	.5783	26.0824	6.0000	295.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	2.3406	.4141	5.6524	.0000	1.5257	3.1556
Bridging	.6111	.0501	12.2036	.0000	.5126	.7097
COP	.0521	.0334	1.5620	.1194	-.0135	.1177
PME	-.0047	.0103	-.4555	.6491	-.0249	.0155
Gen	-.0253	.0894	-.2829	.7775	-.2012	.1506
Age	-.0018	.0060	-.3035	.7617	-.0137	.0100
DOP	-.0505	.0564	-.8942	.3719	-.1616	.0606

****

Outcome: Creativity

Model Summary

R	R-sq	MSE	F	df1	df2	p
.5034	.2534	.9848	16.6899	6.0000	295.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	2.3087	.5404	4.2721	.0000	1.2451	3.3722
Bridging	.6040	.0654	9.2419	.0000	.4754	.7326
COP	.0498	.0435	1.1435	.2537	-.0359	.1354
PME	.0213	.0134	1.5881	.1133	-.0051	.0476
Gen	-.0101	.1167	-.0865	.9311	-.2397	.2195
Age	-.0201	.0079	-2.5497	.0113	-.0355	-.0046
DOP	-.0530	.0737	-.7197	.4723	-.1980	.0920

****

Outcome: Performance

Model Summary

R	R-sq	MSE	F	df1	df2	p
.6920	.4789	.3954	33.6537	8.0000	293.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	1.7392	.3627	4.7954	.0000	1.0254	2.4530
KME	.3883	.0534	7.2651	.0000	.2831	.4935
Creativity	-.0319	.0410	-.7782	.4371	-.1125	.0487
Bridging	.3520	.0519	6.7864	.0000	.2500	.4541
COP	.0239	.0277	.8641	.3883	-.0306	.0785
PME	-.0086	.0085	-1.0027	.3168	-.0254	.0082
Gen	.0247	.0739	.3347	.7381	-.1207	.1702
Age	.0063	.0050	1.2585	.2092	-.0036	.0163
DOP	-.1076	.0467	-2.3026	.0220	-.1996	-.0156

************************* TOTAL EFFECT MODEL ************************

Outcome: Performance

Model Summary

R	R-sq	MSE	F	df1	df2	p
.6104	.3726	.4728	29.1962	6.0000	295.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	2.5746	.3744	6.8763	.0000	1.8377	3.3114
Bridging	.5701	.0453	12.5913	.0000	.4810	.6592
COP	.0426	.0302	1.4120	.1590	-.0168	.1019
PME	-.0111	.0093	-1.1921	.2342	-.0293	.0072
Gen	.0152	.0808	.1886	.8505	-.1438	.1743
Age	.0063	.0054	1.1519	.2503	-.0044	.0170
DOP	-.1256	.0510	-2.4600	.0145	-.2260	-.0251

*************** TOTAL, DIRECT, AND INDIRECT EFFECTS ****************

Total effect of X on Y

Effect	SE	t	p	LLCI	ULCI
.5701	.0453	12.5913	.0000	.4810	.6592

Direct effect of X on Y

Effect	SE	t	p	LLCI	ULCI
.3520	.0519	6.7864	.0000	.2500	.4541

Indirect effect of X on Y

	Effect	Boot SE	BootLLCI	BootULCI
TOTAL	.2181	.0471	.1342	.3195
KME	.2373	.0494	.1503	.3460
Creativity	-.0193	.0264	-.0755	.0291
(C1)	.2566	.0637	.1438	.3945

Table A-5: Table Data Analysis Results for Moderation Effects

```
************PROCESS Procedure for SPSS Beta Release 140712 ***********
    Model = 7
    Y = Performance
    X = Bridging
    M = KME
    W = techcomp

Statistical Controls:
CONTROL= Gen      DOP      COP      PME      Age

Sample size
        302

**********************************************************************
Outcome: KME

Model Summary
R         R-sq         F        df1        df2          p
.6144     .3775    22.2104     8.0000   293.0000      .0000

Model
            coeff          se          t          p       LLCI       ULCI
Constant   5.8778       .2660    22.1002      .0000     5.3544     6.4013
Bridging    .5270       .0538     9.7953      .0000      .4211      .6328
Tech_risk   .1486       .0420     3.5359      .0005      .0659      .2313
int_1      -.0428       .0313    -1.3682      .1723     -.1045      .0188
Gen        -.0047       .0883     -.0533      .9575     -.1786      .1691
DOP        -.0667       .0560    -1.1899      .2351     -.1769      .0436
COP         .0256       .0336     .7621       .4466     -.0405      .0916
PME        -.0038       .0100     -.3771      .7064     -.0236      .0160
Age        -.0003       .0060     -.0521      .9585     -.0121      .0114

Interactions:

 int_1    Bridging    X     Tech_risk

**********************************************************************
Outcome: Performance

Model Summary
         R       R-sq          F        df1        df2          p
      .6912      .4778    38.4264     7.0000   294.0000      .0000

Model
            coeff          se          t          p       LLCI       ULCI
Constant   3.6829       .3591    10.2556      .0000     2.9761     4.3896
KME         .3702       .0481     7.6961      .0000      .2756      .4649
Bridging    .3438       .0508     6.7741      .0000      .2439      .4437
Gen         .0246       .0739      .3331      .7393     -.1208      .1700
```

```
DOP          -.1069       .0467    -2.2881      .0228    -.1988     -.0149
COP           .0233       .0277      .8417      .4006    -.0312      .0778
PME          -.0093       .0085    -1.0999      .2723    -.0260      .0074
Age           .0070       .0050     1.3963      .1637    -.0028      .0168
******************** DIRECT AND INDIRECT EFFECTS ********************
Direct effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
      .3438      .0508     6.7741      .0000      .2439      .4437

Conditional indirect effect(s) of X on Y at values of the moderator(s)

Mediator
      Tech_risk        Effect    Boot SE   BootLLCI   BootULCI
KME     2.0000      .1634      .0463      .0860      .2702



*********** PROCESS Procedure for SPSS Beta Release 140712 ***********
Model = 7
    Y = Performance
    X = Bridging
    M = KME
    W = T_Distr

Statistical Controls:
CONTROL= Gen      TOP      DOP      COP      PME      Age

Sample size
        302
**********************************************************************
Outcome: KME

Model Summary
          R       R-sq          F        df1        df2          p
      .5922      .3507    17.5221     9.0000   292.0000      .0000

Model
            coeff         se          t          p       LLCI       ULCI
Constant   5.7994      .2764    20.9827      .0000    5.2555     6.3434
Bridging    .6161      .0598    10.3071      .0000     .4985      .7338
T_Distrib   .0306      .0338      .9044      .3666    -.0360      .0971
int_1       .0272      .0306      .8906      .3739    -.0329      .0874
Gen        -.0155      .0906     -.1715      .8639    -.1939      .1628
TOP         .0030      .0170      .1755      .8608    -.0305      .0365
DOP        -.0540      .0568     -.9502      .3428    -.1657      .0578
COP         .0428      .0342     1.2505      .2121    -.0245      .1100
PME        -.0039      .0104     -.3791      .7049    -.0243      .0165
Age        -.0008      .0062     -.1233      .9019    -.0129      .0114

Interactions:
int_1    bridging    X     T_Distrib

**********************************************************************
```

```
Outcome: Performance

Model Summary
          R       R-sq          F        df1        df2          p
      .6916      .4783    33.5793     8.0000   293.0000      .0000

Model
            coeff         se          t          p       LLCI       ULCI
Constant   3.7014      .3612    10.2487      .0000     2.9906     4.4122
KME         .3702      .0482     7.6860      .0000      .2754      .4650
Bridging    .3433      .0508     6.7530      .0000      .2432      .4433
Gen         .0294      .0745      .3943      .6937     -.1172      .1759
TOP        -.0075      .0139     -.5430      .5875     -.0349      .0198
DOP        -.1080      .0468    -2.3081      .0217     -.2002     -.0159
COP         .0234      .0277      .8454      .3986     -.0311      .0780
PME        -.0098      .0085    -1.1524      .2501     -.0266      .0070
Age         .0074      .0050     1.4625      .1447     -.0026      .0173

******************** DIRECT AND INDIRECT EFFECTS *********************

Direct effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
      .3433      .0508     6.7530      .0000      .2432      .4433

Conditional indirect effect(s) of X on Y at values of the moderator(s)

Mediator
      T_Distrib      Effect    Boot SE   BootLLCI   BootULCI
KME     2.0000      .2482      .0624      .1462      .3958

NOTE: The following variables were mean centered prior to analysis:
 Bridging T_Distrib



*********** PROCESS Procedure for SPSS Beta Release 140712 ***********
Model = 7
    Y = Performance
    X = Bridging
    M = KME
    W = Interdep

Statistical Controls:
CONTROL= Gen      DOP      COP      PME      Age

Sample size
        302
**********************************************************************
Outcome: KME

Model Summary
          R       R-sq          F        df1        df2          p
      .6317      .3991    24.3254     8.0000   293.0000      .0000
```

