UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
Denkleiers • Leading Minds • Dikgopolo tša Dihlalefi

GORDON INSTITUTE
OF BUSINESS SCIENCE
University of Pretoria

Identifying powerful project stakeholders using workflow, communication and friendship social networks

Karl-Heinz Wessinger
10679015

A research project submitted to the Gordon Institute of Business Science, University of Pretoria, in partial fulfilment of the requirements for the degree of Master of Business Administration.

Abstract

The social networks of IT projects are examined to determine whether powerful stakeholders are identifiable by their centrality in the communication, workflow and friendship networks. Traditional stakeholder models rely on the abilities of the project manager to correctly attribute certain characteristics to stakeholders and thereby determine who is powerful or important to the project. The purpose of the research is to provide an initial network-based stakeholder model that can be used to identify stakeholders by their social interactions in project teams.

Stakeholder interactions and power ratings are collected from project team members that are part of three IT projects using social network tools and the resultant sociomatrices analysed to produce centrality measures for each stakeholder. The power ratings consisted of positional, personal and political power variables which were then entered into a regression analysis with nine centrality measures for degree, closeness and betweenness centrality. Overall, the results provided evidence that powerful stakeholders could be determined by their centrality in the various network types. Stakeholders with high personal power can be identified using the communications network. Those with high positional power can be identified using the workflow network and those with high political power can be identified using the friendship network.

Keywords

Stakeholder, Social, Network, Power, Model

Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

_____ _____

Karl-Heinz Wessinger Date

Acknowledgements

I would like to acknowledge the following people who have supported me during my MBA and through my research:

- My wife, Caroline, for her support, encouragement and patience. I could not have done this without you!
- My son, Evan, who was born during this journey and will now get to see a whole lot more of me.
- Pieter Pretorius, my supervisor, for his guidance and support in a field that is not his speciality. Thanks for pulling through for me!
- The company, project managers and project teams that provided the data.
- Wayne Human, who gave me the confidence to take on this challenge and provided the support and time off work to be able to complete my MBA.

Table of Contents

List of Figures

List of Tables

1 Introduction to the research problem

1.1 Research title

Identifying powerful project stakeholders using workflow, communication and friendship social networks

1.2 Research problem

Information technology (IT) projects are typically complex requiring significant communication and strong commitment of resources from influential business and technology stakeholders to achieve success. In many cases IT project success has been mediocre with projects exceeding their budgets, overrunning on delivery timelines and delivering only partial functionality. The Standish Group's (2009) CHAOS report showed that only 32% of IT projects succeeded in delivering on time, on budget and with the required features. Research from IAG Consulting in 2008 found that 68% of IT projects fail (ZDNet.com, 2008) so achieving project success is clearly a difficult task.

One factor influencing project success is whether project managers are able to develop robust relationships with powerful project stakeholders and pay attention to their needs and expectations (Bourne & Walker, 2006, p. 20). Effective communication is the key to building relationships and managing expectations within projects (Assudani & Kloppenborg, 2010). Preble (2005) argued that

stakeholders should be managed instrumentally to provide the necessary resources to enhance the financial performance of organisations. In a project context, managing stakeholders instrumentally should therefore ensure that stakeholders are aligned with the project objectives and that their influence is used to contribute to the return on investment. When contributions to a project come from a strong coalition of influential and mutually supportive stakeholders they increase the likelihood of successful project outcomes (Jepsen & Eskerod, 2009). Good stakeholder management is therefore becoming a more important task for project managers and the available tools must be able to deal with the complex and dynamic nature of IT projects.

Several stakeholder models have been developed and applied in the project environment to help project managers identify, classify and manage stakeholders. Traditional stakeholder models include the Stakeholder Salience Model (Mitchell, Agle, & Wood, 1997), the Stakeholder Grid (Boddy & Paton, 2004), the Power/Interest Matrix (Olander & Landin, 2005) and the Stakeholder Circle™ (Bourne & Walker, 2006). These stakeholder models are reliant on the ability of the project manager and sponsor to identify key stakeholders, perceive their relationships with others and understand their level of influence on the project. Assudani and Kloppenberg (2010) suggest that these models take a static view of stakeholders where the analysis of stakeholders is conducted only by the project manager upfront or during the planning stages of a project and assume that the project manager on his own is able to correctly identify the potential stakeholders.

1.3 Research motivation

The weakness of traditional stakeholder models is that they place heavy emphasis on front-end planning and the cognitive ability of the project manager to perceive the attributes of each stakeholder. It is left to project managers to identify stakeholders, characterise their needs and expectations and decide on a strategy to influence them to achieve successful outcomes (Jepsen & Eskerod, 2009). It is however difficult perceive many of the attributes required by traditional stakeholder models and to foresee which stakeholders will be influential as the project is implemented. Perhaps this is why models such as Mitchell's stakeholder salience model have had limited practical application (Knox & Gruar, 2007).

Even when stakeholders can be identified the project manager cannot be certain that these stakeholders are actually the most important. There may be stakeholders that are not perceived by the project manager as important but actually play a vital role in the execution of the project. Project managers also cannot determine whether important stakeholders use their influence to support or restrain the project. Furthermore, as projects move through their various stages the needs, expectations and influence of different stakeholders change which means that project managers must adjust (Assudani & Kloppenborg, 2010). Bourne and Walker (2006) found that many projects fail because the team does not recognise changes in the relative power or position of key stakeholders and does not adjust the approach to interacting with these stakeholders.

An opportunity exists to examine other means of identifying important project stakeholders that overcome some of the weaknesses of traditional stakeholder models. Bourne and Walker (2005) suggested that social network analysis was a useful way of visualising stakeholder power and influence in a project. Assudani and Kloppenberg (2010) also suggested that a stakeholder model could be developed using social network analysis that uses the workflow and communication network to identify important stakeholders. Rowley (1997) has developed a network-based stakeholder model to classify guide the management of stakeholders in an organisational environment. This study proposes that social network analysis provides an alternative tool that can be used to identify important stakeholders based on their power and influence in the project network.

If social network analysis is to overcome some traditional stakeholder model weaknesses then multiple inputs should be used as input to the identification process so that hidden stakeholders can be uncovered. Furthermore, it should determine actual the importance of stakeholders based on their level of power and influence rather than just perceived importance based on certain attributes. Network analysis may provide a solution as it is able to visualise and measure interactions amongst groups of individuals within a project and could provide a dynamic stakeholder identification model (Assudani & Kloppenborg, 2010).

1.4 Research scope and aim

The aim of this study is to develop an initial network-based project stakeholder model as proposed by Assudani and Kloppenborg (2010). Social networks have been used to measure several forms of individual power (Krackhardt, 1990; Brass & Burkhardt, 1993; Ibarra & Andrews, 1993) and stakeholder influence can be mapped visually using social networks (Bourne & Walker, 2006). Chinowsky, Diekmann, and Galotti (2008) developed a network-based model for construction projects, called the "Social Network Model of Construction". Their model provides a means for identifying and understanding the key individuals and interactions but is limited to construction organisations only.

Assudani and Kloppenborg (2010) suggested that an emergent model for stakeholder management should be developed using social network analysis to manage stakeholders using the workflow and communication network. They believed that such a network model could identify and classify stakeholders in the same way as Mitchell's traditional Stakeholder Salience Model (1997) but would be more effective than traditional stakeholder models. This study links traditional stakeholder models to the underlying premise that they are used to measure stakeholder power and uses three network types to identify powerful stakeholders based on their influence on the project.

The first network type used is the communication network which encompasses the formal and informal communication channels of a project team (Assudani & Kloppenborg, 2010). Secondly, the workflow network type is used as it relates to the contributions or access to resources by individuals in the network (Assudani & Kloppenborg, 2010). The third network type is the friendship network which has been used in the social network studies related to individual power within a network because it measures the alliances that are formed by friendships (Krackhardt, 1990; Brass & Burkhardt, 1993; Ibarra & Andrews, 1993).

The relationship between social networks and powerful project stakeholders will be tested by gathering empirical data from IT projects in one of South Africa's large banks. The research scope includes:

- Linking common stakeholder attributes based on current stakeholder models to stakeholder power.
- The use of suitable network types and network measures to represent stakeholder power in a project network.
- The development and testing of an initial project stakeholder network model using empirical data. The objective of the tests is to determine whether powerful stakeholders can be identified and linked to specific types of power.

1.5 Conclusion

The following chapter provides a review of the current literature on project stakeholder models, social network analysis. It also covers the theory for the development of a project stakeholder network model. Thereafter, specific hypothesis are developed and the research design and approach are explained. The results of the empirical data gathering and analysis are presented followed by a discussion of the results in terms of the expected and actual outcomes. The study will conclude with a summary of the findings and recommendations for future research.

2 Theory and literature review

2.1 Introduction

In order to define and describe a social network model that can be used to identify project stakeholders based on their sources of power it is necessary to review the existing theory that supports the development of such a model. The fields of project stakeholder management and social network analysis are the primary theoretical bases.

A brief review of the literature on strategic project management highlights the importance of managing project stakeholders and how the discipline of project management has evolved to measure success in terms of stakeholder satisfaction. Project stakeholders and their roles in a project environment are defined and two generic approaches to mapping project stakeholders are briefly reviewed before introducing a variety of stakeholder models that have been gathered from existing literature.

The stakeholder models range from generic stakeholder models to project-based stakeholder models that aid project managers in identifying and classifying important project stakeholders and managing them appropriately based on their attributes. Existing literature is used to argue that the stakeholder models use attributes as proxies for stakeholder sources of power. The sources of power are described and linked to the various attributes used by the stakeholder models to

describe powerful stakeholders and their influence on project networks using those sources of power.

Relevant social network analysis literature is reviewed to explain how stakeholder interaction can be measured using network centrality which provides a suitable means of visualising stakeholder influence on projects. Once the theoretical foundation for network centrality measurement is established with its relevance to measuring influence, three network types are discussed, workflow, communication and friendship. The use of these networks to identify stakeholders based on their power sources and influence is explained to provide the conceptual stakeholder network model to be tested by this study.

2.2 Evolution of strategic project management

A project is a set of related work activities that aim to achieve a particular objective (Assudani & Kloppenborg, 2010). Projects follow a structured pattern of steps and outcomes called a life cycle which consists of several stages during which deliverables are created that lead to progression through the stages (Assudani & Kloppenborg, 2010). These life cycles typically describe several distinct stages in the life of the project that follow a pattern of initiation, planning, execution and termination (Pinto & Prescott, 1987).

The Project Management Body of Knowledge (PMBOK) defines three characteristics that projects share which make them different from repeat operational work. They are temporary in nature, they produce unique products or results and they develop in progressive steps, sometimes called progressively elaboration (PMBOK Guide, 2004, pp. 5-6). Time constraints are imposed on projects in which a set of objectives or goals must be achieved between a defined start and end date. The outcome of a project is a unique product, service or result which highlights that no two projects are alike because of the variation in requirements, available resources, internal and external environmental conditions and achievement goals of the project stakeholders.

Project managers are responsible for the project management process which includes planning, monitoring and executing the project. The process requires that the project manager takes a set of inputs through the project management process to generate a desired output for the stakeholders (Milosevic, 1989). These outputs were traditionally always specified as achievement of very specific goals such as completing the project on time, at the agreed cost and to the defined specifications. However, the view of project success has changed over time as the initial measurement of project success in terms of meeting simpler completion criteria such as delivery time, cost and specifications has changed to a need to achieve more demanding stakeholder satisfaction criteria (Jugdev & Muller, 2005; Zwikael & Globerson, 2006).

The shift to stakeholder satisfaction criteria resulted from the increased importance of customer satisfaction and a more competitive marketplace (Jugdev & Muller, 2005). A further reason for the shift is that the problems and uncertainly caused by project stakeholders through poor communication, inadequate resource assignment to the project, changes in scope of work contributed to project failure and highlighted the importance of managing stakeholders (Karlsen, 2002).

Pinto (1990) highlighted that one of the most important project success factors was good communication to ensure that project teams, clients and the parent organisation exchange relevant information. This echoes Milosevic's (1989) thinking that project stakeholders required more project management attention because the inputs and outputs that had to be generated were the result of an exchange of needed materials, energy and information between the internal project actors and the external project stakeholders (Milosevic, 1989).

Strategic project management has taken this concept further by viewing success as a combination of project outcomes and project management success with results measured both in the short and the long term in the economic context of the overall organisation (Jugdev & Muller, 2005). Responsibility for success has shifted to key stakeholders such as project owners and senior management that are expected to jointly agree on success criteria with the project manager and then partner, support and empower the project team by developing collaborative working relationships where they actively show interest in the project to highlight its

strategic importance to the client organisation (Jugdev & Muller, 2005). Stakeholder management is therefore an important part of strategic project management and t is important for project managers to be able to understand and influence the working relationships within a project.

2.3 Project stakeholders

In his landmark book Strategic Management: A Stakeholder Approach, Freeman (1984, p. 6) defined stakeholders as "individuals or groups of individuals who can affect or are affected by the achievement of an organisation's objectives". A brief literature search revealed the following definitions for project stakeholders listed in Table 1.

Table 1: Project Stakeholder Definitions

Author	Definition
(Cleland, 1995, p. 85)	"…those people who have, or believe that they have, a claim on those things of value created by the project…".
(Newcombe, 2003, p. 842)	"Project stakeholders are groups or individuals who have a stake in, or expectation of, the project's performance and include clients, project managers, designers, subcontractors, suppliers, funding bodies, users and the community at large."
(PMBOK Guide, 2004, p. 24)	"Project stakeholders are individuals and organisations that are actively involved in the project, or whose interest may be affected as a result of project execution or project completion. They may also exert influence over the project's objectives and outcomes."
(Boddy & Paton, 2004, p. 231)	"Stakeholders are individuals, groups or institutions with an interest in the project, and who can affect the outcome."

(El-Gohary, Osman, & El-Diraby, 2006, p. 595)	"…stakeholders are individuals or organisations that are either affected by or affect the development of the project."
(Assudani & Kloppenborg, 2010, p. 70)	"Project stakeholders can be broadly considered as any person or group that either impacts the project or is impacted by the project."

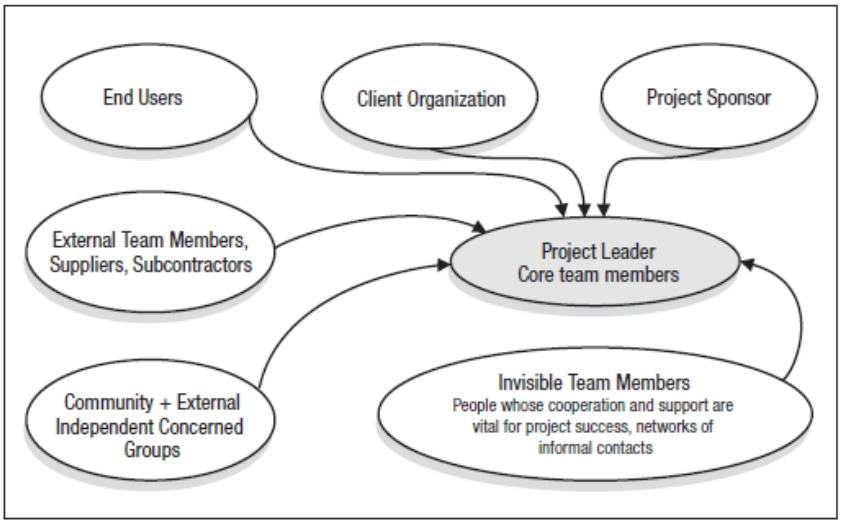
Project stakeholders can therefore be defined as *individuals and/or groups that are affected by or have an expectation of the project performance and are actively involved and can influence the project results.*

The definition of project stakeholders creates a large number of possible individuals and groups. Cleland (1995) names project stakeholder roles such as the members of the project team, and other principals in the political, social, legal, economic, technological, and competitive environments in which the project exists. More specifically, the PMBOK Guide (2004) suggests that key stakeholders roles on every project include the project manager, customer/user, the performing organisation, project team members, the project management team, sponsors, influencers and the project management office (PMO).

A similar grouping of generic project stakeholders roles are named by Bourne and Walker (2006) which includes the project leader, core project team members, end users, client organisation, project sponsor, external team members, external

independent concerned groups and “invisible team members” who support the project through informal networks. See Figure 1.

Figure 1: Generic stakeholder model (Bourne & Walker, 2006, p. 7)



In his study on project stakeholder management Karlsen (2002) identified 13 organisational stakeholder roles including clients / customers, end users, contractors / suppliers, consultants, line organisation, public authorities and labour unions as depicted in Figure 2. Karlsen (2002) differentiated the general environment which includes technological factors, legal factors, labour supply, cultural and environmental factors from the task environment of the project which includes individuals that are explicitly relevant or involved in the project work.

Figure 2: Project stakeholder groups (Karlsen, 2002, p. 20)

Notably, the five most important stakeholder groups were found to be clients, end users, contractors/suppliers, consultant/advisors and the line/base organisation (Karlsen, 2002). This may indicate that stakeholders who are given authority by their role also have access to and control over certain sources of power. This is supported by Krackhardt (1990) who found that those individuals with more authority in the project will have more power, on average, that those with less authority.

A key issue in stakeholder management is the identification of salient stakeholders (Assudani & Kloppenborg, 2010) or as encapsulated by Freeman's (1994, p. 411) principle "Who and What Really Counts". Bourne and Walker (2006) call for legitimate and valid stakeholders to be identified and their power and influence to be mapped so that their potential impact on projects can be better understood.

(Bourne & Walker, 2006, p. 651). Therefore, a central function of a project manager is to be able to identify important stakeholders that can be deliberately influenced so that they deliver their contributions to the project (Jepsen & Eskerod, 2009).

The topic has seen extensive coverage in both general management literature and project management literature. A review of the 25 years of stakeholder theory in project management literature (Littau, Jujagiri, & Adlbrecht, 2010) found that stakeholder theory has become popular in project management with articles covering aspects such as project success criteria, strategic frameworks, project processes, leadership, communication and external influences on the project environment. These aspects are key areas of concern for project managers who must manage the temporary coalition of project stakeholders to bring about the desired outcomes (Assudani & Kloppenborg, 2010). The tools and methods that project managers can use to identify important stakeholders are formalised through the activity of stakeholder mapping.

2.4 Mapping project stakeholders

The objective of stakeholder mapping, also referred to as stakeholder analysis, is to develop a list of important stakeholders, assess their key characteristics and use this information to implement effective stakeholder management initiatives (Bourne & Weaver, 2010, p. 99). This process is usually performed by the project manager

and project sponsor but can also involve a slightly larger group of individuals that are knowledgeable about the project environment or the organisation. Techniques that can be used to aid this work are interviews with experts, brainstorming in group meetings and checklists (Karlsen, 2002). This group of people is expected to objectively identify stakeholders and characterise them therefore it is best to involve people with different backgrounds (Karlsen, 2002).

Stakeholder mapping is a challenging process. Bourne and Weaver (2010) use the characterisation of stakeholders as an example, such as level of stakeholder support or level of stakeholder interest, which cannot be known by anyone except the stakeholder. Furthermore, the people undertaking the mapping are influenced by their attitudes and their perception of the stakeholders (Bourne & Weaver, 2010, p. 99). The stakeholder mapping process is therefore significantly impacted by the people participating in the process and could result in different outcomes if the group completing the task is changed. These limitations could mean that the list of identified stakeholders excludes certain key stakeholders or that the characterisation of stakeholders is based on past experiences that are not necessarily true for the stakeholders perceptions and attitudes towards the current project.

There are two major approaches to mapping stakeholders. The first is described by Jepsen and Eskerod (2009) who suggest that project managers first identify the important stakeholders, then characterise the intensity of the stakeholder impact

based on needed contributions, expectations and power and finally implement a strategy to influence the important stakeholders. This approach first identifies stakeholders by name and then characterises using specific attributes that inform a stakeholder influence strategy (Cleland, 1995).

An alternative approach proposed to start by Achterkamp and Vos (2008) is to define stakeholder groups first and then identify the stakeholders that form part of each of the groups. Essentially, a role-based classification model is used to define groups of stakeholders based on their role in the project to ensure that the project context is first addressed before a role-based identification model is applied to name the stakeholders and assign them to each of the groups (Achterkamp & Vos, 2008). Either approach may be used for stakeholder mapping.

2.5 Traditional project stakeholder models

Several traditional stakeholder models are available that use various attributes to characterise stakeholders. Some of the more familiar stakeholder models are described in the following section to provide an overview of the stakeholder attributes used and the process of stakeholder mapping:

2.5.1 Stakeholder Cooperation / Threat Model

One of the best known and most commonly used organisational stakeholder models used to identify and classify stakeholders is the matrix based on the stakeholder potential for cooperation with the organisation versus the stakeholder potential for threat to the organisation (Savage, Whitehead, Carlton, & Blair, 1991). The two dimensions of potential for cooperation and threat create four possible classifications for stakeholders and determine the organisational response strategy See Figure 3. The factors that determine whether a stakeholder has either potential to cooperate or threaten an organisation include whether the stakeholder controls any necessary resources, the extent of the stakeholder's power compared to the organisation, the likelihood that the stakeholder will take supportive or non-supportive action and the likelihood that the stakeholder will form coalitions with other stakeholders or the organisation (Griseri & Seppala, 2010, p. 34).

Figure 3 : Adapted from Savage et al. (1991, p. 65)

		Stakeholder's potential for threat to the organisation	
		High	Low
Stakeholder's potential for cooperation with the organisation	High	Mixed blessing stakeholder **Collaborate**	Supportive stakeholder **Involve**
	Low	Non-supportive stakeholder **Defend**	Marginal stakeholder **Monitor**

2.5.2 Friedman and Miles Stakeholder Model

Another model that is common is Friedman and Miles's (2002) model based on stakeholder relationships with the organisation. They premised that the legitimacy of stakeholders and the nature of their relationship with the organisation determine the kind of relationship they are likely to form is based on formal or informal contracts (Griseri & Seppala, 2010, p. 35). The matrix depict in Figure 4 represents the two dimensions, one for the stakeholder's interests and the other for the nature of the connection with the organisation (Friedman & Miles, 2002). The interests dimension measures whether stakeholders have aligned (compatible) or misaligned (incompatible) interests. The connections that stakeholders can have with an organisation are either required (necessary) or optional (contingent). Contingent relationships are therefore voluntarily entered into making them more informal whereas necessary relationships are required for the business to function and are more formally contracted

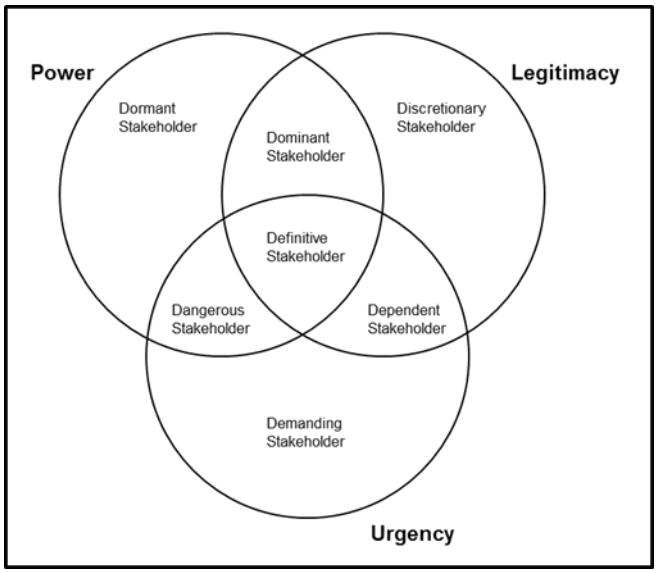
Figure 4: Adapted from Friedman & Miles (2002, p. 8)

		Stakeholder connections	
		Necessary	Contingent
Stakeholder interests	Compatible	**Defend** • Shareholders • Top management • Partners	**Form relation** • The general public • Trade associations
	Incompatible	**Compromise** • Trade unions • Customers • Suppliers	**Eliminate** • Some NGOs • Aggrieved/criminal elements

2.5.3 Mitchell's Stakeholder Salience Model

Mitchell developed the concept of stakeholder salience or relevance which can be used to identify important organisational stakeholders based on three attributes on power, legitimacy and urgency (Mitchell et al., 1997). See Figure 5.

Figure 5: Mitchell's Stakeholder Salience Model (1997, p. 874)



Power is the extent to which a party in a relationship can access coercive, utilitarian and normative means to impose its will in the relationship (Mitchell et al., 1997). Griseri and Seppala (2010, p. 30) referred to Mitchell's (1997) power as the formal, economic or political power of stakeholders to express their interests. *Legitimacy* means that stakeholder actions are desirable, proper or in line with generally accepted values, norms and beliefs of society (Griseri & Seppala, 2010)

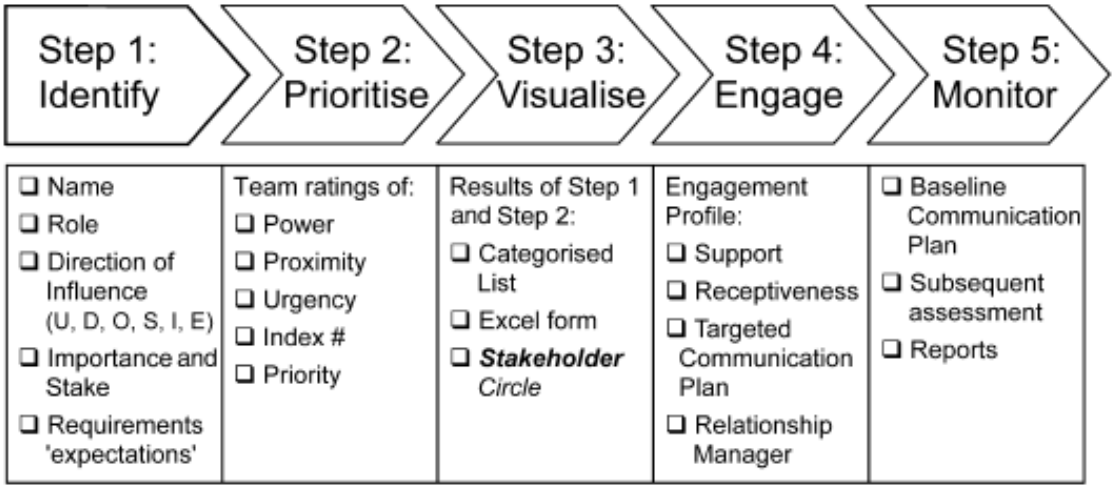
(Mitchell et al., 1997). Preble (2005) stated that legitimacy could also include any contractual or legal rights that a stakeholder may have. Finally, *urgency* is the degree to which a stakeholders' claim requires urgent attention because it is either time sensitive or critical (Mitchell et al., 1997; Griseri & Seppala, 2010).

Stakeholder salience is described as the degree to which a project manager gives priority to competing claims (Aaltonen, Jaakko, & Tuomas, 2008) and is as such a measure of the importance of the stakeholder. The model is not limited to identifying important organisational stakeholders, but can also be used for identifying important stakeholders in a project context (Assudani & Kloppenborg, 2010).

2.5.4 The Stakeholder Circle™ Model

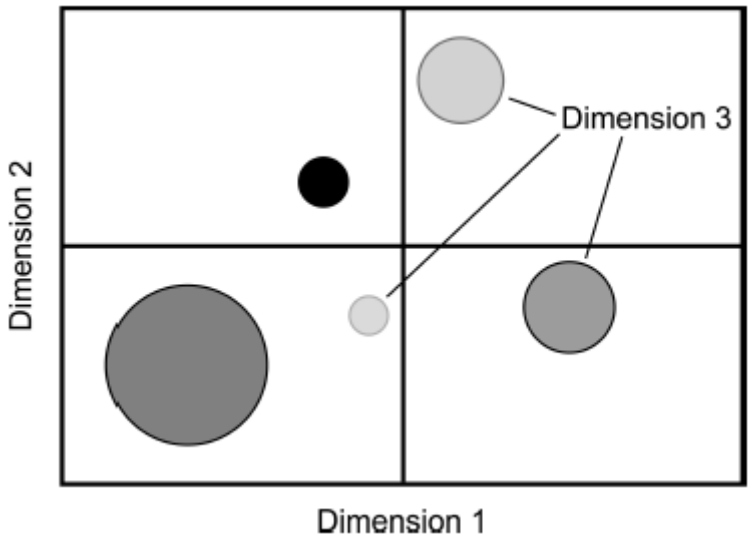
The Stakeholder Circle™ is a newer and more elaborate model developed by Bourne and Walker (2005) to help map and visualise stakeholder power and influence within the organisation. The model is the outcome of a five-step methodology as described in the summary of the Stakeholder Circle™ methodology in Figure 6. It may not be strictly required to follow the methodology provided by Bourne and Walker to complete the Stakeholder Circle™ but the steps produce information which feeds into the final model.