Model

	coeff	se	t	p	LLCI	ULCI
Constant	5.9351	.2605	22.7864	.0000	5.4225	6.4477
Bridging	.4752	.0552	8.6125	.0000	.3666	.5838
Interdep	.1962	.0478	4.1024	.0001	.1021	.2904
int_1	-.0704	.0297	-2.3674	.0186	-.1290	-.0119
Gen	-.0408	.0866	-.4712	.6378	-.2112	.1296
DOP	-.0585	.0553	-1.0584	.2907	-.1672	.0503
COP	.0324	.0324	.9994	.3184	-.0314	.0961
PME	.0008	.0099	.0793	.9369	-.0188	.0203
Age	-.0020	.0058	-.3375	.7360	-.0134	.0095

Interactions:

int_1   Bridging   X   Interdep

****
Outcome: Performance

Model Summary

R	R-sq	F	df1	df2	p
.6912	.4778	38.4264	7.0000	294.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	3.6829	.3591	10.2556	.0000	2.9761	4.3896
KME	.3702	.0481	7.6961	.0000	.2756	.4649
Bridging	.3438	.0508	6.7741	.0000	.2439	.4437
Gen	.0246	.0739	.3331	.7393	-.1208	.1700
DOP	-.1069	.0467	-2.2881	.0228	-.1988	-.0149
COP	.0233	.0277	.8417	.4006	-.0312	.0778
PME	-.0093	.0085	-1.0999	.2723	-.0260	.0074
Age	.0070	.0050	1.3963	.1637	-.0028	.0168

******************* DIRECT AND INDIRECT EFFECTS ********************

Direct effect of X on Y

Effect	SE	t	p	LLCI	ULCI
.3438	.0508	6.7741	.0000	.2439	.4437

Conditional indirect effect(s) of X on Y at values of the moderator(s)

Mediator

	Interdep	Effect	Boot SE	BootLLCI	BootULCI
KME	2.0000	.1238	.0409	.0542	.2191

*********** PROCESS Procedure for SPSS Beta Release 140712 ***********

Model = 7
    Y = Performance
    X = Bridging
    M = KME
    W = teamdive

Statistical Controls:

CONTROL= Gen DOP COP PME Age

Sample size
302

****

Outcome: KME

Model Summary

R	R-sq	F	df1	df2	p
.6301	.3970	24.1175	8.0000	293.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	5.8770	.2604	22.5655	.0000	5.3644	6.3896
Bridging	.4595	.0572	8.0315	.0000	.3469	.5722
teamdive	.2089	.0525	3.9751	.0001	.1055	.3123
int_1	-.0576	.0294	-1.9579	.0512	-.1154	.0003
Gen	-.0391	.0862	-.4534	.6506	-.2088	.1306
DOP	-.0242	.0549	-.4413	.6593	-.1322	.0838
COP	.0424	.0322	1.3172	.1888	-.0210	.1058
PME	-.0016	.0099	-.1573	.8751	-.0211	.0179
Age	-.0027	.0058	-.4680	.6401	-.0142	.0087

Interactions:

int_1 Bridging X teamdive

****

Outcome: Performance

Model Summary

R	R-sq	F	df1	df2	p
.6912	.4778	38.4264	7.0000	294.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	3.6829	.3591	10.2556	.0000	2.9761	4.3896
KME	.3702	.0481	7.6961	.0000	.2756	.4649
Bridging	.3438	.0508	6.7741	.0000	.2439	.4437
Gen	.0246	.0739	.3331	.7393	-.1208	.1700
DOP	-.1069	.0467	-2.2881	.0228	-.1988	-.0149
COP	.0233	.0277	.8417	.4006	-.0312	.0778
PME	-.0093	.0085	-1.0999	.2723	-.0260	.0074
Age	.0070	.0050	1.3963	.1637	-.0028	.0168

```
******************* DIRECT AND INDIRECT EFFECTS ********************
Direct effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
      .3438      .0508     6.7741      .0000      .2439      .4437

Conditional indirect effect(s) of X on Y at values of the moderator(s)

Mediator
      teamdive     Effect    Boot SE   BootLLCI   BootULCI
KME     2.0000      .1275      .0392      .0644      .2207

NOTE: The following variables were mean centered prior to analysis:
 Bridging teamdive



*********** PROCESS Procedure for SPSS Beta Release 140712 ***********
Model = 4
    Y = Performance
    X = Bridging
    M = Creativity

Statistical Controls:
CONTROL= Gen      DOP      COP      PME      Age

Sample size
        302

**********************************************************************

Outcome: Creativity

Model Summary
          R       R-sq          F        df1        df2          p
      .5034      .2534    16.6899     6.0000   295.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
Constant     2.3087      .5404     4.2721      .0000     1.2451     3.3722
Bridging      .6040      .0654     9.2419      .0000      .4754      .7326
Gen         -.0101      .1167     -.0865      .9311     -.2397      .2195
DOP         -.0530      .0737     -.7197      .4723     -.1980      .0920
COP          .0498      .0435     1.1435      .2537     -.0359      .1354
PME          .0213      .0134     1.5881      .1133     -.0051      .0476
Age         -.0201      .0079    -2.5497      .0113     -.0355     -.0046

**********************************************************************
Outcome: Performance

Model Summary
          R       R-sq          F        df1        df2          p
      .6205      .3850    26.2906     7.0000   294.0000      .0000
```