Figure 6: Stakeholder Circle™ methodology (Bourne & Weaver, 2010, p. 103)



The starting point is the identification of each project stakeholder by determining what each individual or group “requires from the project” and their “significance to the project” (Walker, Bourne, & Shelley, 2008). This step can be completed using a traditional stakeholder which consists of a two dimensional grid with and X and Y axis that each represents a stakeholder attribute. The project manager typically chooses the appropriate attributes to customise the grid for the particular circumstances using attributes such as power, support, influence, interest or attitude (Bourne & Weaver, 2010, p. 102). A third dimension can also sometimes be used to reflect the size or intensity of one of the attributes as depicted in Figure 7.

Figure 7: Traditional stakeholder map (Bourne & Weaver, 2010, p. 102)

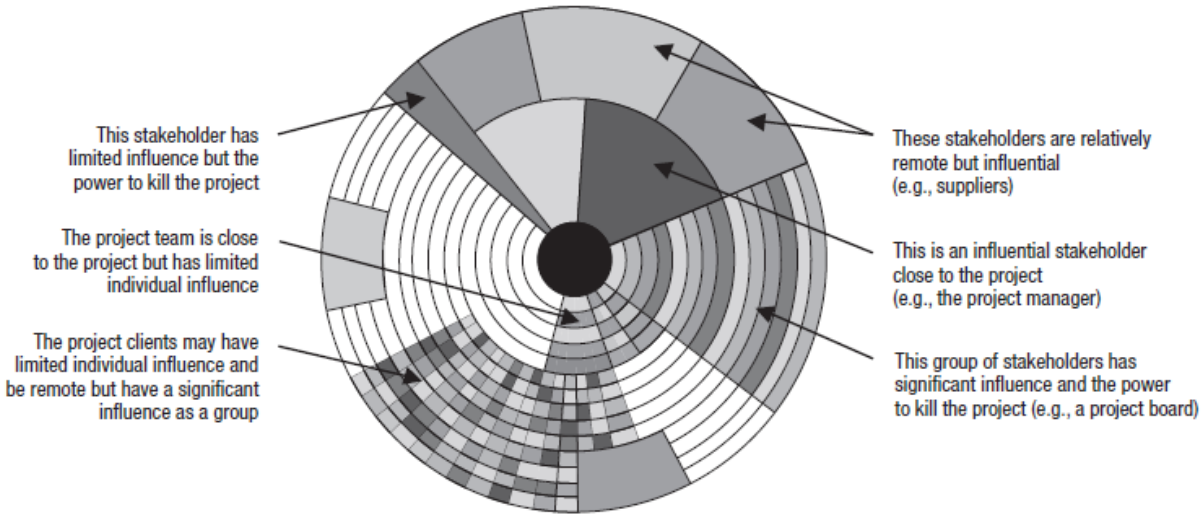


The second step requires the prioritisation of the stakeholders using the specific attributes of power ("the power to kill the project"), proximity (direct involvement and closeness to the project) and urgency which is rated by a combination of the value or stake the individual or group has in the project and the likelihood that the stakeholder will take action to influence the project work (Bourne & Weaver, 2010, p. 109).

The third step in the process is to visualise the stakeholder relationships using the Stakeholder Circle™ tool which provides an output as depicted in Figure 8. Bourne and Walker (2005, p. 656) describe the key elements of the Stakeholder Circle™ as follows:

"…concentric circle lines that indicate distance of stakeholders from the project or project delivery entity; patterns of stakeholder entities that indicate their homogeneity, for example a solid shade indicates solidarity while shading or patterning can indicate heterogeneity in presenting an interest; the size of the block, its relative area covered of the circle, indicates the scale and scope of influence; and the colour density can indicate the degree of impact."

Figure 8: The Stakeholder Circle™ (Bourne & Walker, 2006)



The radial depth of the area in the circle for each stakeholder indicates the degree of power and the position of the stakeholder relative to the 12 o'clock position indicates their ranked importance to the project (Bourne & Weaver, 2010, p. 110). Therefore, the stakeholder at 12 o'clock is the most important and the ranking of next importance follows clockwise around the circle (Bourne & Weaver, 2010, p. 110).

This is followed by the engagement of stakeholders using approaches tailored to their expectations and needs (Walker et al., 2008). The fifth step is that the project manager monitors the effectiveness of the communication plan developed for each stakeholder and makes any required adjustments (Walker et al., 2008).

2.5.5 The Stakeholder Grid

Boddy and Paton (2004) developed a stakeholder grid in response to the assessment of lessons learned from project managers. Their view of project stakeholders was that they "may be active supporters giving a positive narrative, or vigorous opponents who see it as threat to some aspect of their culture, structure or power". The stakeholder grid, depicted in Figure 9, therefore defines the major attributes used to classify all stakeholders as expectations, interest, culture or structure, power and their positive or negative narrative about the project.

Figure 9: The Stakeholder Grid (Boddy & Paton, 2004)

Stakeholder	What is expected of them?	Their interests	Cultural, structural, political issues?	Positive or negative narrative?	Ideas for action

Boddy and Paton (2004) explain that the stakeholder grid is completed by first completing a visual stakeholder map showing the stakeholders of the project as circles around a central circle representing the project. The most significant stakeholder circles are placed nearer to the centre. Once all relevant stakeholders have been identified the interests of the main stakeholders are assessed using questions to complete each column of the grid. Lastly, the project manager will use the information to develop a plan to influence the stakeholders.

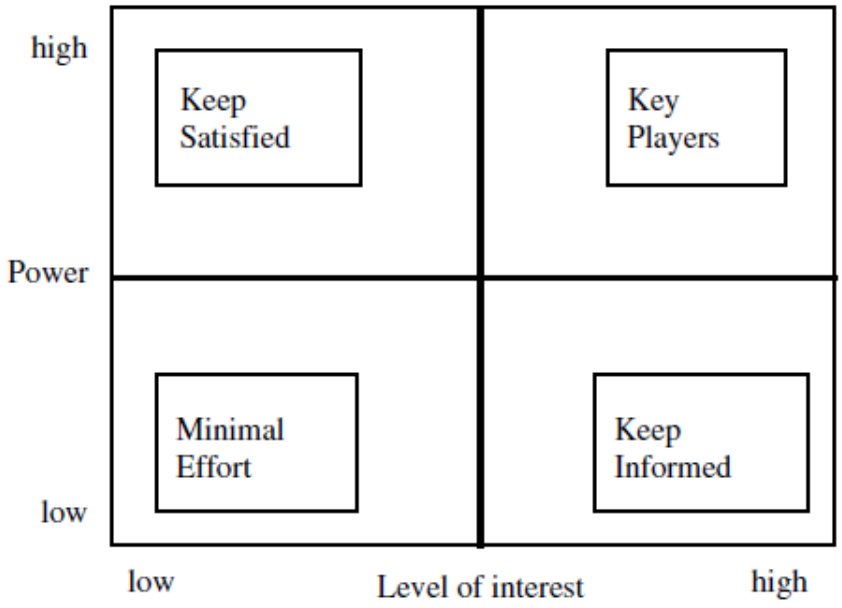
2.5.6 The Power / Interest Matrix

The power/interest matrix does not propose any specific approach to identifying stakeholders but provides a means to classify by assessing their power on one dimension and interest on another (Olander & Landin, 2005). The matrix is based on the use of two specific attributes to describe the communication and relationships between stakeholders. Two questions are asked to determine the position of each stakeholder on the matrix: *"How interested is each stakeholder group to impress its expectations on the project decisions?"* and *"Do they mean to do so? Do they have the power to do so?"* (Olander & Landin, 2005, p. 322). The power/interest matrix is depicted in Figure 10.

Key players are stakeholders that have high levels of interest in the project and significant power to affect the project outcomes. Stakeholders with low levels of

power and interest are classified as requiring only minimal effort from the project manager because they are less likely to have a significant impact on the project.

Figure 10: The Power/Interest Matrix (Olander & Landin, 2005, p. 322)



2.5.7 Kloppenborg's Stakeholder Grid and the PMBOK

Kloppenborg (2009) developed a stakeholder grid which classifies project stakeholders as either internal or external to the organization executing the project and whether they were affected by the project processes or project results. Identifying those stakeholders affected by the project processes and those affected by the project results distinguish between those stakeholders that provide inputs to the project and those that are the recipients of the outputs of the project. Figure 12

depicts this grid which has been adapted by (Assudani & Kloppenborg, 2010, p. 70).

Figure 11: Kloppenborg's stakeholder grid

	Internal to performing organisation	Internal to customer organisation	External to both organisations
Can positively impact the project process			
Can negatively impact the project process			
Can positively impact the project results			
Can negatively impact the project results			
Can be positively impacted by project process			
Can be negatively impacted by project process			
Can be positively impacted by project results			
Can be negatively impacted by project results			

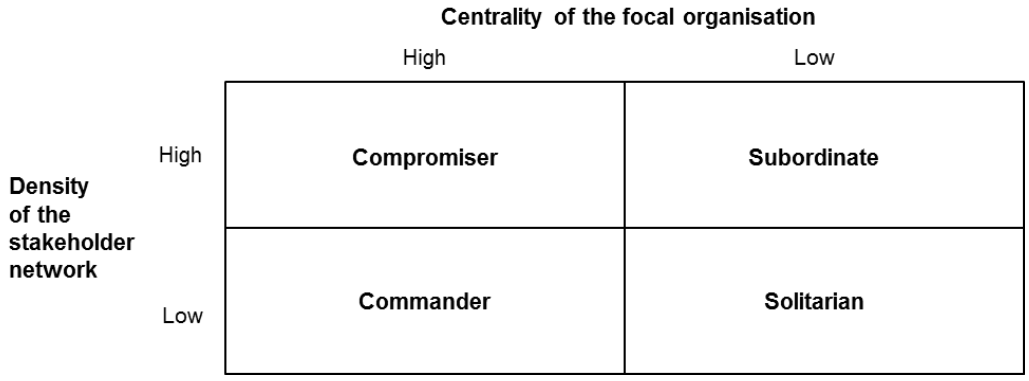
Kloppenborg's stakeholder grid is very similar to the guidelines suggested by the PMBOK Guide (2004) that project managers identify stakeholders based on whether they have a positive or negative influence on the project. According to PMBOK, project stakeholders have a positive influence if they will benefit from the project outcomes and a negative influence if they will not.

2.5.8 Rowley's Stakeholder Network Model

This model provides some guidance on how social network analysis could be used to form a stakeholder model. Rowley (1997) took a network perspective when he argued that firms should not respond to stakeholders individually but address multiple stakeholder demands simultaneously. The model makes use of network analysis measures to determine each stakeholder's position within the stakeholder network and the number of connections between stakeholders.

The centrality of focal organisation in the stakeholder network determines the degree to which it can control the flow of information and the level of density/connections within the stakeholder network imposes constraints on the how the focal organisation can act (Rowley, 1997). The dimensions for the model are therefore network centrality and network density as depicted in Figure 11 which creates four possible network structures that "influence the relative power balance between a focal firm and its stakeholders" (Rowley, 1997, p. 901).

Figure 12: Adapted from Rowley (1997)



2.6 Stakeholder attributes: power, influence and interaction

The stakeholder attributes used by the stakeholder models reviewed are summarised in Table 2.

Table 2: Stakeholder Attributes

Stakeholder attribute summary	Source
Potential for cooperation	(Savage et al., 1991)
Potential for threaten	
Connections	(Friedman & Miles, 2002)
Interests	
Power	Stakeholder salience model (Mitchell et al., 1997)
Legitimacy	
Urgency	
Power	The Stakeholder Circle™ (Bourne & Weaver, 2010)
Proximity	
Urgency	
Expectation	Stakeholder grid (Boddy & Paton, 2004)
Interest	
Culture / structural	
Narrative	

Stakeholder attribute summary	Source
Power	Power/interest matrix (Olander & Landin, 2005)
Interest	
Network power to control information flow	Stakeholder network model (Rowley, 1997)
Interconnectedness	
Legitimacy based on conformity pressure	
Impact on process	(Assudani & Kloppenborg, 2010)
Impact on results	
Impacted by process	
Impacted by results	
Influence on project outcomes	(PMBOK Guide, 2004)

Three themes emerge from the various stakeholder attributes that are used to identify important stakeholders and should be accommodated by a network-based stakeholder model. The first is that important stakeholders have a source of power that makes them important in the context of the project or organisations (Mitchell et al., 1997; Bourne & Weaver, 2010; Olander & Landin, 2005; Rowley, 1997). The second is that important stakeholders are able to influence the project using their source of power (Savage et al., 1991; Rowley, 1997; Assudani & Kloppenborg, 2010; PMBOK Guide, 2004). The third theme is that important stakeholders are highly connected and maintain considerable interactions to look after their interests (Friedman & Miles, 2002; Boddy & Paton, 2004; Rowley, 1997).

2.6.1 Theme 1: Stakeholder power

Current literature highlights that powerful stakeholders have the potential to threaten or cooperate with a project (Savage et al., 1991) and can impose their will in a relationship (Mitchell et al., 1997), Powerful stakeholders have the "power to kill a project" or instruct change (Bourne & Weaver, 2010), can impress their expectations on project decisions (Olander & Landin, 2005), can control the flow of information in a social network (Rowley, 1997) and can have a significant impact or influence over the project processes and project results (Rowley, 1997; Assudani & Kloppenborg, 2010; PMBOK Guide, 2004). Stakeholders with power also have the ability to influence the behaviour of other stakeholders (Preble, 2005).