Model

	coeff	se	t	p	LLCI	ULCI
Constant	2.3497	.3826	6.1407	.0000	1.5966	3.1027
Creativity	.0974	.0400	2.4351	.0155	.0187	.1762
Bridging	.5113	.0510	10.0264	.0000	.4109	.6116
Gen	.0162	.0802	.2025	.8397	-.1415	.1740
DOP	-.1204	.0507	-2.3763	.0181	-.2201	-.0207
COP	.0377	.0300	1.2588	.2091	-.0213	.0967
PME	-.0131	.0092	-1.4211	.1564	-.0313	.0051
Age	.0082	.0055	1.5065	.1330	-.0025	.0190

************************ TOTAL EFFECT MODEL ************************

Outcome: Performance

Model Summary

R	R-sq	F	df1	df2	p
.6104	.3726	29.1962	6.0000	295.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	2.5746	.3744	6.8763	.0000	1.8377	3.3114
Bridging	.5701	.0453	12.5913	.0000	.4810	.6592
Gen	.0152	.0808	.1886	.8505	-.1438	.1743
DOP	-.1256	.0510	-2.4600	.0145	-.2260	-.0251
COP	.0426	.0302	1.4120	.1590	-.0168	.1019
PME	-.0111	.0093	-1.1921	.2342	-.0293	.0072
Age	.0063	.0054	1.1519	.2503	-.0044	.0170

**************** TOTAL, DIRECT, AND INDIRECT EFFECTS ****************

Total effect of X on Y

Effect	SE	t	p	LLCI	ULCI
.5701	.0453	12.5913	.0000	.4810	.6592

Direct effect of X on Y

Effect	SE	t	p	LLCI	ULCI
.5113	.0510	10.0264	.0000	.4109	.6116

Indirect effect of X on Y

	Effect	Boot SE	BootLLCI	BootULCI
Creativity	.0588	.0290	.0057	.1195

*********** PROCESS Procedure for SPSS Beta Release 140712 ***********

Model = 7
    Y = Performance
    X = Bridging
    M = Creativity
    W = Tech_risk

Statistical Controls:
CONTROL= Gen DOP COP PME Age

Sample size
302

****
Outcome: Creativity

Model Summary

R	R-sq	F	df1	df2	p
.6624	.4388	28.6350	8.0000	293.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	5.7249	.3083	18.5692	.0000	5.1181	6.3317
Bridging	.3777	.0624	6.0573	.0000	.2550	.5005
Tech_risk	.4792	.0487	9.8352	.0000	.3833	.5751
int_1	.0130	.0363	.3591	.7198	-.0584	.0845
Gen	.0932	.1024	.9101	.3635	-.1083	.2947
DOP	-.1333	.0649	-2.0524	.0410	-.2611	-.0055
COP	-.0380	.0389	-.9761	.3298	-.1145	.0386
PME	.0232	.0116	1.9918	.0473	.0003	.0461
Age	-.0123	.0069	-1.7787	.0763	-.0259	.0013

Interactions:

int_1 Bridging X Tech_risk
****
Outcome: Performance

Model Summary

R	R-sq	F	df1	df2	p
.6205	.3850	26.2906	7.0000	294.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	5.2862	.3347	15.7956	.0000	4.6275	5.9448
Creativity	.0974	.0400	2.4351	.0155	.0187	.1762
Bridging	.5113	.0510	10.0264	.0000	.4109	.6116
Gen	.0162	.0802	.2025	.8397	-.1415	.1740
DOP	-.1204	.0507	-2.3763	.0181	-.2201	-.0207
COP	.0377	.0300	1.2588	.2091	-.0213	.0967
PME	-.0131	.0092	-1.4211	.1564	-.0313	.0051
Age	.0082	.0055	1.5065	.1330	-.0025	.0190

******************** DIRECT AND INDIRECT EFFECTS ********************

Direct effect of X on Y

Effect	SE	t	p	LLCI	ULCI
.5113	.0510	10.0264	.0000	.4109	.6116

```
Conditional indirect effect(s) of X on Y at values of the moderator(s)

Mediator
           Tech_risk        Effect    Boot SE   BootLLCI   BootULCI
Creativity     2.0000      .0393      .0195      .0057      .0839

NOTE: The following variables were mean centered prior to analysis:
 Bridging Tech_risk



*********** PROCESS Procedure for SPSS Beta Release 140712 ***********
Model = 7
    Y = Performance
    X = Bridging
    M = Creativity
    W = Interdep

Statistical Controls:
CONTROL= Gen      DOP      COP      PME      Age

Sample size
        302

**********************************************************************
Outcome: Creativity
Model Summary
          R       R-sq          F        df1        df2          p
      .5145      .2647    13.1850     8.0000   293.0000      .0000

Model
            coeff         se          t          p       LLCI       ULCI
Constant   5.7991      .3518    16.4861      .0000     5.1068     6.4913
Bridging    .5400      .0745     7.2464      .0000      .3933      .6866
Interdep    .1369      .0646     2.1199      .0349      .0098      .2641
int_1       .0111      .0402      .2752      .7834     -.0680      .0901
Gen        -.0016      .1169     -.0135      .9892     -.2317      .2286
DOP        -.0732      .0746     -.9817      .3271     -.2201      .0736
COP         .0372      .0438      .8504      .3958     -.0489      .1233
PME         .0240      .0134     1.7889      .0747     -.0024      .0504
Age        -.0196      .0078    -2.4937      .0132     -.0350     -.0041

Interactions:

 int_1    Bridging    X     Interdep
**********************************************************************
Outcome: Performance

Model Summary
          R       R-sq          F        df1        df2          p

      .6205      .3850    26.2906     7.0000   294.0000      .0000
```

```
Model
              coeff         se          t          p       LLCI       ULCI
Constant     5.2862      .3347    15.7956      .0000     4.6275     5.9448
Creativity    .0974      .0400     2.4351      .0155      .0187      .1762
Bridging      .5113      .0510    10.0264      .0000      .4109      .6116
Gen           .0162      .0802      .2025      .8397     -.1415      .1740
DOP         -.1204      .0507    -2.3763      .0181     -.2201     -.0207
COP           .0377      .0300     1.2588      .2091     -.0213      .0967
PME         -.0131      .0092    -1.4211      .1564     -.0313      .0051
Age           .0082      .0055     1.5065      .1330     -.0025      .0190

******************** DIRECT AND INDIRECT EFFECTS *********************
Direct effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
      .5113      .0510    10.0264      .0000      .4109      .6116

Conditional indirect effect(s) of X on Y at values of the moderator(s)

Mediator
             Interdep     Effect    Boot SE    BootLLCI   BootULCI
Creativity     2.0000      .0548      .0284      .0032      .1177

NOTE: The following variables were mean centered prior to analysis:
 Bridging Interdep



*********** PROCESS Procedure for SPSS Beta Release 140712 ***********
Model = 7
    Y = Performance
    X = bridging
    M = Creativity
    W = T_Distrib

Statistical Controls:
CONTROL= Gen      DOP      COP      PME      Age

Sample size
        302

**********************************************************************
Outcome: Creativity

Model Summary
          R       R-sq          F        df1        df2          p
      .5819      .3387    18.7547     8.0000   293.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
Constant     5.6018      .3353    16.7088      .0000     4.9420     6.2616
Bridging      .5129      .0735     6.9756      .0000      .3682      .6576
T_Distrib     .2377      .0412     5.7689      .0000      .1566      .3187
```

int_1	.0511	.0375	1.3615	.1744	-.0228	.1249
Gen	.0304	.1108	.2743	.7841	-.1877	.2485
DOP	-.0855	.0698	-1.2252	.2215	-.2229	.0519
COP	-.0023	.0420	-.0547	.9564	-.0850	.0804
PME	.0237	.0126	1.8708	.0624	-.0012	.0486
Age	-.0122	.0075	-1.6226	.1057	-.0271	.0026