The stakeholder salience model (Mitchell et al., 1997), Stakeholder Circle™ (Bourne & Weaver, 2010) and power/interest matrix (Olander & Landin, 2005) refer directly to power as a stakeholder attribute. Mitchell et al. (1991) refer to coercive, utilitarian and normative power bases in their definition but exclude legitimate power which is then used as a separate dimension of their model. Later, Olander and Landin (2005) define power as any of the bases of power, including legitimate power, that a stakeholder may have and that these bases are dynamic and may shift during a project. Bourne and Weaver (2010) also used the concept of power in the broader sense which includes legitimate power. When viewing stakeholders as a network, Rowley (1997) found that power was largely attributed to the position of the stakeholder within the network which allowed for control of information. Power is therefore gained or accessed because others recognise the individual or group

as legitimate and may apply conformity pressure on non-compliant stakeholders (Rowley, 1997). Legitimacy is therefore also recognized as a power source by Rowley (1997) which derives from the other stakeholders in the network.

French and Raven (1959) identified five sources of power in their seminal work on bases of social power which are further explained in Raven, Schwarzwald, and Koslowsky (1998) as being “conceived as the resources one person has available so that he or she can influence another person to do what that person would not have done otherwise”. As noted by Steven (2008) in his 50 year review of influence in the workplace, Raven later independently expanded the typology from five to six sources of power by differentiating expert power from information power (Raven, 1965). When informational influence is used then the agent provides good reasons substantiated by data to convince a target to comply or change their behaviour whereas when expert influence is used then reasons are not explicit and the target has to trust the agent’s knowledge and experience (Raven et al., 1998).

Podsakoff and Schriesheim (1985) described French and Raven’s (1959) six power bases as interactions between an agent (influencer) and a target (being influenced):

a) *Coercive power* – based on the agent’s threat of punishment which is enhanced when the target perceives a low probability of avoiding the punishment as a result of non-conformance.

b) *Rewards power* – based on the ability to provide rewards the strength of which is dependent on the targets' perception of the probability that the agent can mediate the reward.

c) *Legitimate power* – based on the rights granted through organisational or hierarchical position but based in the values that are perceived in the agent by the target. Legitimacy includes power derived from promises, standards and codes of conduct give the agent the right to exert influence over the target as perceived by the target.

d) *Expert power* – based on the superior knowledge of the agent that the target perceives in relation to their own knowledge and against a known absolute standard.

e) *Referent power* – based on identification with certain personal traits in the agent by the target of the influence so that the target wants to maintain a relationship with the agent.

f) *Information power* – "…based on presentation of persuasive material or logic…" (Raven et al., 1998, p. 308).

Raven et al. (1998) tested an expanded set of 11 sources of power based to expand the original French and Raven typology (1959) resulting in differentiation of the power bases as: rewards (personal, impersonal), coercive (personal, impersonal) and legitimate (position, reciprocity, equity, dependence), expert, referent and information power. Bourne and Walker (2005) used Yukl's (1998) definition as a simpler grouping of sources of power to describe power and

influence of project stakeholders. Yukl (1998) defined three power groups which encompass the underlying sources of power described by French and Raven (1959) and provide a good means of defining stakeholder power:

a) *Positional power* – derived from formal authority which includes coercive, rewards, legitimate power.
b) *Personal power* – derived from relationships with other people and the social network formed within the organisation that includes referent, information and expert power.
c) *Political power* - vested in the formal or informal alliances through shared objectives or goals that includes legitimate and information power.

2.6.2 Theme 2: Stakeholders influence

Stakeholders are able to use their power to influence a project so a network-based stakeholder model must be able to measure the influence of individual stakeholders using various sources of power. Savage et al. (1991) chose not to distinguish power sources but to classify stakeholders based on their potential to help or harm the project. This potential is a measure of the degree of power that a stakeholder can access and whether they are willing to influence the project.

Urgency is a recurring attribute (Mitchell et al., 1997; Bourne & Weaver, 2010) that also indicates the degree to which a stakeholder is able and willing to act. When a stakeholder's claim on the project is threatened then this translates into an urgency

to use sources of power to influence the project. The intensity of the source of power available to the stakeholder provides the impetus to act if its stake is critical enough. This “call to action” is emphasised by Friedman and Miles (2002) and Olander and Landin (2005) by dedicating one of the two dimensions of their respective grids to stakeholder interest.

Olander and Landin (2005) describe stakeholder interest as “a vested interest in the success of a project and the environment within which the project operates. Project stakeholders may impact or be impacted by the project processes and outcomes (Assudani & Kloppenborg, 2010) which will intensify their interest in a project. This vested interest translates in the stakeholder impressing their expectations on project decisions (Olander & Landin, 2005) and could be combined with the stakeholder’s impact and influence to create a vested interest intensity index as proposed by Bourne and Walker (2005). Such an index provides a measure of the degree of interest which is the influence that a stakeholder will apply to ensure their stake is considered.

It would stand to reason that stakeholders who have an impact or are impacted by a project are less important if they are unable to use their sources of power to exert influence on the project. The PMBOK Guide recognises that the power to influence the outcomes of the project is the primary measure of a stakeholder’s importance (PMBOK Guide, 2004). Therefore, stakeholder interest and expectation is determined by the alignment or opposition of a stakeholder’s influence with the

project based on whether the project processes and objectives serve the stakeholder. Friedman and Miles's (2002) support this view of stakeholder influence by viewing stakeholder interests as compatible (aligned) or incompatible (opposed) to the project.

Boddy and Paton (2004) capture the positive or negative influence in the project narrative attribute that provides a view of stakeholder's sentiment or attitude towards the project. A positive narrative is supported by a stakeholder if the project follows similar goals and ways of working to those expected by the stakeholder in what Boddy and Paton (2004) called the hierarchical structure of the project. Attributes such as urgency, interest, expectation and impact are therefore determinants of a stakeholder's current positive or negative influence on the project.

2.6.3 Theme 3: Stakeholder interaction

The traditional stakeholder models suggest that individuals or groups are important if the number of relationships is high and their nature critical to the project. Friedman and Miles (2002) capture the nature of the relationships by specifying that connections between groups are necessary (required) or contingent (not integral) to the social structure.

Boddy and Paton (2004) describe this social structure as the culture of the project. If a stakeholder's claims are consistent with the prevailing culture of other stakeholders and the project environment then the stakeholder is likely to promote the project (Boddy & Paton, 2004). The Stakeholder Circle™ model uses an attribute called proximity to indicate that stakeholders are more influential when they are closer to the project, more involved with the work and more embedded in the team social structure (Bourne & Weaver, 2010).

The number of relationships that stakeholders have with each other is highlighted by Rowley (1997) who used network analysis to describe stakeholders. Rowley (1997) considers the social network of the stakeholder groups to be essential for diffusing institutional values and enforcing conformance towards the group objectives (Rowley, 1997). Interconnectedness is used as a key property of the project network and is measured by the density of the network. As the number of relations or ties between stakeholders increases information can be exchanged more efficiently and the pressure to conform to the norms and values of the other project stakeholders increases (Rowley, 1997).

Stakeholder interactions are important in understanding how stakeholders use their power to influence others to impact the outcome of a project. The use of a social network analysis to visualise power and influence has been suggested (Bourne & Walker, 2005) and interconnectedness has been used by Rowley (1997) to characterise organisational stakeholders. The concepts of stakeholder power,

influence and interaction can therefore be measured using social network analysis and could also capture the essence of what traditional stakeholder models are trying to achieve when using stakeholder attributes.

2.7 Social network analysis

Social network analysis is “a useful tool for visualising power and influence patterns…” (Bourne & Walker, 2005) and can be used to examine the relations among these stakeholders (Assudani & Kloppenborg, 2010). Project-related network studies have been conducted to understand the meaning of project success (Smith-Doerr, Manev, & Rizova, 2004), information exchange leading to client satisfaction (El-Sheikh & Pryke, 2010), effects of contractual relationships, performance incentives (Pryke, 2004) and the influence of internal stakeholder networks in project outcomes (Jääskelainen & Pau, 2009).

The social network analysis (SNA) concept was first introduced by Moreno in 1934 (Moreno, 1960) using graphs called sociograms, where nodes represent individuals and links between the nodes represent relationships. Wasserman and Faust (1994, p. 20) define a social network as “consisting of a finite set of actors or sets of actors and the relation or relations defined on them”. Both definitions emphasise that network analysis deals with members of a group and their social interactions or relationships with one another which form a social structure that can be studied.

Social networks are based on the principles of graph theory which is “a set of mathematical formulae and concepts for the study of patterns of lines” (Haythornthwaite, 1996). Notations of social networks therefore include graph theoretic notation, sociometric notation and algebraic notation (Wasserman & Faust, 1994, p. 70).

Network analysis is used to gather data about actor attributes and relations (Wasserman & Faust, 1994, p. 38). Actor attributes can include any actor-specific data such as race, gender and organisation role (Wasserman & Faust, 1994, p. 29). Relations, also called structural variables are measured on pairs of actors (Wasserman & Faust, 1994, p. 29). Relations are the basis for studying social structure by analysing the patterns of ties linking the nodes or members of the social network (Wellman, 1983). Ties are social interactions that establish linkages between a pair of actors in a network. The collection of all ties of a specific kind, such as friendship, support and advice, amongst all actors in a given network is termed a relation (Wasserman & Faust, 1994, p. 20).

Network analysis allows these ties to be modelled to depict the structure of the group and the influence of the structure on individuals within the group (Wasserman & Faust, 1994, p. 9). Some of the relations that have been studied include friendship, advice (Krackhardt, 1990), communication, support and

influence (Ibarra, 1993). More recently, the application of social network analysis has led to studies of knowledge transfer (Inkpen & Tsang, 2005), formal and informal organisational hierarchies (Rank, 2008), team performance (Chinowsky et al., 2008), and collaboration and leadership (Chinowsky, Diekmann, & O'Brien, 2010).

2.7.1 Network centrality

SNA has become an instrumental tool for researchers focusing on interactions of groups because it is able to provide explicit formal statements and measures of social structural properties (Chinowsky et al., 2008; Wasserman & Faust, 1994, p. 17). One such measure of social structure is network centrality. Centrality means "that an actor in the network is in a position to influence the participation of others in the internal interaction" (Henttonen, 2010, p. 85). Centrality can be measured on the group level or the individual member level. It reflects the distribution of relationships through the network on a group level and on the member level it indicates prominent members based on their extensive involvement in relationships with other actors (Chinowsky et al., 2010; Wasserman & Faust, 1994, p. 173).

Brass (1984) describes that actors in a network would acquire power if they could decrease their own dependence on others and increase other's dependence on them. He views central actors "…as potentially powerful because of their greater access to and possible control over relevant resources" (Brass, 1984). Social ties

affect information access and central project managers have access to more information through their network ties that shape their perception of project success (Smith-Doerr et al., 2004).

Central actors are better able to perceive networks such as advice or friendship networks which cause other actors to view central actors as more powerful (Krackhardt, 1990). An individual's structural position measured by their network centrality is therefore related to others perception of the individual's power within the organization (Brass & Burkhardt, 1993). Therefore, centrality is a measure of actor's power, influence and interaction in a network.

The three common measures of centrality are called degree, closeness and betweenness centrality. Degree centrality indicates the members with the highest activity or involvement in a given activity measured by the number of ties the member has with others (Pryke, 2004).

Closeness centrality indicates prominent members based on their distance (number of links) to all other members in the network (Haythornthwaite, 1996). Central actors with respect to closeness can quickly interact with others and can be very productive in communicating information to other members (Wasserman & Faust, 1994, p. 183).

The third measure of centrality, called betweenness centrality, is used to highlight central members that potentially have some control over interactions with other nonadjacent members by lying on the path between the two (Wasserman & Faust, 1994, p. 189). This measure indicates the amount of information that is routed through a central member, sometimes called brokering, which indicates that an individual would be involved in many discussions within the network (Haythornthwaite, 1996; Chinowsky et al., 2010).

Brass (1984) found that closeness and betweenness centrality corresponded to the two necessary conditions related to acquiring power: decreasing dependence on others through increasing an actor's independent access to resources (closeness centrality) and increasing other's dependence on the actor which increases control (betweenness centrality). This means that central actors have access to and control over resources that decrease their dependence on others and increase others' dependence on them (Brass, Galaskiewicz, Greve, & Tsai, 2004). The closeness measure is therefore representative of access to sources of power and the betweenness measure is representative of control of sources of power (Brass, 1984).

2.8 Network types

An actor's centrality may differ based on the type of network studied because each network type indicates different relationships amongst actors and can therefore

distinguish sources of power that are available to central actors (Ibarra & Andrews, 1993). Social network theory distinguishes between workflow, also called instrumental, network links formed through work roles and expressive networks which primarily provide friendship and social support (Brass, 1984; Krackhardt, 1990; Ibarra & Andrews, 1993).

2.8.1 Workflow network

The workflow network is the basis for interaction through the recurring exchange of inputs and outputs between workers based on their role or position within an organisation (Brass, 1984). The source of power derives from the position that the individual holds which makes them critical in a project network when they are in a focal position and there are no alternatives available (Brass, 1984).

The workflow network is a source of power and information because it provides resources such as physical, financial, human or other types of resources to the project (Smith-Doerr et al., 2004). Central actors in workflow network will gain influence as their access to and control over resources increases because they are able to exchange a multitude of resources required by others (Ibarra, 1993; Brass, 1984).

Assudani and Kloppenborg (2010) indicate that salient project stakeholders could be identified by finding out who was being asked for input into the project which

would measure their centrality in the workflow network. Krackhardt (1990) found evidence that individuals in an organisation who had more cognition of the advice network (which represented the workflow network in the study) were more central to the network and were rated as more powerful by others.

Formal position that allows individuals to access or control resources has been classified by Yukl (1998) as positional power. Project work is structured around the work roles that have to be performed by key stakeholders in critical roles. Therefore, it could be expected that important project stakeholders derive power from their position in the workflow network.

2.8.2 Friendship network

The friendship network is also sometimes called the “primary network” and captures important effective social bonds related to trust (Krackhardt, 1990). It links employees together based on the social liking or friendship which provides a good measure of the informal structure of an organisation (Brass, 1984). Individuals typically express liking and friendship to others that have similar organisational affiliations, personal characteristics and similar interests (Ibarra & Andrews, 1993). Brass (1984) concluded that friendship was not directly related to power but that friendship connections are vital in obtaining access to resources such as information or rewards. Krackhardt (1990) found that accurate cognitions of certain networks could be a source of power in itself. He argued that knowing who was

central in a given network is “essential political knowledge” and that this information could be used to identify coalitions (Krackhardt, 1990).