Interactions:

int_1 Bridging X T_Distrib

****
Outcome: Performance

Model Summary

R	R-sq	F	df1	df2	p
.6205	.3850	26.2906	7.0000	294.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	5.2862	.3347	15.7956	.0000	4.6275	5.9448
Creativity	.0974	.0400	2.4351	.0155	.0187	.1762
Bridging	.5113	.0510	10.0264	.0000	.4109	.6116
Gen	.0162	.0802	.2025	.8397	-.1415	.1740
DOP	-.1204	.0507	-2.3763	.0181	-.2201	-.0207
COP	.0377	.0300	1.2588	.2091	-.0213	.0967
PME	-.0131	.0092	-1.4211	.1564	-.0313	.0051
Age	.0082	.0055	1.5065	.1330	-.0025	.0190

******************* DIRECT AND INDIRECT EFFECTS ********************
Direct effect of X on Y

Effect	SE	t	p	LLCI	ULCI
.5113	.0510	10.0264	.0000	.4109	.6116

Conditional indirect effect(s) of X on Y at values of the moderator(s)

Mediator

	T_Distrib	Effect	Boot SE	BootLLCI	BootULCI
Creativity	2.0000	.0599	.0317	.0063	.1342

NOTE: The following variables were mean centered prior to analysis:
Bridging T_Distrib

*********** PROCESS Procedure for SPSS Beta Release 140712 ***********

Model = 7
Y = Performance
X = bridging
M = Creativity
W = teamdive

Statistical Controls:
CONTROL= Gen DOP COP PME Age

Sample size
302

****

Outcome: Creativity

Model Summary

R	R-sq	F	df1	df2	p
.5472	.2994	15.6503	8.0000	293.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	5.7664	.3427	16.8245	.0000	5.0919	6.4410
Bridging	.4682	.0753	6.2174	.0000	.3200	.6164
teamdive	.3031	.0692	4.3827	.0000	.1670	.4392
int_1	.0352	.0387	.9096	.3638	-.0410	.1114
Gen	-.0152	.1135	-.1341	.8935	-.2386	.2082
DOP	-.0431	.0722	-.5969	.5511	-.1852	.0990
COP	.0398	.0424	.9383	.3489	-.0437	.1232
PME	.0241	.0130	1.8510	.0652	-.0015	.0498
Age	-.0203	.0077	-2.6570	.0083	-.0354	-.0053

Interactions:
int_1 Bridging X teamdive

****

Outcome: Performance

Model Summary

R	R-sq	F	df1	df2	p
.6205	.3850	26.2906	7.0000	294.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	5.2862	.3347	15.7956	.0000	4.6275	5.9448
Creativity	.0974	.0400	2.4351	.0155	.0187	.1762
Bridging	.5113	.0510	10.0264	.0000	.4109	.6116
Gen	.0162	.0802	.2025	.8397	-.1415	.1740
DOP	-.1204	.0507	-2.3763	.0181	-.2201	-.0207
COP	.0377	.0300	1.2588	.2091	-.0213	.0967
PME	-.0131	.0092	-1.4211	.1564	-.0313	.0051
Age	.0082	.0055	1.5065	.1330	-.0025	.0190

```
******************** DIRECT AND INDIRECT EFFECTS *********************

Direct effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
      .5113      .0510    10.0264      .0000      .4109      .6116

Conditional indirect effect(s) of X on Y at values of the moderator(s)

Mediator
           teamdive     Effect    Boot SE   BootLLCI   BootULCI
Creativity     2.0000      .0525      .0285      .0016      .1152


NOTE: The following variables were mean centered prior to analysis:
 Bridging teamdive




*********** PROCESS Procedure for SPSS Beta Release 140712 ***********
Model = 7
    Y = Performance
    X = Bonding
    M = KME
    W = Tech_risk

Statistical Controls:
CONTROL= Gen      DOP      COP      PME      Age

Sample size
        302
**********************************************************************
Outcome: KME

Model Summary
          R       R-sq          F        df1        df2          p
      .6036      .3643    20.9928     8.0000   293.0000      .0000
Model
             coeff         se          t          p       LLCI       ULCI
Constant    6.1069      .2682    22.7713      .0000     5.5791     6.6347
Bonding      .5072      .0570     8.9048      .0000      .3951      .6192
Tech_risk    .1846      .0418     4.4178      .0000      .1023      .2668
int_1       -.0642      .0335    -1.9177      .0561     -.1301      .0017
Gen         -.0528      .0893     -.5912      .5548     -.2284      .1229
DOP         -.0515      .0567     -.9080      .3646     -.1632      .0601
COP         -.0014      .0337     -.0428      .9659     -.0678      .0649
PME          .0056      .0101      .5569      .5780     -.0142      .0255
Age         -.0053      .0060     -.8763      .3816     -.0172      .0066

Interactions:
 int_1    Bonding     X     Tech_risk
```

Outcome: Performance
Model Summary

R	R-sq	F	df1	df2	p
.7260	.5271	46.8055	7.0000	294.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	4.0146	.3450	11.6371	.0000	3.3356	4.6935
KME	.3361	.0448	7.5077	.0000	.2480	.4242
Bonding	.4476	.0496	9.0166	.0000	.3499	.5453
Gen	-.0137	.0703	-.1949	.8456	-.1521	.1247
DOP	-.0780	.0447	-1.7461	.0818	-.1660	.0099
COP	.0096	.0262	.3657	.7148	-.0421	.0613
PME	-.0041	.0080	-.5138	.6078	-.0199	.0116
Age	.0031	.0047	.6618	.5086	-.0062	.0125

******************** DIRECT AND INDIRECT EFFECTS ********************
Direct effect of X on Y

Effect	SE	t	p	LLCI	ULCI
.4476	.0496	9.0166	.0000	.3499	.5453

Conditional indirect effect(s) of X on Y at values of the moderator(s)

Mediator

	Tech_risk	Effect	Boot SE	BootLLCI	BootULCI
KME	2.0000	.1273	.0435	.0536	.2251

NOTE: The following variables were mean centered prior to analysis:
Bonding Tech_risk