Individuals in central positions in friendship networks are expected to be highly influential and interconnected individuals that can form strong coalitions (Brass, 1984). Central actors in the friendship network will have access to and control over sources of power based on their reputation and charisma (Krackhardt, 1990). Coalition and alliance formation power form part of Yukl’s (1998) definition of political power so it is reasonable that individuals should be important project stakeholders because of their political power in the friendship network.

2.8.3 Communication network

Assudani and Kloppenborg (2010) also suggested that communication networks could be used to identify salient stakeholders based on who individuals frequently talk to about project-related activities. The communication network is based on the exchange of information (Brass, 1984). Communication networks can be examined to determine the informal network that exists within a project team (Chinowsky et al., 2008). Stakeholders will use the communication network to provide information on their critical claims and demand immediate action (Aaltonen et al., 2008) and address conformance gaps in the project (El-Sheikh & Pryke, 2010).

Influence and power have been correlated to communication network centrality in small decision-making groups (Pryke, 2004) and central actors in the communication network have been found to be more influential in organisations (Brass, 1984). Yukl (1998) defined information referent and expert power as a form of personal power which means that important project stakeholders should be central actors in the communication network.

2.9 Conclusion

The importance of project stakeholder management has been explored in this chapter along with some of the current models available for identifying and classifying these stakeholders using traditional stakeholder attributes. The stakeholder attributes examined suggest that important stakeholders are typically powerful, influential and well-connected. Social network analysis is a useful tool in measuring these three aspects. Social network studies have found that influential actors have access to and control over sources of power in various network types.

Three network types in particular seem to be useful in measuring each of the various sources of power (personal power, positional power and political power). A model can be constructed using current literature and is presented in the next chapter with the research hypotheses.

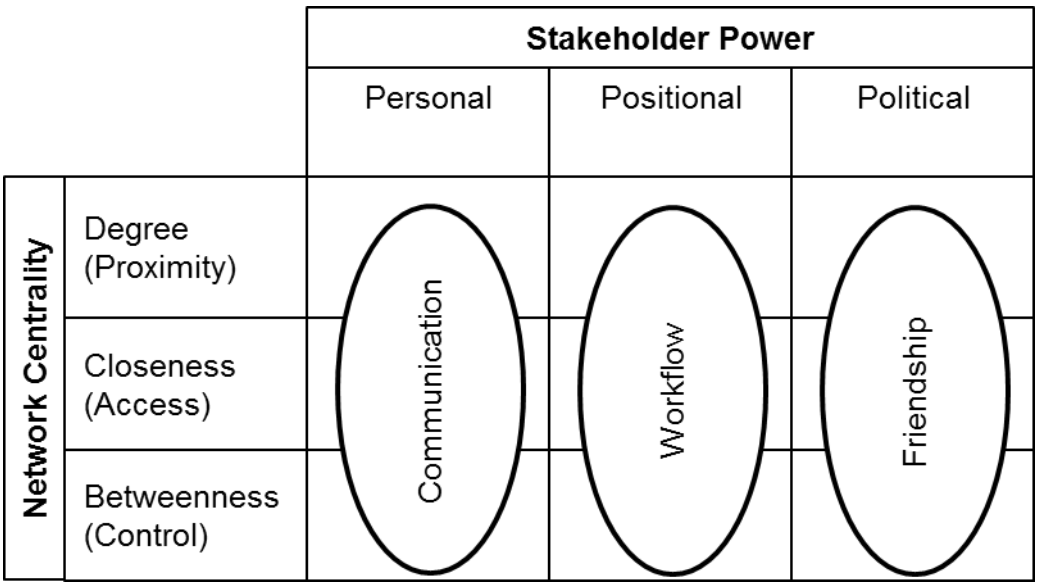
3 Research question

3.1 Introduction

The purpose of this chapter is to present the hypotheses that follow from the purpose of the research and the literature reviewed. The research question that this study aims to answer is: *How can powerful project stakeholders be identified using social network types and measures?*

A conceptual model has been developed to aid in the understanding of the research hypotheses as presented in Figure 13. The ellipses denote the network types that have been linked to the specific sources of power.

Figure 13: Conceptual stakeholder network model



The networks used to examine the sources of personal, positional and political power are the communication, workflow and friendship networks respectively which are based on previous studies in the field of network influence (Brass, 1984; Brass & Burkhardt, 1993; Ibarra, 1993; Assudani & Kloppenborg, 2010).

3.2 Research Question 1

Which network centrality measure is the most important in identifying actors in a project network with high positional power?

The null hypothesis states that workflow, friendship, and communication centrality are all equally good measures of identifying actors with high positional power. The alternative hypothesis states that differences exist in workflow, friendship and communication network centrality measures regarding the ability to identify actors with high positional power. The hypotheses tests are stated as the following two-tailed test (where N represents the various network measures):

H_o: $\mu_N - \mu_{N+1} = 0$

H_A: $\mu_N - \mu_{N+1} \neq 0$

3.3 Research Question 2

Which network centrality measure is the most important in identifying actors in a project network with high personal power?

The null hypothesis states that workflow, friendship, and communication centrality are all equally good measures of identifying actors with high personal power. The alternative hypothesis states that differences exist in workflow, friendship and communication network centrality measures regarding the ability to identify actors with high personal power. The hypotheses tests are stated as the following two-tailed test (where N represents the various network measures):

$\mathbf{H_o: \mu_N - \mu_{N+1} = 0}$

$\mathbf{H_A: \mu_N - \mu_{N+1} \neq 0}$

3.4 Research Question 3

Which network centrality measure is the most important in identifying actors in a project network with high political power?

The null hypothesis states that workflow, friendship, and communication centrality are all equally good measures of identifying actors with high political power. The alternative hypothesis states that differences exist in workflow, friendship and communication network centrality measures regarding the ability to identify actors with high political power. The hypotheses tests are stated as the following two-tailed test (where N represents the various network measures):

$\mathbf{H_o: \mu_N - \mu_{N+1} = 0}$

$\mathbf{H_A: \mu_N - \mu_{N+1} \neq 0}$

4 Research methodology

4.1 Introduction

The objective of this study is to gather structural network data that can be used to relate network measures of closeness and betweenness centrality with sources of power within a project network. This chapter provides details on the research philosophy, research design, research approach, the sampling design, data collection method and instrument design. .

4.2 Research design

Formal studies are typically well structured with clear research hypotheses that must be tested (Blumberg, Cooper, & Schindler, 2008, p. 201) and the majority of network research applies quantitative techniques because they are useful in highlighting structural features of networks such as centrality, activity levels and density with (Jack, 2010). Therefore, this study is suitable for a quantitative (descriptive) design because it has clear hypotheses constructed from existing literature and aims to use structural measures such as network centrality to test the hypotheses.

Network studies are usually approached in one of two ways, ego-centric and whole network (Haythornthwaite, 1996). Ego-centric network designs view the network from the perspective of a focal actor (ego) and the objects (alters) to which this

actor is linked (Carrington, Scott, & Wasserman, 2005, p. 9). This approach is particularly useful when the population is large (Haythornthwaite, 1996). Whole network designs describe the interactions of all members in an environment with all others in that environment (Haythornthwaite, 1996) which makes these designs ideal for studies where the population consists of a "bounded social collective" (Carrington et al., 2005, p. 8). The whole network approach is used for this study because it is concerned with project teams which include a set of actors that are an identifiable group. Ideally, responses are required from each actor in the set for whole network studies although there are methods available for handling incomplete datasets (Haythornthwaite, 1996).

4.2.1 Network measurement:

Network data can be studied at a number of levels, such as the individual actor, pairs of actors (dyads), triples of actors (triads), subsets of actors or the whole network. (Wasserman & Faust, 1994, p. 43). Wasserman and Faust (1994) call this the modelling unit and differentiate it from the level at which data is gathered. The latter is referred to as the unit of observation which can be an individual actor from whom data is collected or it can be a dyad when one is measuring ties between pairs of actors (Wasserman & Faust, 1994, p. 43). Some methods are used to analyse the total social network by enumerating through all data for a network to calculate measures such as group centrality and group density (Marsden, 1990). This study is interested in individual actor centrality. Therefore, the modelling unit is

the individual actor and the unit of observation is also the individual actor from whom information about ties is elicited (Wasserman & Faust, 1994, p. 43).

4.2.2 Boundary specification

Boundary specification is a problem for both whole and egocentric network data because it is always necessary to determine which set of objects must be included in a network (Marsden, 1990). It can be difficult to determine which objects lie within the set for whole-network studies (Carrington et al., 2005, p. 9). Laumann, Marsden and Prensky (1989) provide two approaches to boundary specification: the realist approach that focuses on actors setting the boundaries based on membership to the network as perceived by the actors; and the nominalist approach which sets network boundaries based on the theoretical membership criteria as determined or observed by the researcher.

This study is concerned with setting a network boundary for a whole project network and whole network studies require a complete enumeration of the members of the network under study in what is called a “dense” or “saturation” sample (Marsden, 1990). Therefore, the researcher has set specific membership criteria following the nominalist approach based on actor’s project roles as determined by the project manager of the project. This approach is appropriate because it is reasonable to expect a project manager to be able to identify members of their project team based on their roles on the project. The study is also

specifically concerned with important stakeholders and Karlsen (2002) determined that certain stakeholder roles are more important than others.

The membership criteria has therefore be specified as any active member of the project identified by the project manager that holds any of Karlsen's (2002) more important project stakeholder roles defined as: the project sponsor, project manager, end users, core project team members (including consultants and advisors), external team members (including sub-contractors and suppliers,) and the client or line organisation members that are performing the project.

4.3 Sample design

An important part of research design is specifying the unit of analysis which describes "the level at which the research is performed and which objects are researched" (Blumberg et al., 2008, p. 224). Based on the research question, the unit of analysis is the individual project stakeholder. Therefore, data has been gathered about individual project stakeholders that represent the total population of stakeholders.

The population for the study includes all project team members who have been part of IT projects in South Africa. The population size is unknown as there is no comprehensive list of projects or project team members available. Therefore, non-probability sampling will be used because each potential member (project

stakeholder) does not have a known non-zero chance of being included in the sample (Blumberg et al., 2008, p. 235). In contrast to probability sampling, which is requires controlled procedures to provide each member a known non-zero chance of random selection, non-probability sampling uses non-random and subjective techniques such as convenience, purposive, judgement, quota and snowball sampling (Blumberg et al., 2008, p. 224).

The sampling frame is the list of elements from which the sample was actually drawn (Blumberg et al., 2008, p. 239). This study followed a whole network approach which required the sampling frame for project stakeholders to consist of entire sets of actors per project (Marsden, 1990). Therefore, the sampling frame for the study was not a list of individual project stakeholder but a list of current projects in the target organisation.

The scope of the study was limited to active IT projects in one of South Africa's large banks. A list of IT projects with an indicator of their size was obtained from the bank's project office. Further, the scope was to study only projects that were relatively large and valuable to the organisation. There was no indication of team size or any way to determine the importance of the project to the organisation based on the list so projects were selected using judgement sampling which "occurs when a researcher selects sample members to conform to some criterion (Blumberg et al., 2008, p. 253). The criterion for inclusion was that the project size had to be medium or large as reflected on the project list.

An interview was then conducted with the project manager to verify the size of the project team and importance of the project to the organisation. Lastly, the project manager had to provide permission for the study to be conducted on their project team. Each project member included was allocated a project role by the project manager which would be overridden by the respondent when completing the survey. All project roles would therefore be known before the survey was submitted to project members.

4.4 Time Horizon

Whereas cross-sectional studies are carried out only once and view a snapshot of data for one point in time, longitudinal studies are repeated several times over an extended period of time (Blumberg et al., 2008, p. 199). The nature of the research question did not require repeated data collection points for the project networks to identify project stakeholders. The study was also time-constrained so a cross-sectional design was used.

4.5 Data collection method

Techniques that can be used to collect network data include questionnaires, interviews, observations, archival records, experiments and others such as ego-centred, small world and diaries (Wasserman & Faust, 1994, p. 45). Network studies draw extensively on survey and questionnaire data because the researcher

can decide on the relationships to measure and the actors to approach for data (Carrington et al., 2005). The great strength of surveys is their versatility however its shortcoming lies in the quality and quantity of information gathered relies on the ability and willingness of participants to cooperate with the research (Blumberg et al., 2008, p. 278).

Surveys have successfully been used in similar studies of network power and influence (Brass, 1984; Brass & Burkhardt, 1993; Ibarra, 1993; Krackhardt, 1990). The accuracy of network data collected from a survey is a concern because respondents may not provide data on the "true structure" of relatively prolonged and stable interpersonal relationships (Holland & Leinhardt, 1973). Freeman, Romney and Freeman (1987) studied informant accuracy and found that what people reported about their interactions with others is in fact related to the long-range social structure, instead of a recall of particular instances (Wasserman & Faust, 1994, p. 57). Therefore, respondents provide largely accurate reports about enduring patterns of interaction of the "true structure" of the network so a survey was used for this study.

The survey was an electronic self-administered questionnaire using Network Genie, a specialised social network survey tool (Hansen, Reese, Bryant, Bishop, Wyrick, & Dyreng, 2008). Network Genie allows questions to be configured to gather network data by uploading a roster of network actors and giving participants the ability to select, rate and rank these actors for different network types. A

computer-administered web survey was selected because of its easy distribution to project stakeholders which reduced the time and lowered the cost of delivery for each project selected as part of the sample (Blumberg et al., 2008, p. 303).

Before the web survey was delivered an e-mail was distributed to the project stakeholders providing instructions and explaining the purpose of the study to motivate participants to respond. The project stakeholders were also informed that participation was voluntary and were assured of their confidentiality. See Appendix 9 for the questionnaire.

4.6 Questionnaire design

Questionnaires usually contain questions about respondents' ties to other actors in the network so it is necessary to consider the format that will be used to allow respondents to evaluate their ties to other actors (Wasserman & Faust, 1994, p. 45). The first choice is whether the respondent should be presented with a complete list or roster of the other actors in the set or whether the respondent should use free recall to generate a list of actors because the set is not presented (Wasserman & Faust, 1994, p. 46). Whole network studies usually compile a roster of actors before data collection begins (Carrington et al., 2005, p. 10) which makes a roster appropriate for this study because it is a whole network study and the full list of project stakeholders can be determined before the data collection commences.

The roster of individual actors for each project was developed during an initial structured interview with the project manager. This roster contained the name, e-mail address and project stakeholder role of each identified member of the project. The collection was then limited to a pre-defined set of actors in the project network and did not allow for the addition of more actors by the respondents in the network.

The second choice is whether to use free or fixed choice. If respondents are told how many other actors to nominate then each person has a fixed number of choices, therefore it is fixed choice (Wasserman & Faust, 1994, p. 46). The alternative is to use free choice which allows the respondent to nominate any number of other actors (Wasserman & Faust, 1994, p. 46). Holland and Leinhardt (1973) found that fixed choice designs introduced error into the data because it is unlikely that all people are able to make exactly the same number of nominations by asking them to “List your three best friends”. The aim of the study also does not support this line of questioning so free choice was used to collect data on actor ties.

4.7 Independent variables

The survey required participants to check the names of the list of individuals identified by the project stakeholder roster developed with the project manager. The selection of a tie with another actor on a specified relationship is also called a

sociometric choice (Carrington et al., 2005, p. 11). The raw structural network data resulting from the survey provided a sociomatrix reflecting each actor's ties with other actors.

4.7.1 Communication network

Using a combination of the questions posed by Brass (1984) and suggested by Assudani and Kloppenberg (2010), the electronic survey asked participants to "Please check the names of people with whom you frequently discuss what is going on in the project, including any project-related activities to ensure the success of the project". The outcome was a binary sociomatrix describing the presence or absence of communication-related interaction.

4.7.2 Workflow network

Following Brass's (1984) example, the workflow measure required respondents to check the names of "people who you interact with to complete your work activities on the project. These are people that provide you with inputs for your job or to who you distribute the outputs of your work." Workflow measured interaction where stakeholders were dependent on each other's inputs and outputs to complete their work. The outcome was a binary sociomatrix describing the presence or absence of workflow-related interaction.

4.7.3 Friendship network

The friendship network was measured with an adaptation of the question that Ibarra (1993) used to ask participants to name the "people on the project who are very good friends of yours, people whom you see socially outside of work". The outcome was a binary sociomatrix describing the presence or absence of friendship-related interaction.

4.7.4 Project stakeholder attributes:

One actor attribute was collected to indicate the project stakeholder role. Each respondent was asked to select their project role from one of Karlsen's (2002) project stakeholder roles. Response options presented were:

- project sponsor
- project manager
- end users
- core project team members (including consultants and advisors)
- external team members (including sub-contractors and suppliers)
- other members of the client or line organisation that are in some way involved in the project

4.8 Dependent variables - Stakeholder power

Three dependent variables were collected. One for each of the three forms of stakeholder power: personal, positional and political power. Following the example of previous studies the word “influence” is used in the survey instead of “power” because of the negative connotation often associated with the use of the latter (Brass, 1984; Brass & Burkhardt, 1993). Respondents were asked to rate the influence of each person that they checked on the communication (personal), workflow (positional) and friendship (political) network respectively using a 5-point Likert scale. The anchors of the scale are “very little influence” coded as 1 and “very much influence” coded as a 5 as used by Brass and Burkhardt (1993).

4.9 Data analysis

Blumberg et al. (2008) suggest that data analysis typically follows a process of:

- Data preparation
- Exploring and describing the data
- Hypothesis testing

Data was collected electronically using Network Genie and exported in a sociomatrix for entry into a social network analysis software package (Hansen et al., 2008). The data that was exported was coded by Network Genie, which is the activity of assigning numbers or symbols to answers so that the responses can be grouped into a limited number of categories for analysis (Blumberg et al., 2008, p.

692). The data collected from the survey was then imported and analysed using UCINET Version 6 SNA software (Borgatti, Everett, & Freeman, 2002).

UCINET provides mathematical measurements as well as graphical representations required for SNA (Chinowsky et al., 2010). Exploring and describing the data refers to working with the data to provide visual representations and descriptive statistics including frequency tables, charts, histograms that "guide the choice of analysis" (Blumberg et al., 2008, p. 719). UCINET provide these features and specialised network analysis visualisations called graphs which can depict the nodes and interactions in a network visually (Wasserman & Faust, 1994). A dataset was then constructed with all necessary network measures from UCINET with the average power scores for each participant in SPSS 19.0.

The three hypotheses presented in Chapter 3 were tested using regression analysis in SPSS 19.0 to determine the outcomes of the data collection. Regression analysis is the study of relationships between variables and can be used to "understand how the world operates and to make predictions" (Albright, Winston, & Zappe, 2009, p. 573).

4.10 Limitations

Several limitations are listed for this study:

- Survey results rely heavily on the validity of self-reports (Carrington et al., 2005, p. 10). The option to conduct interviews and administer a questionnaire is too time-consuming considering that a whole-network analysis is being conducted. Surveys are the most practical way to gather the data and are the least demanding of participants (Carrington et al., 2005, p. 10).
- The study is not representative of all IT projects as it only allows for examination of active projects within a single bank. The study is time constrained and the researcher only has limited access to project managers and project personnel.
- The environment, organisational hierarchy, business and IT structure may influence the sources of power by either enabling or constraining certain actors in the network based on their formal authority and individual characteristics. A larger study may be required to include factors in the general environment as referred to by Karlsen (2002).
- Only core project team stakeholders are considered as defined by Karlsen (2002) and less important stakeholders have been excluded. The research could allow project stakeholders to nominate any other stakeholder as part of the questionnaire which would provide an unrestricted view of how the project network integrates with the broader organisation. Due to the time constraints this snowball approach is not feasible.

4.11 Summary

In summary, the study will use a self-administered web-based survey to collect cross-sectional data from a roster of project team members from a sample of IT projects in one of South Africa's large banks. Judgement sampling will be used to select appropriate projects and the data collected will be analysed using UCINET. The following chapter will detail the analysis steps and the results from the empirical data collected.

5 Analysis

5.1 Introduction

This chapter presents the results of the survey conducted and tests the hypotheses of the study as specified in Chapter 3. It details the response rate, provides descriptive information about the collected data and describes the data preparation process. Finally the chapter explains the results of the multiple regression analysis that were run to tests each of the three hypotheses.

5.2 Pre-testing

A paper-based version of the questionnaire was tested with members of a project team within the researcher's firm. A small subset of the project team was asked to complete the questionnaire while the researcher observed and answered any clarification questions. Testing feedback indicated that the questionnaire offered sufficient explanation, was relatively quick to complete, and that the perception of influence within the project team was not problematic.

5.3 Network participants

The project list used to select projects for inclusion in the study contained 113 projects classified as medium or large. Three projects were selected from this list based on the researcher's access to the project managers. These projects will be

referred to as projects A, B and C. A short description of the projects is provided Table 4.

The three projects included consisted of 94 project stakeholders who were nominated by the project managers as active project team members. Project A had 30 stakeholders, B had 45 and C was the smallest with 19 stakeholders. Out of the 94 stakeholders, 51 completed the survey for an overall response rate of 54.3%. A further two respondents started the survey but did not complete it. The response rate for each of the projects is also included in Table 4.

Table 3: Project description and response rate

Project Code	Project Details	Project Team Members	Respondents (completed)	Response Rate
A	Stage: Build Est. to Completion: 9 months Current Duration: 9 months Budget: R 8 million	30	19	63.3%
B	Stage: Build Est. to Completion: 8 months Current Duration: 5 months Budget: R 21 million	45	21	46.7%
C	Stage: Build Est. to Completion: 36 months Current Duration: 24 months Budget: R 200 million	19	11	57.9%
		94	**51**	**54.3%**

Stork and Richards (1992) reviewed literature on network research in their study of problems caused by non-respondents in communiations networks and found that response rates varied between 65% and 90%. The achieved response rate is therefore lower than some of the current literature has achieved. The study measures directed relationships. Therefore person A may indicate a relationship to person B but person B may not indicate the same relationship to person A.

As a result respondents may indicate interaction with non-respondents which leads to the use of partial cases for the analysis. Partial cases are those cases where a respondent has provided information about a non-respondent. The response rate for each project network is made up of the sum of all complete and partial relationships as indicated in Table 5. It is important to note that the absent relationships are also included in the response counts below.

Table 4: Response break-down

Project Code	Total possible observations	Respondent to respondent		Respondent to non-respondent		Non-respondent to respondent		Non-respondent to non-respondent	
		Complete		Partial		Missing			
A	870	342	**39.3%**	209	**24.0%**	209	**24.0%**	110	**12.6%**
B	1980	420	**21.2%**	504	**25.5%**	504	**25.5%**	276	**13.9%**
C	342	110	**32.2%**	88	**25.7%**	88	**25.7%**	28	**8.2%**

5.4 Descriptive Information

Table 6 provides information on the types of various stakeholder roles for each of the three projects. Most respondents indicated that they were other members (40%) or core members (26%) of the project team. The smallest number of project stakeholder roles included in the survey was project sponsors (5%). Where a project member did not respond to the survey the project stakeholder role was allocated by the project manager.

Table 5: Project Stakeholder Roles

	Project A		Project B		Project C		Total	
Stakeholder Role	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**
Core Member	10	33%	9	20%	5	26%	24	26%
End-user	6	20%	2	4%	1	5%	9	10%
External Member	1	3%	2	4%	6	32%	9	10%
Other Member	9	30%	25	56%	4	21%	38	40%
Project Manager	2	7%	5	11%	2	11%	9	10%
Project Sponsor	2	7%	2	4%	1	5%	5	5%
Total	**30**	**100%**	**45**	**100%**	**19**	**100%**	**94**	**100%**

5.4.1 Project A - Details

Project A consisted of 30 project stakeholders, of which 19 responded to the survey. The maximum number of observed relations, if every stakeholder indicated

a relationship with every other stakeholder, was 870. Out of the 551 possible observations based on the response rate, the communication network had the highest number of relationships with 162 observations. The workflow network consisted of 141 relationships and the friendship network 64 relationships. The means, standard deviation, variance and number of observations for the communication, workflow and friendship matrices have been listed in Table 7.

Table 6: Project A – Sociomatrix univariate statistics

Item	Communication (Personal Influence)	Workflow (Positional)	Friendship (Political)
Mean	4.0679	3.8723	3.2500
Std Dev	1.1607	1.1660	1.5411
Sum	659	546	208
Variance	1.3472	1.3596	2.3750
Minimum	1	1	1
Maximum	5	5	5
N of Obs	162	141	64

A test for network density and variance of ties was run between the network types using a bootstrap sample of 5000 random sub-samples. Hanneman & Riddle (2005) explain that the estimated sampling variance of the mean is calculated by bootstrapping 5000 random sub-samples from each of the networks and constructing a sampling distribution of density measures. The standard error or sampling distribution therefore represents the distribution of the values on repeated sampling (Hanneman & Riddle, 2005). The summary of the network density and variance of ties is presented in Table 8

Table 7: Project A – Density and Variance

Network Type	Density	Variance of ties	Bootstrap Std. Err.
Communication	.1862	.1517	.0380
Workflow	.1621	.1360	.0374
Friendship	.0736	.0682	.0231

The communication network has the highest density with .1862, the workflow is next with a density of .1621 and the friendship is the least dense with .0736. A paired sample T-Test was run to compare the differences in density between networks for Project A. The results of the test are presented Appendix B.

The results of the paired sample T-Test show a significant difference in density with the communication network having a larger density than the workflow network with a T-statistic of 4.4448, $p < .0005$. The same test also presented that the communication network density was larger than the friendship network with a T-statistic of 1.4367, $p = .0730$ which was not significant at the 95% confidence level. Lastly, the same test indicated that the friendship network density was significantly smaller than the workflow network with a T-statistic of -3.4724, $p < .0005$.

5.4.2 Project B - Details

Project B consisted of 45 project stakeholders, of which 21 responded to the survey. The maximum number of observed relations, if every stakeholder indicated a relationship with every other stakeholder, was 1980. Out of the 924 possible observations based on the response rate, the communication network had the highest number of relationships with 190 observations. The workflow network consisted of 136 relationships and the friendship network 32 relationships. The means, standard deviation, variance and observations for the entire communication, workflow and friendship matrices have been listed in Table 9.

As with the networks measured for Project A, a test was run for the network density and variance of ties was run between the network types using a bootstrap sample of 5000 random sub-samples. The results of the test are presented in Table 10.

Table 8: Project B – Sociomatrix univariate statistics

Item	Communication (Personal Influence)	Workflow (Positional)	Friendship (Political)
Mean	3.8632	3.5147	3.6875
Std Dev	1.1797	1.3060	1.3332
Sum	734	478	118
Variance	1.3918	1.7057	1.7773
Minimum	1	1	1
Maximum	5	5	5
N of Obs	190	136	32

Table 9: Project B – Density and Variance

Network Type	Density	Variance of ties	Bootstrap Std Err.
Communication	.0960	.0868	.0204
Workflow	.0687	.0640	.0168
Friendship	.0162	.0159	.0057

The communication network has the highest density with .0960, followed by the workflow network with a density of .0687 and the friendship network with .0162. A paired sample T-Test was run to compare the differences in density between networks for Project B. The results of the test are presented Appendix C.

The results of the paired sample T-Test show that the communication network density is significant larger than the workflow network with a T-statistic of 4.5151, $p < .0005$. The communication network density was also significantly larger than the friendship network with a T-statistic of 2.8331, $p = .0078$. Lastly, the same test indicated that the friendship network density was significantly smaller than the workflow network with a T-statistic of -3.5896, $p = .00012$.

5.4.3 Project C - Details

Project B consisted of 19 project stakeholders (the smallest of the three projects), of which 11 responded to the survey. The maximum number of observed relations,

if every stakeholder indicated a relationship with every other stakeholder, was 342. Out of the 198 possible observations based on the response rate, the communication network had the highest number of relationships with 70 observations. The workflow network consisted of 46 relationships and the friendship network 13 relationships. The means, standard deviation, variance and observations for the entire communication, workflow and friendship matrices have been listed in Table 11.

As with the networks measured for Project A and B, a test was run for the network density and variance of ties was run between the network types using a bootstrap sample of 5000 random sub-samples. The results of the test are presented in Table 12.