*********** PROCESS Procedure for SPSS Beta Release 140712 ***********
Model = 7
Y = Performance
X = Bonding
M = KME
W = Interdep

Statistical Controls:
CONTROL= Gen DOP COP PME Age

Sample size
302

****
Outcome: KME

Model Summary

R	R-sq	F	df1	df2	p
.6171	.3809	22.5307	8.0000	293.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	6.1188	.2625	23.3121	.0000	5.6023	6.6354
Bonding	.4479	.0595	7.5269	.0000	.3308	.5650
Interdep	.1993	.0489	4.0730	.0001	.1030	.2956
int_1	-.0945	.0310	-3.0450	.0025	-.1556	-.0334
Gen	-.0891	.0876	-1.0167	.3101	-.2616	.0834
DOP	-.0357	.0565	-.6327	.5275	-.1469	.0754
COP	.0147	.0328	.4491	.6537	-.0498	.0792
PME	.0085	.0100	.8526	.3946	-.0111	.0281
Age	-.0063	.0059	-1.0759	.2829	-.0179	.0053

Interactions:

int_1 Bonding X Interdep

****
Outcome: Performance

Model Summary

R	R-sq	F	df1	df2	p
.7260	.5271	46.8055	7.0000	294.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	4.0146	.3450	11.6371	.0000	3.3356	4.6935
KME	.3361	.0448	7.5077	.0000	.2480	.4242
Bonding	.4476	.0496	9.0166	.0000	.3499	.5453
Gen	-.0137	.0703	-.1949	.8456	-.1521	.1247
DOP	-.0780	.0447	-1.7461	.0818	-.1660	.0099
COP	.0096	.0262	.3657	.7148	-.0421	.0613
PME	-.0041	.0080	-.5138	.6078	-.0199	.0116
Age	.0031	.0047	.6618	.5086	-.0062	.0125

******************** DIRECT AND INDIRECT EFFECTS ********************
Direct effect of X on Y

Effect	SE	t	p	LLCI	ULCI
.4476	.0496	9.0166	.0000	.3499	.5453

Conditional indirect effect(s) of X on Y at values of the moderator(s)

Mediator

	Interdep	Effect	Boot SE	BootLLCI	BootULCI
KME	2.0000	.0870	.0393	.0164	.1743

NOTE: The following variables were mean centered prior to analysis:
Bonding Interdep

*********** PROCESS Procedure for SPSS Beta Release 140712 ***********

Model = 7
Y = Performance
X = bonding
M = KME
W = T_Distrib

Statistical Controls:
CONTROL= Gen DOP COP PME Age

Sample size
302

****

Outcome: KME

Model Summary

R	R-sq	F	df1	df2	p
.5791	.3354	18.4816	8.0000	293.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	6.1226	.2768	22.1196	.0000	5.5779	6.6674
Bonding	.5507	.0576	9.5673	.0000	.4374	.6639
T_Distrib	.0798	.0328	2.4303	.0157	.0152	.1445
int_1	-.0570	.0312	-1.8302	.0682	-.1183	.0043
Gen	-.1028	.0918	-1.1196	.2638	-.2835	.0779
DOP	-.0276	.0578	-.4780	.6330	-.1413	.0861
COP	.0135	.0342	.3936	.6942	-.0539	.0808
PME	.0053	.0103	.5111	.6097	-.0150	.0255
Age	-.0061	.0062	-.9870	.3244	-.0184	.0061

Interactions:
int_1 bonding X T_Distrib

****

Outcome: Performance

Model Summary

R	R-sq	F	df1	df2	p
.7260	.5271	46.8055	7.0000	294.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
constant	4.0146	.3450	11.6371	.0000	3.3356	4.6935
KME	.3361	.0448	7.5077	.0000	.2480	.4242
bonding	.4476	.0496	9.0166	.0000	.3499	.5453
Gen	-.0137	.0703	-.1949	.8456	-.1521	.1247
DOP	-.0780	.0447	-1.7461	.0818	-.1660	.0099
COP	.0096	.0262	.3657	.7148	-.0421	.0613
PME	-.0041	.0080	-.5138	.6078	-.0199	.0116
Age	.0031	.0047	.6618	.5086	-.0062	.0125

```
******************* DIRECT AND INDIRECT EFFECTS ********************
Direct effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
      .4476      .0496     9.0166      .0000      .3499      .5453

Conditional indirect effect(s) of X on Y at values of the moderator(s)

Mediator
      T_Distrib      Effect    Boot SE   BootLLCI   BootULCI
KME     2.0000      .1467      .0462      .0670      .2491

NOTE: The following variables were mean centered prior to analysis:
 Bonding  T_Distrib
```

```
*********** PROCESS Procedure for SPSS Beta Release 140712 ***********
Model = 7
    Y = Performance
    X = Bonding
    M = KME
    W = teamdive

Statistical Controls:
CONTROL= Gen      DOP      COP      PME      Age

Sample size
        302

**************************************************************************
Outcome: KME
Model Summary
          R       R-sq          F        df1        df2          p
      .6277      .3940    23.8133     8.0000   293.0000      .0000

Model
            coeff         se          t          p       LLCI       ULCI
Constant   6.0615      .2600    23.3107      .0000     5.5497     6.5733
Bonding     .4472      .0579     7.7271      .0000      .3333      .5611
teamdive    .2585      .0499     5.1846      .0000      .1604      .3567
int_1      -.0689      .0305    -2.2611      .0245     -.1288     -.0089
Gen        -.0887      .0864    -1.0274      .3051     -.2587      .0813
DOP         .0012      .0552      .0209      .9833     -.1074      .1097
COP         .0240      .0322      .7442      .4573     -.0394      .0874
PME         .0062      .0098      .6276      .5307     -.0132      .0255
Age        -.0074      .0058    -1.2711      .2047     -.0188      .0041

Interactions:
 int_1    Bonding     X     teamdive
```

```
**********************************************************************
Outcome: Performance
Model Summary
          R       R-sq          F        df1        df2          p
      .7260      .5271    46.8055     7.0000   294.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
Constant     4.0146      .3450    11.6371      .0000     3.3356     4.6935
KME           .3361      .0448     7.5077      .0000      .2480      .4242
Bonding       .4476      .0496     9.0166      .0000      .3499      .5453
Gen          -.0137      .0703     -.1949      .8456     -.1521      .1247
DOP          -.0780      .0447    -1.7461      .0818     -.1660      .0099
COP           .0096      .0262      .3657      .7148     -.0421      .0613
PME          -.0041      .0080     -.5138      .6078     -.0199      .0116
Age           .0031      .0047      .6618      .5086     -.0062      .0125

******************** DIRECT AND INDIRECT EFFECTS *********************
Direct effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
      .4476      .0496     9.0166      .0000      .3499      .5453

Conditional indirect effect(s) of X on Y at values of the moderator(s)

Mediator
      teamdive     Effect     Boot SE     BootLLCI   BootULCI
KME     2.0000      .1040      .0331      .0472      .1809

NOTE: The following variables were mean centered prior to analysis:
 Bonding  teamdive




*********** PROCESS Procedure for SPSS Beta Release 140712 ***********
Model = 7
    Y = Performance
    X = Bonding
    M = Creativity
    W = Tech_risk

Statistical Controls:
CONTROL= Gen      DOP      COP      PME      Age

Sample size
        302

**********************************************************************
Outcome: Creativity

Model Summary
          R       R-sq          F        df1        df2          p
      .6534      .4270    27.2885     8.0000   293.0000      .0000
```