Table 10: Project C – Sociomatrix univariate statistics

	Communication (Personal Influence)	Workflow (Positional)	Friendship (Political)
Mean	3.9571	3.7391	4.2308
Std Dev	1.0749	1.2057	0.9730
Sum	277	172	55
Variance	1.1553	1.4537	0.9467
Minimum	1	1	2
Maximum	5	5	5
N of Obs	70	46	13

Table 11: Project C – Density and Variance

Network Type	Density	Variance of ties	Bootstrap Std Err.
Communication	.2047	.1633	.0519
Workflow	.1345	.1168	.0415
Friendship	.0380	.0367	.0172

The communication network has the highest density with .2047, followed by the workflow network with a density of .1345 and the friendship with .0380. A paired sample T-Test was run to compare the differences in density between networks for Project C. The results of the test are presented Appendix D.

The results of the paired sample T-Test show that the communication network density is significant larger than the workflow network with a T-statistic of 2.0694, $p < .0250$ at a 95% confidence level. The communication network density was also significantly larger than the friendship network with a T-statistic of 3.5800, $p = .0012$. Lastly, the same test indicated that the friendship network density was significantly smaller than the workflow network with a T-statistic of -2.4316, $p = .0136$.

5.5 Network Visualisation

The communication, workflow and friendship networks for each of the three projects have been visualised using NetDraw (Borgatti, 2002), and presented in

Appendix E. The node colours and labels refer to the project stakeholder role. The arrow heads on the connections indicate the direction of the relationship (who nominated whom). The labels for each of the connections indicate the strength given by the nominee to the project team member in terms of their influence (whether personal, positional and political influence) measured on a scale from 1 to 5 with 1 indicating the least influence and 5 the most.

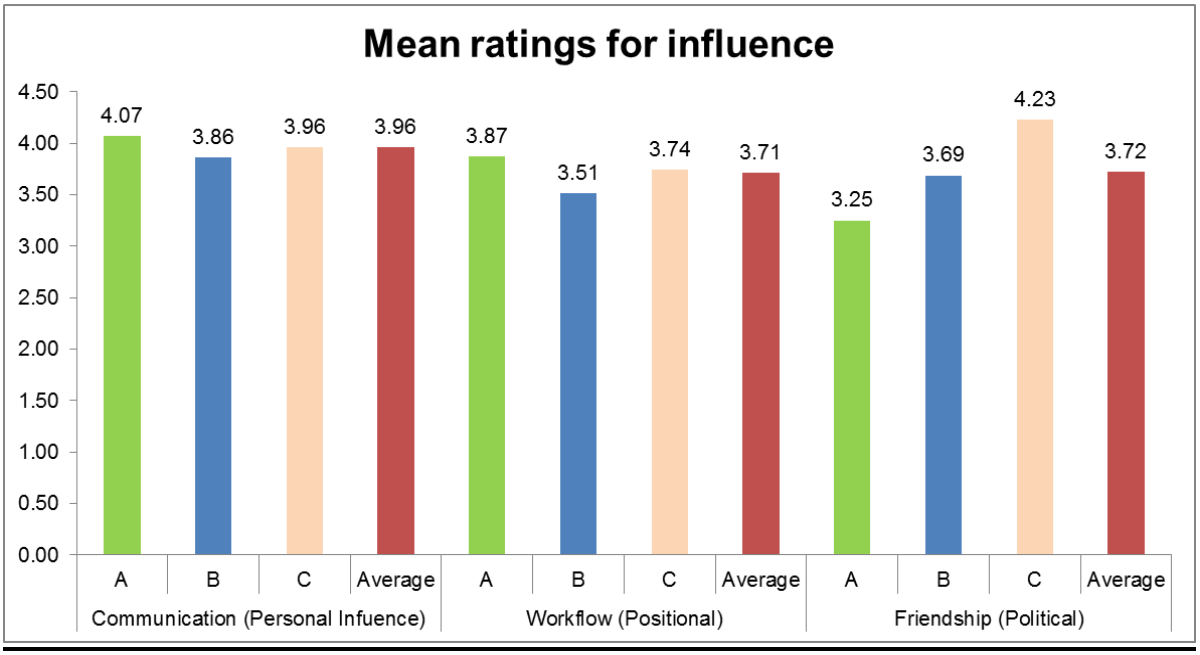
5.6 Data Preparation

Power has been calculated as the mean of the influence ratings allocated to each project member from each other team member. The mean was calculated by summing the scores for influence for each column in the influence matrices (personal, positional and political) and dividing by the nominees of that influence rating. Therefore, cases of non-respondents were excluded as well as cases where a project team member had not nominated the member for that particular network. For example, if a project team member was nominated by 5 others and not nominated by the remaining 10 members (including non-respondents) then the mean was calculated as the sum of the nominated ratings divided by 5.

The average score for personal influence rating using the communication network for all projects was 3.96. Project A achieved the highest rating of 4.07 with Project B the lowest at 3.86. The average score for positional influence using the workflow network for all projects was 3.71. Project A achieved the highest rating of 3.87 with

Project B again the lowest with 3.51. The average score for political influence using the friendship network for all projects was 3.72. Project C achieved the highest rating of 4.23 with Project A receiving the lowest rating of 3.25. Figure 14 below depicts the averages graphically.

Figure 14: Project influence means



The mean personal, political and positional influence rating was calculated for each project stakeholder role. The means per stakeholder role are listed in Table 13. The highest total mean for all three influence ratings was recorded for the project manager who scored 3.59. This was followed by core team members, end-users, external team members, project sponsors and lastly other team members.

Table 12: Project stakeholder influence means

	Means			
Project Stakeholder Role	**Personal Influence**	**Political Influence**	**Positional Influence**	**Total Power**
Project Manager	3.70	3.24	3.82	3.59
Core Member	3.97	2.66	3.49	3.38
End-user	3.20	2.89	3.36	3.15
External Member	3.16	1.33	3.25	2.58
Project Sponsor	4.27	1.00	1.88	2.38
Other Member	2.77	1.14	2.32	2.08

The top five most powerful project stakeholders for project A, B and C have been listed in Tables 14, 15 and 16. The stakeholder power is based on the average influence rating (personal, positional and political) as determined by other team members that nominated the stakeholder in the respective network. The project manager role may be repeated for each project because a project could have multiple project managers involved.

The project manager that was interviewed as the IT project manager has been highlighted in bold and italics. In each project at least one stakeholder appeared in the top five ranking of all three bases of influence. In Project A it was a core team member (14), in Project B an end-user (40) and in Project C a core member (94) and external team member (82) appeared. These have been highlighted in grey.

Table 13: Top five personal power stakeholders per project

	Project A		Project B		Project C	
Rank	**Team Member**	**Role**	**Team Member**	**Role**	**Team Member**	**Role**
1	10	Other Member	57	Other Member	78	Other Member
2	***24***	***Project Manager***	60	Other Member	91	Project Sponsor
3	14	Core Member	***31***	***Project Manager***	94	Core Member
4	7	Core Member	40	End-user	***89***	***Project Manager***
5	12	Core Member	32	Core Member	82	External Member

Table 14: Top five positional power stakeholders per project

	Project A		Project B		Project C	
Rank	**Team Member**	**Role**	**Team Member**	**Role**	**Team Member**	**Role**
1	10	Other Member	***31***	***Project Manager***	***89***	***Project Manager***
2	18	Project Sponsor	41	Project Manager	93	Other Member
3	14	Core Member	32	Core Member	82	External Member
4	***24***	***Project Manager***	64	Core Member	94	Core Member
5	4	Core Member	40	End-user	90	End-user

Table 15: Top five political power stakeholders per project

	Project A		Project B		Project C	
Rank	**Team Member**	**Role**	**Team Member**	**Role**	**Team Member**	**Role**
1	8	Project Sponsor	57	Other Member	94	Core Member
2	2	Project Manager	40	End-user	82	External Member
3	17	Other Member	67	Other Member	90	End-user
4	6	Other Member	38	Project Manager	81	Core Member
5	14	Core Member	39	Core Member	79	Other Member

Several centrality measures were calculated on the individual project networks using UCINET (Borgatti et al., 2002). The centrality measures calculated are each actor's in-degree centrality, in-closeness centrality and betweenness centrality. The relationships in the networks are directed so it is possible to include in and out centrality measures however the objective of the study is to identify actors who are identified by others as influential.

As a result, only the in-directed centrality measures which provide information on the nominees instead of the nominators of a relationship. Therefore, an actor that

has nominated many other actors will not feature as central but an actor that has been nominated by many others will. Three variables of centrality have therefore been calculated for each of the three network types studied creating a total of nine independent variables.

The actor data for the three project networks was combined into a single dataset with each project member listed as a case with data variables for project role, average personal influence, average positional influence, average political influence and the nine centrality measures. An indicator was included to identify respondents and non-respondents and the project that each project member belongs to. The combined means and standard deviations for the dependent variables of personal, positional and political power have been listed in Table 17.

Table 16: Means and Standard Deviation – Combined Influence

	Mean	Std. Deviation	N
Personal Influence	3.3259	1.33428	94
Political Influence	1.9104	2.00130	94
Positional Influence	2.9289	1.38372	94

The correlation between the dependent variables highlights that the three power variables are positively correlated to each other. The correlations are significant

with a 99% confidence level. The correlations are however only moderately strong ranging from .320 to .416. The correlations have been listed in Table 18.

Table 17: Correlation – Combined Influence

	Scale	1	2	3
1	Personal Influence	-	.320**	.409*
2	Political Influence		-	.416**
3	Positional Influence			-

** p < .001 (1-tailed)

The full data set was run through three independent stepwise regression analyses. Albright et al. (2009) explain that a stepwise regression builds the combination of variables that best explain the dependent variable by adding and deleting variables automatically based on a set of pre-defined rules. The stepwise regression works much like a forward regression by starting with no explanatory variables in the equation. It then successively adds one at a time but may also consider deleting the variable if another makes a more significant contribution. In this way, the equation automatically returns the explanatory variables that make the biggest contribution to explaining the dependent variable.

5.7 Hypothesis 1

Which network centrality measure is the most important in identifying actors in a project network with high positional power?

H_o: $\mu_N - \mu_{N+1} = 0$

The null hypothesis states that workflow, friendship, and communication centrality are all equally good measures of explaining actors with high positional power.

H_A: $\mu_N - \mu_{N+1} \neq 0$

The alternative hypothesis states that differences exist in workflow, friendship and communication network centrality measures regarding the ability to explain actors with high positional power.

Preliminary analysis was conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity. See Appendix F for the detailed test results, including the correlations, coefficients, scatterplot, residuals histogram and normal P-P plot of regression standardised residuals. The means and standard deviations for the variables entered into the stepwise regression are displayed in Table 19.

Table 18: Descriptive Statistics – Positional Influence Regression

Variable	Mean	Std. Deviation	N
Positional Influence	2.9289	1.38372	94
Communication_In_Degree	4.4894	3.85418	94
Workflow_In_Degree	3.4362	3.29078	94
Friendship_In_Degree	1.1596	1.66755	94
Communication_In_Closeness	5.9428	2.34931	94
Workflow_In_Closeness	5.9587	2.66130	94
Friendship_In_Closeness	3.8490	1.61139	94
Communication_Betweenness	14.4043	44.91951	94
Workflow_Betweenness	14.5532	44.11153	94
Friendship_Betweenness	4.2872	19.77516	94

Table 20 depicts the regression test statistics for the dependent variable Positional Influence. Workflow_In_Degree is the most significant explanatory variable explaining 34.9% of the variance in Positional Influence. After adding Workflow_In_Closeness the model changes by 14.5% with an F change = 26.077 ($p < .0005$). The third model includes Friendship_In_Closeness which improves the model by a further 3.1% with an F change = 5.892 ($p = .017$). One of the regression assumptions is that the error terms are probabilistically independent (lag 1 autocorrelation) which is tested with the Durbin-Watson statistic (Albright et

al., 2009). The statistic is 1.822 for this regression which indicates little lag 1 autocorrelation. See Table 21 for a summary of the model.

Table 19: Positional Influence Stepwise Regression Statistics

Model	Change Statistics					Durbin-Watson
	R Square Change	F Change	df1	df2	Sig. F Change	
Workflow_In_Degree	.349	49.254	1	92	.000	
Workflow_In_Degree, Workflow_In_Closeness	.145	26.077	1	91	.000	
Workflow_In_Degree, Workflow_In_Closeness, Friendship_In_Closeness	.031	5.892	1	90	.017	1.822

Table 20: Positional Influence Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Workflow_In_Degree	.591	.349	.342	1.12277
Workflow_In_Degree, Workflow_In_Closeness	.703	.494	.483	.99529
Workflow_In_Degree, Workflow_In_Closeness, Friendship_In_Closeness	.724	.525	.509	.96957

The adjusted R Square for the model including the Workflow_In_Degree, Workflow_In_Closeness and Friendship_In_Closeness explanatory variables reaches .509 (50.9%). The ANOVA indicates that the model as a whole is significant with the first model achieving an F = 49.254 (p < .0005) and the second an F = 44.378 (p < .0005). The third model achieved an F = 31.153 (p < .0005) which includes all three explanatory variables. The ANOVA results are shown in Table 22.

Table 21: ANOVA - Positional Influence

Model		Sum of Squares	df	Mean Square	F	Sig.
Workflow_In_Degree	Regression	62.090	1	62.090	49.254	.000
	Residual	115.976	92	1.261		
	Total	178.066	93			
Workflow_In_Degree, Workflow_In_Closeness	Regression	87.922	2	43.961	44.378	.000
	Residual	90.144	91	.991		
	Total	178.066	93			
Workflow_In_Degree, Workflow_In_Closeness, Friendship_In_Closeness	Regression	93.460	3	31.153	33.140	.000
	Residual	84.605	90	.940		
	Total	178.066	93			

The standardized coefficient beta for Workflow_In_Degree and Workflow_In_Closeness is significant ($p < .0005$) with Friendship_In_Closeness also significant with a $p = .017$. The most significant individual variable is Workflow_In_Closeness with a Beta of .711 followed by Workflow_In_Degree with a Beta of .551. See Appendix F for the table of coefficients.

The tests confirm that hypothesis 1 can be rejected. Workflow, friendship and communication centrality are not equally good variables to explain positional power. The primary explanatory variables for positional power are the two workflow variables of in-degree centrality and in-closeness centrality. This is followed by friendship in-closeness centrality as a third possible predictor.

5.8 Hypothesis 2

Which network centrality measure is the most important in identifying actors in a project network with high personal power?