Model

	coeff	se	t	p	LLCI	ULCI
Constant	5.8562	.3109	18.8383	.0000	5.2444	6.4680
Bonding	.3604	.0660	5.4587	.0000	.2304	.4903
Tech_risk	.5014	.0484	10.3537	.0000	.4061	.5967
int_1	.0243	.0388	.6255	.5321	-.0521	.1007
Gen	.0642	.1035	.6202	.5356	-.1395	.2678
DOP	-.1216	.0658	-1.8493	.0654	-.2510	.0078
COP	-.0562	.0391	-1.4377	.1516	-.1330	.0207
PME	.0293	.0117	2.5066	.0127	.0063	.0523
Age	-.0153	.0070	-2.1893	.0294	-.0291	-.0015

Interactions:
 int_1   Bonding   X   Tech_risk

****
Outcome: Performance

Model Summary

R	R-sq	F	df1	df2	p
.6703	.4492	34.2589	7.0000	294.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	5.4805	.3182	17.2215	.0000	4.8542	6.1068
Creativity	.0966	.0369	2.6201	.0092	.0240	.1692
Bonding	.5981	.0494	12.1063	.0000	.5009	.6953
Gen	-.0359	.0758	-.4729	.6366	-.1851	.1134
DOP	-.0826	.0482	-1.7139	.0876	-.1775	.0123
COP	.0165	.0283	.5827	.5605	-.0392	.0722
PME	-.0053	.0087	-.6071	.5443	-.0225	.0119
Age	.0030	.0052	.5786	.5633	-.0072	.0132

******************** DIRECT AND INDIRECT EFFECTS ********************
Direct effect of X on Y

Effect	SE	t	p	LLCI	ULCI
.5981	.0494	12.1063	.0000	.5009	.6953

Conditional indirect effect(s) of X on Y at values of the moderator(s)

Mediator

	Tech_risk	Effect	Boot SE	BootLLCI	BootULCI
Creativity	2.0000	.0395	.0193	.0085	.0870

NOTE: The following variables were mean centered prior to analysis:
 Bonding Tech_risk

```
*********** PROCESS Procedure for SPSS Beta Release 140712 ***********
Model = 7
    Y = Performance
    X = Bonding
    M = Creativity
    W = Interdep

Statistical Controls:
CONTROL= Gen      DOP      COP      PME      Age
Sample size
        302

**********************************************************************
Outcome: Creativity

Model Summary
         R       R-sq          F        df1        df2          p
      .4789      .2294    10.9012     8.0000   293.0000      .0000

Model
            coeff         se          t          p       LLCI       ULCI
Constant   6.0292      .3575    16.8649      .0000     5.3256     6.7328
Bonding     .4757      .0810     5.8695      .0000      .3162      .6352
Interdep    .1545      .0666     2.3179      .0211      .0233      .2856
int_1      -.0216      .0423     -.5099      .6105     -.1048      .0617
Gen        -.0607      .1194     -.5084      .6115     -.2956      .1742
DOP        -.0512      .0769     -.6661      .5058     -.2026      .1001
COP         .0156      .0446      .3490      .7274     -.0723      .1034
PME         .0338      .0136     2.4915      .0133      .0071      .0605
Age        -.0247      .0080    -3.0857      .0022     -.0405     -.0090

Interactions:
int_1    Bonding     X     Interdep
**********************************************************************
Outcome: Performance

Model Summary
         R       R-sq          F        df1        df2          p
      .6703      .4492    34.2589     7.0000   294.0000      .0000

Model
            coeff         se          t          p       LLCI       ULCI
Constant   5.4805      .3182    17.2215      .0000     4.8542     6.1068
Creativity  .0966      .0369     2.6201      .0092      .0240      .1692
Bonding     .5981      .0494    12.1063      .0000      .5009      .6953
Gen        -.0359      .0758     -.4729      .6366     -.1851      .1134
DOP        -.0826      .0482    -1.7139      .0876     -.1775      .012
COP         .0165      .0283      .5827      .5605     -.0392      .0722
PME        -.0053      .0087     -.6071      .5443     -.0225      .0119
Age         .0030      .0052      .5786      .5633     -.0072      .0132
```

```
******************** DIRECT AND INDIRECT EFFECTS *********************
Direct effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
      .5981      .0494    12.1063      .0000      .5009      .6953

Conditional indirect effect(s) of X on Y at values of the moderator(s)

Mediator
             Interdep     Effect    Boot SE   BootLLCI   BootULCI
Creativity     2.0000      .0418      .0221      .0071      .0931

Values for quantitative moderators are the mean and plus/minus one SD
from mean


NOTE: The following variables were mean centered prior to analysis:
 Bonding  Interdep





*********** PROCESS Procedure for SPSS Beta Release 140712 ***********
Model = 7
    Y = Performance
    X = bonding
    M = Creativity
    W = T_Distrib

Statistical Controls:
CONTROL= Gen      DOP      COP      PME      Age

Sample size
        302
Outcome: Creativity
Model Summary
          R       R-sq          F        df1        df2          p
      .5688      .3235    17.5135     8.0000   293.0000      .0000

Model
            coeff         se          t          p       LLCI       ULCI
Constant   5.8462      .3409    17.1478      .0000     5.1752     6.5172
Bonding     .4407      .0709     6.2165      .0000      .3012      .5802
T_Dist      .2794      .0405     6.9050      .0000      .1997      .3590
int_1      -.0223      .0384     -.5823      .5608     -.0979      .0532
Gen        -.0372      .1131     -.3293      .7422     -.2598      .1853
DOP        -.0687      .0711     -.9654      .3352     -.2087      .0713
COP        -.0219      .0422     -.5183      .6046     -.1048      .0611
PME         .0309      .0127     2.4352      .0155      .0059      .0559
Age        -.0164      .0077    -2.1428      .0330     -.0315     -.0013

Interactions:
 int_1    Bonding     X     T_Distrib
```

```
Outcome: Performance
Model Summary
          R       R-sq          F        df1        df2          p
      .6703      .4492    34.2589     7.0000   294.0000      .0000

Model
             coeff         se          t          p       LLCI       ULCI
Constant    5.4805      .3182    17.2215      .0000     4.8542     6.1068
Creativity   .0966      .0369     2.6201      .0092      .0240      .1692
Bonding      .5981      .0494    12.1063      .0000      .5009      .6953
Gen         -.0359      .0758     -.4729      .6366     -.1851      .1134
DOP         -.0826      .0482    -1.7139      .0876     -.1775      .0123
COP          .0165      .0283      .5827      .5605     -.0392      .0722
PME         -.0053      .0087     -.6071      .5443     -.0225      .0119
Age          .0030      .0052      .5786      .5633     -.0072      .0132

******************** DIRECT AND INDIRECT EFFECTS ********************

Direct effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
      .5981      .0494    12.1063      .0000      .5009      .6953

Conditional indirect effect(s) of X on Y at values of the moderator(s)

Mediator
           T_Distrib      Effect    Boot SE   BootLLCI   BootULCI
Creativity    2.0000       .0383      .0198      .0073      .0863

NOTE: The following variables were mean centered prior to analysis:
 Bonding  T_Distrib



*********** PROCESS Procedure for SPSS Beta Release 140712 ***********
Model = 7
    Y = Performance
    X = Bonding
    M = Creativity
    W = teamdive

Statistical Controls:
CONTROL= Gen      DOP      COP      PME      Age

Sample size
        302

**********************************************************************
Outcome: Creativity

Model Summary
          R       R-sq          F        df1        df2          p
      .5312      .2822    14.3968     8.0000   293.0000      .0000
```

Model

	coeff	se	t	p	LLCI	ULCI
Constant	5.9411	.3455	17.1951	.0000	5.2611	6.6211
Bonding	.4237	.0769	5.5108	.0000	.2724	.5751
teamdive	.3507	.0663	5.2930	.0000	.2203	.4811
int_1	.0242	.0405	.5985	.5499	-.0554	.1039
Gen	-.0596	.1148	-.5191	.6041	-.2855	.1663
DOP	-.0188	.0733	-.2565	.7977	-.1630	.1254
COP	.0205	.0428	.4792	.6321	-.0638	.1048
PME	.0322	.0131	2.4648	.0143	.0065	.0580
Age	-.0247	.0077	-3.1956	.0015	-.0399	-.0095

Interactions:
int_1   Bonding   X   teamdive

****
Outcome: Performance
Model Summary

R	R-sq	F	df1	df2	p
.6703	.4492	34.2589	7.0000	294.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	5.4805	.3182	17.2215	.0000	4.8542	6.1068
Creativity	.0966	.0369	2.6201	.0092	.0240	.1692
Bonding	.5981	.0494	12.1063	.0000	.5009	.6953
Gen	-.0359	.0758	-.4729	.6366	-.1851	.1134
DOP	-.0826	.0482	-1.7139	.0876	-.1775	.0123
COP	.0165	.0283	.5827	.5605	-.0392	.0722
PME	-.0053	.0087	-.6071	.5443	-.0225	.0119
Age	.0030	.0052	.5786	.5633	-.0072	.0132

******************** DIRECT AND INDIRECT EFFECTS ********************
Direct effect of X on Y

Effect	SE	t	p	LLCI	ULCI
.5981	.0494	12.1063	.0000	.5009	.6953

Conditional indirect effect(s) of X on Y at values of the moderator(s)

Mediator

	teamdive	Effect	Boot SE	BootLLCI	BootULCI
Creativity	2.0000	.0456	.0243	.0068	.0999

NOTE: The following variables were mean centered prior to analysis:
Bonding teamdive

Table A-6: Post-hoc Analysis

```
*********** PROCESS Procedure for SPSS Beta Release 140712 ***********
Model = 7
    Y = Performance
    X = Bonding
    M = KME
    W = P_complex

Statistical Controls:
CONTROL= Gen      DOP      COP      PME      Age

Sample size
        302
**********************************************************************
Outcome: KME

Model Summary
          R       R-sq          F        df1        df2          p
      .6374      .4063    25.0626     8.0000   293.0000      .0000

Model
             coeff         se          t          p       LLCI       ULCI
Constant    6.0592      .2592    23.3810      .0000     5.5491     6.5692
Bonding      .3939      .0602     6.5411      .0000      .2754      .5125
P_complex    .3568      .0600     5.9430      .0000      .2386      .4750
int_1       -.0961      .0349    -2.7564      .0062     -.1647     -.0275
Gen         -.0652      .0863     -.7558      .4504     -.2351      .1046
DOP         -.0482      .0549     -.8773      .3810     -.1563      .0599
COP         -.0096      .0325     -.2967      .7669     -.0737      .0544
PME          .0067      .0097      .6841      .4945     -.0125      .0258
Age         -.0029      .0059     -.4993      .6179     -.0144      .0086

Interactions:
 int_1    Bonding     X     P_complex

**********************************************************************
Outcome: Performance

Model Summary
          R       R-sq          F        df1        df2          p
      .7260      .5271    46.8055     7.0000   294.0000      .0000

Model
             coeff         se          t          p       LLCI       ULCI
Constant    4.0146      .3450    11.6371      .0000     3.3356     4.6935
KME          .3361      .0448     7.5077      .0000      .2480      .4242
Bonding      .4476      .0496     9.0166      .0000      .3499      .5453
Gen         -.0137      .0703     -.1949      .8456     -.1521      .1247
DOP         -.0780      .0447    -1.7461      .0818     -.1660      .0099
COP          .0096      .0262      .3657      .7148     -.0421      .0613
PME         -.0041      .0080     -.5138      .6078     -.0199      .0116
```

```
Age         .0031      .0047      .6618     .5086    -.0062      .0125

******************** DIRECT AND INDIRECT EFFECTS ********************
Direct effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
      .4476      .0496     9.0166      .0000      .3499      .5453

Conditional indirect effect(s) of X on Y at values of the moderator(s)

Mediator
      P_complex     Effect    Boot SE   BootLLCI   BootULCI
KME     2.0000      .0678      .0564     -.0409      .1600


NOTE: The following variables were mean centered prior to analysis:
 Bonding  P_complex




*********** PROCESS Procedure for SPSS Beta Release 140712 ***********
Model = 7
    Y = Performance
    X = bridging
    M = KME
    W = P_complex

Statistical Controls:
CONTROL= Gen      DOP      COP      PME      Age

Sample size
        302

Outcome: KME
Model Summary
          R       R-sq          F        df1        df2          p
      .6338      .4016    24.5845     8.0000   293.0000      .0000

Model
            coeff         se          t          p       LLCI       ULCI
Constant   5.8698      .2606    22.5222      .0000     5.3569     6.3828
Bridging    .4144      .0616     6.7232      .0000      .2931      .5357
P_complex   .3070      .0637     4.8216      .0000      .1817      .4323
int_1      -.0648      .0356    -1.8188      .0700     -.1349      .0053
Gen        -.0172      .0865     -.1987      .8426     -.1873      .1530
DOP        -.0682      .0548    -1.2436      .2146     -.1761      .0397
COP         .0147      .0330      .4465      .6556     -.0503      .0798
PME        -.0008      .0099     -.0840      .9331     -.0203      .0186
Age         .0010      .0059      .1709      .8644     -.0105      .0125

Interactions:
 int_1    Bridging    X     P_complex
**********************************************************************
```

Outcome: Performance
Model Summary

R	R-sq	F	df1	df2	p
.6912	.4778	38.4264	7.0000	294.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
Constant	3.6829	.3591	10.2556	.0000	2.9761	4.3896
KME	.3702	.0481	7.6961	.0000	.2756	.4649
Bridging	.3438	.0508	6.7741	.0000	.2439	.4437
Gen	.0246	.0739	.3331	.7393	-.1208	.1700
DOP	-.1069	.0467	-2.2881	.0228	-.1988	-.0149
COP	.0233	.0277	.8417	.4006	-.0312	.0778
PME	-.0093	.0085	-1.0999	.2723	-.0260	.0074
Age	.0070	.0050	1.3963	.1637	-.0028	.0168

******************** DIRECT AND INDIRECT EFFECTS ********************

Direct effect of X on Y

Effect	SE	t	p	LLCI	ULCI
.3438	.0508	6.7741	.0000	.2439	.4437

Conditional indirect effect(s) of X on Y at values of the moderator(s)

Mediator

	P_complex	Effect	Boot SE	BootLLCI	BootULCI
KME	2.0000	.1055	.0572	-.0083	.2245

NOTE: The following variables were mean centered prior to analysis:
Bridging P_complex

*********** PROCESS Procedure for SPSS Beta Release 140712 ***********
Model = 7
Y = Performance
X = Bonding
M = Creativity
W = P_complex

Statistical Controls:
CONTROL= Gen DOP COP PME Age

Sample size
302

****
Outcome: Creativity

```
Model Summary
          R       R-sq          F        df1        df2          p
      .6473      .4189    26.4069     8.0000   293.0000      .0000

Model
             coeff         se          t          p       LLCI       ULCI
Constant    5.7786      .3130    18.4626      .0000     5.1626     6.3946
Bonding      .2338      .0727     3.2138      .0015      .0906      .3769
P_complex    .7385      .0725    10.1850      .0000      .5958      .8812
int_1        .0195      .0421      .4629      .6438     -.0634      .1023
Gen          .0317      .1042      .3045      .7609     -.1734      .2369
DOP         -.1134      .0664    -1.7094      .0884     -.2441      .0172
COP         -.0522      .0393    -1.3290      .1849     -.1295      .0251
PME          .0331      .0118     2.8125      .0052      .0099      .0562
Age         -.0133      .0071    -1.8857      .0603     -.0273      .0006

Interactions:
 int_1    Bonding     X     P_complex

**********************************************************************
Outcome: Performance

Model Summary
          R       R-sq          F        df1        df2          p
      .6703      .4492    34.2589     7.0000   294.0000      .0000

Model
             coeff         se          t          p       LLCI       ULCI
Constant    5.4805      .3182    17.2215      .0000     4.8542     6.1068
Creativity   .0966      .0369     2.6201      .0092      .0240      .1692
Bonding      .5981      .0494    12.1063      .0000      .5009      .6953
Gen         -.0359      .0758     -.4729      .6366     -.1851      .1134
DOP         -.0826      .0482    -1.7139      .0876     -.1775      .0123
COP          .0165      .0283      .5827      .5605     -.0392      .0722
PME         -.0053      .0087     -.6071      .5443     -.0225      .0119
Age          .0030      .0052      .5786      .5633     -.0072      .0132

******************** DIRECT AND INDIRECT EFFECTS ********************

Direct effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
      .5981      .0494    12.1063      .0000      .5009      .6953

Conditional indirect effect(s) of X on Y at values of the moderator(s)

Mediator
           P_complex     Effect    Boot SE   BootLLCI   BootULCI
Creativity    2.0000      .0264      .0156      .0031      .0670

NOTE: The following variables were mean centered prior to analysis:
 Bonding  P_complex
*********** PROCESS Procedure for SPSS Beta Release 140712 ***********
```

```
Model = 7
    Y = Performance
    X = Bridging
    M = Creativity
    W = P_complex

Statistical Controls:
CONTROL= Gen      DOP      COP      PME      Age

Sample size
        302

**********************************************************************
Outcome: Creativity

Model Summary
          R       R-sq          F        df1        df2          p
      .6501      .4227    26.8132     8.0000   293.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
Constant     5.6807      .3125    18.1760      .0000     5.0656     6.2959
Bridging      .2607      .0739     3.5270      .0005      .1152      .4062
P_complex     .7055      .0763     9.2403      .0000      .5552      .8557
int_1         .0389      .0427      .9115      .3628     -.0451      .1230
Gen           .0556      .1037      .5363      .5922     -.1485      .2597
DOP          -.1245      .0658    -1.8936      .0593     -.2540      .0049
COP          -.0401      .0396    -1.0134      .3117     -.1181      .0378
PME           .0288      .0118     2.4348      .0155      .0055      .0521
Age          -.0113      .0070    -1.6079      .1089     -.0251      .0025

Interactions:
 int_1    Bridging    X     P_complex

**********************************************************************
Outcome: Performance

Model Summary
          R       R-sq          F        df1        df2          p
      .6205      .3850    26.2906     7.0000   294.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
Constant     5.2862      .3347    15.7956      .0000     4.6275     5.9448
Creativity    .0974      .0400     2.4351      .0155      .0187      .1762
Bridging      .5113      .0510    10.0264      .0000      .4109      .6116
Gen           .0162      .0802      .2025      .8397     -.1415      .1740
DOP          -.1204      .0507    -2.3763      .0181     -.2201     -.0207
COP           .0377      .0300     1.2588      .2091     -.0213      .0967
PME          -.0131      .0092    -1.4211      .1564     -.0313      .0051
Age           .0082      .0055     1.5065      .1330     -.0025      .0190

******************** DIRECT AND INDIRECT EFFECTS *********************
```

```
Direct effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
      .5113      .0510    10.0264      .0000      .4109      .6116

Conditional indirect effect(s) of X on Y at values of the moderator(s)

Mediator
             P_complex     Effect    Boot SE   BootLLCI   BootULCI
Creativity     2.0000      .0330      .0200      .0026      .0848

NOTE: The following variables were mean centered prior to analysis:
 Bridging P_complex
```

Appendix A content goes on this page.

Appendix B

Results of the Text Analysis

Ranked Concept List

Name-Like	Count	Relevance
Alcon	15	06%
PMO	5	02%
R&d	4	02%
Asia	2	01%

Word-Like	Count	Relevance
project	196	83%
people	90	38%
manager	81	34%
work	71	30%
business	70	30%
team	66	28%
members	58	24%
meeting	54	23%
time	49	21%
zones	45	19%
complex	40	17%
different	38	16%
problem	33	14%
system	33	14%
person	27	11%
requirements	27	11%
lead	26	11%
change	25	11%
group	18	08%
important	18	08%
involved	16	07%
start	16	07%
schedule	15	06%
risk	14	06%
critical	13	05%
resources	12	05%
vendor	12	05%

technical	11	05%
experience	11	05%
huge	11	05%
core	9	04%
charter	8	03%
assigned	6	03%
performing	5	02%
title	5	02%
funding	5	02%
year	5	02%
number	4	02%
owner	4	02%
levels	3	01%
synergy	3	01%
running	3	01%
approach	3	01%
segmentation	3	01%
forum	3	01%
segmented	3	01%
wrong	2	01%
spend	2	01%

Tag	Count	Relevance
FILE: t2	237	100%
FILE: t5	113	48%
FILE: t1	81	34%
FILE: t3	73	31%
FILE: t4	65	27%

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