H_o: $\mu_N - \mu_{N+1} = 0$

The null hypothesis states that workflow, friendship, and communication centrality are all equally good measures of explaining actors with high personal power.

H_A: $\mu_N - \mu_{N+1} \neq 0$

The alternative hypothesis states that differences exist in workflow, friendship and communication network centrality measures regarding the ability to explain actors with high personal power.

Preliminary analysis was conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity. See Appendix G for the detailed test results, including the correlations, coefficients, scatterplot, residuals histogram and normal P-P plot of regression standardised residuals. The means and standard deviations for the variables entered into the stepwise regression are displayed in Table 23.

Table 22: Descriptive Statistics – Personal Influence Regression

Variable	Mean	Std. Deviation	N
Personal Influence	3.3259	1.33428	94
Communication_In_Degree	4.4894	3.85418	94
Workflow_In_Degree	3.4362	3.29078	94
Friendship_In_Degree	1.1596	1.66755	94
Communication_In_Closeness	5.9428	2.34931	94
Workflow_In_Closeness	5.9587	2.66130	94
Friendship_In_Closeness	3.8490	1.61139	94
Communication_Betweenness	14.4043	44.91951	94
Workflow_Betweenness	14.5532	44.11153	94
Friendship_Betweenness	4.2872	19.77516	94

Table 24 depicts the regression test statistics for the dependent variable Personal Influence. Communication_In_Degree is the most significant explanatory variable explaining 31.0% of the variance in Personal Influence. After adding Communication_In_Closeness the model changes by only 3% with an F change = 4.202 (p = .043). The third model includes Workflow_In_Closeness which improves the model by a further 3.9% with an F change = 5.695 (p = .019). The Durbin-Watson statistic is 2.242 for this regression which indicates little lag 1 autocorrelation. See Table 25 for a summary of the model.

Table 23: Personal Influence Stepwise Regression Statistics

Model	Change Statistics					Durbin-Watson
	R Square Change	F Change	df1	df2	Sig. F Change	
Communication_In_Degree	.310	41.369	1	92	.000	
Communication_In_Degree, Communication_In_Closeness	.030	4.202	1	91	.043	
Communication_In_Degree, Communication_In_Closeness, Workflow_In_Closeness	.039	5.695	1	90	.019	2.242

Table 24: Personal Influence Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Communication_In_Degree	.557	.310	.303	1.11420
Communication_In_Degree, Communication_In_Closeness	.584	.341	.326	1.09530
Communication_In_Degree, Communication_In_Closeness, Workflow_In_Closeness	.616	.380	.359	1.06809

The adjusted R Square for the model including the Communication_In_Degree, Communication_In_Closeness and Workflow_In_Closeness explanatory variables

reaches .359 (35.9%). The ANOVA indicates that the models as a whole are significant with the first model achieving an F = 41.369 (p < .0005) and the second model achieving an F = 23.505 (p < .0005). The third model achieved an F = 18.377 (p < .0005) which includes all three explanatory variables. The ANOVA is shown in Table 26.

Table 25: ANOVA - Personal Influence

Model		Sum of Squares	df	Mean Square	F	Sig.
Communication_In_Degree	Regression	51.356	1	51.356	41.369	.000
	Residual	114.212	92	1.241		
	Total	165.568	93			
Communication_In_Degree, Communication_In_Closeness	Regression	56.398	2	28.199	23.505	.000
	Residual	109.170	91	1.200		
	Total	165.568	93			
Communication_In_Degree, Communication_In_Closeness, Workflow_In_Closeness	Regression	62.894	3	20.965	18.377	.000
	Residual	102.673	90	1.141		
	Total	165.568	93			

The standardized coefficient betas for each of the variables included in the model are significant. The most significant explanatory variable is Communication_In_Degree which has a Beta of .479 ($p < .0005$), Communication_In_Closeness is second with a Beta of .450 ($p = .002$) followed by Workflow_In_Closeness which has a Beta of -.331 ($p = .019$). The ranking of explanatory variables is based on the significance of that variables' unique contribution to the equation (Pallant, 2010, p. 161). This is why Communication_In_Closeness ($p = .002$) ranks higher than Workflow_In_Closeness ($p = .019$) even though Workflow_In_Closeness (3.9%) explains more of the variance of the Personal Influence variable than Communication_In_Closeness (3%) See Appendix G for the table of coefficients.

The tests confirm that hypothesis 2 can be rejected. Workflow, friendship and communication centrality are not equally good variables to explain personal power. The primary explanatory variables for positional power are the two communication variables of in degree centrality and in closeness centrality. This is followed by workflow in closeness centrality as a third possible predictor.

5.9 Hypothesis 3

Which network centrality measure is the most important in identifying actors in a project network with high political power?

H_o: $\mu_N - \mu_{N+1} = 0$

The null hypothesis states that workflow, friendship, and communication centrality are all equally good measures of explaining actors with high political power.

H_A: $\mu_N - \mu_{N+1} \neq 0$

The alternative hypothesis states that differences exist in workflow, friendship and communication network centrality measures regarding the ability to explain actors with high political power.

Preliminary analysis was conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity. See Appendix H for the detailed test results, including the correlations, coefficients, scatterplot, residuals histogram and normal P-P plot of regression standardised residuals. The means and standard deviations for the variables entered into the stepwise regression are displayed in Table 27.

Table 26: Descriptive Statistics – Political Influence Regression

Variable	Mean	Std. Deviation	N
Political Influence	1.9104	2.00130	94
Communication_In_Degree	4.4894	3.85418	94
Workflow_In_Degree	3.4362	3.29078	94
Friendship_In_Degree	1.1596	1.66755	94
Communication_In_Closeness	5.9428	2.34931	94
Workflow_In_Closeness	5.9587	2.66130	94
Friendship_In_Closeness	3.8490	1.61139	94
Communication_Betweenness	14.4043	44.91951	94
Workflow_Betweenness	14.5532	44.11153	94
Friendship_Betweenness	4.2872	19.77516	94

Table 28 depicts the test statistics for the dependent variable Political Influence. Friendship_In_Degree is the most significant explanatory variable explaining 31.0% of the variance in Political Influence. After adding Friendship_In_Closeness the model changes by only 8.8% with an F change = 13.339 ($p < .0005$). The third model includes Friendship_Betweenness which improves the model by a further 5.6% with an F change = 9.260 ($p = .003$). The Durbin-Watson statistic is 1.733 for this regression which indicates little lag 1 autocorrelation. See Table 29 for a summary of the model.

Table 27: Political Influence Stepwise Regression Statistics

Model	Change Statistics					Durbin-Watson
	R Square Change	F Change	df1	df2	Sig. F Change	
Friendship_In_Degree	.310	41.298	1	92	.000	
Friendship_In_Degree, Friendship_In_Closeness	.088	13.339	1	91	.000	
Friendship_In_Degree, Friendship_In_Closeness, Friendship_Betweenness	.056	9.260	1	90	.003	1.733

Table 28: Political Influence Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Friendship_In_Degree	.557	.310	.302	1.67163
Friendship_In_Degree, Friendship_In_Closeness	.631	.398	.385	1.56968
Friendship_In_Degree, Friendship_In_Closeness, Friendship_Betweenness	.674	.454	.436	1.50295

The adjusted R Square for the model including the Friendship_In_Degree, Friendship_In_Closeness and Friendship_Betweenness explanatory variables reaches .436 (43.6%). The ANOVA indicates that the models as a whole are

significant with the first model achieving an F = 41.298 (p < .0005) and the second model achieving an F = 30.088 (p < .0005). The third model achieved an F = 24.966 (p < .0005) which includes all three explanatory variables. The ANOVA is shown in Table 30.

Table 29: ANOVA - Political Influence

Model		Sum of Squares	df	Mean Square	F	Sig.
Friendship_In_Degree	Regression	115.402	1	115.402	41.298	.000
	Residual	257.080	92	2.794		
	Total	372.483	93			
Friendship_In_Degree, Friendship_In_Closeness	Regression	148.269	2	74.134	30.088	.000
	Residual	224.214	91	2.464		
	Total	372.483	93			
Friendship_In_Degree, Friendship_In_Closeness, Friendship_Betweenness	Regression	169.185	3	56.395	24.966	.000
	Residual	203.298	90	2.259		
	Total	372.483	93			

The standardized coefficient betas for each of the variables included in the model are significant. The most significant explanatory variable is Friendship_In_Degree which has a Beta of .606 ($p < .0005$). Friendship_In_Closeness is second with a Beta of .318 ($p < .0005$) followed by Friendship_Betweenness which has a Beta of -.287 ($p = .003$). See Appendix H for the table of coefficients.

The tests confirm that hypothesis 3 can be rejected. Workflow, friendship and communication centrality are not equally good variables to explain political power. The primary explanatory variables for political power are the centrality degree closeness and betweenness centrality measures of the friendship network.

5.10 Conclusion

This chapter has described the results of the data preparation, data exploration and finally the hypotheses testing conducted. The three project networks were first described individually to provide a sense of the data. Thereafter, various dependent and independent variables were constructed for the regression analysis. The data from the three projects was merged into a single data set with 94 cases. Finally, each of the three hypotheses was tested using a stepwise multiple regression with personal, positional and political power as dependent variables respectively with the following results:

Table 30: Hypothesis Results Summary

Hypothesis	Result
Hypothesis 1: $\mathbf{H1_o: \mu_N - \mu_{N+1} = 0}$	Rejected
Hypothesis 2: $\mathbf{H2_o: \mu_N - \mu_{N+1} = 0}$	Rejected
Hypothesis 3: $\mathbf{H3_o: \mu_N - \mu_{N+1} = 0}$	Rejected

Chapter 6 will provide a discussion of the results of each hypothesis test relating these back to the literature explored in Chapter 2 and the objectives of the research. Any other relevant findings will also be discussed in the context of the literature.

6 Discussion

6.1 Introduction

This chapter discusses the results of the empirical data collected and analysed in Chapter 5. The discussion will focus on the findings related to the three hypotheses that were tested and how these relate to identifying powerful stakeholders using workflow, communication and friendship networks. A summary is provided as a conclusion to the chapter and the conceptual stakeholder model created in Chapter 3 is updated to reflect the outcomes of the analysis.

6.2 Hypothesis 1

Which network centrality measure is the most important in identifying actors in a project network with high positional power?

The objective of the hypothesis was to assess whether there is a way to identify powerful stakeholders based on their position in the project using social network centrality. The results of the regression analysis rejected the null hypothesis which stated that the workflow, friendship and communication network would all be equally good at identifying stakeholders with high positional power within a network.

The alternate hypothesis is accepted. The workflow network is a better predictor of positional power than the other network types. The regression model identified

workflow in-degree and in-closeness centrality as the primary explanatory variables with 34.9% and 14.5% respectively. The in-closeness centrality measure of the friendship network was the third best predictor but only contributed 3.1%. The regression models were significant to a confidence interval of 95% with the combined model using all three explanatory variables reaching an $F = 33.140$ ($p < .0005$). The explanatory power of the model with just the workflow in-degree and in-closeness centrality is 49.4% which provides relatively strong support that the workflow network is a reasonably good predictor of positional power.

It also supports the argument that positional power derives from access or control to resources as proposed by Yukl (1998). Ibarra (1993) and Brass (1984) found that central actors in a workflow network would gain influence because of their access and control over resources. The results of the regression confirm that the workflow network is instrumental in determining stakeholders with positional power. The measure of in-degree centrality identifies stakeholders with high proximity to others which means that they have many relationships to others in the project network. Their proximity would therefore allow them to control information and resource exchanges. Stakeholders with high in-degree centrality are known to many others and approached by them for resources.

The second explanatory variable of in-closeness centrality points to stakeholders who typically interact with many other project members because their position makes gives others easy access to them. Where stakeholders have high in-

closeness centrality it means that other stakeholders in the project network approach them to gain access to information or because there is a reliance on their input or output in terms of the workflow of the project. The workflow network is therefore likely to ensure that certain stakeholders have power because of their position in the workflow which makes others dependent on them. The dependency could result from a specific expertise, the production of certain resources or the supply of valuable information.

The regression test results also support the assertion by Brass (1984) that sources of power derive from position, especially when individuals hold focal positions in a network. Brass et al. (2004) explains that central actors increase others' dependence on themselves and decreas their own dependence on others. A high in-degree and in-closeness centrality indicates that a stakeholder is a major channel of information and occupies a crucial position in the network because he/she is in direct contact with many other stakeholders in the project. They therefore become very critical to the project network and become powerful because they can increase others' dependence on themselves. These stakeholders also have several alternative links that they can use to disseminate their influence. This variety of options to access the network reduces their dependence on others which also leads to an increase in power.

Interestingly, the workflow network density is the second highest of the three network types studied in each of the three projects. It is consistently weaker than

the communication network and consistently stronger than the friendship network. The project context has likely contributed to this outcome because the study was conducted in a work environment. The average positional power score measured on the workflow network was also the lowest of the three power scores. This may indicate that the instrumental network (workflow) has less potential to transmit social influence than the friendship or communication networks. This supports the argument by Ibarra and Andrews (1993) that the network type may affect the amount of influence that can be transmitted. They suggested that friendship-based social networks allow for more social influence to be transmitted than instrumental (workflow) networks which is what the power ratings for the networks support.

In a project setting, it should be expected that the project manager, who is the central co-ordinator of activities, will be central to the workflow network. The analyses of the project stakeholder roles showed that in each project the project manager was one of the most powerful stakeholders in the workflow network. This is not surprising because project managers have control over and provide access to a large amount of resources, such a financial resources and human resoures. Smith-Doerr et al. (2004) also found that the workflow network was a source of power and information to those stakeholders who provided resources to the network. The power conferred to the project manager by their position is therefore valuable in managing the allocation of work and directing the project efforts.

The results indicate that access and control over resources is a greater source of power than the actual ownership or provision of those resources. The project sponsor is typically the provider of financial resources, human and other types of resources to the project but only appeared in the top five positionally powerful stakeholders for project A. The project sponsors scored an average of 1.88 for positional influence which ranks them the lowest influencer role for the workflow network. The project manager and core team members ranked as first and second respectively, followed by end-users and exteral team members.

Karlsen (2002) found that clients and end-users were the most important project stakeholders. The results gathered in this study show that the project sponsor, who would be the client, ranked as one of the least powerful. Therefore, even if clients are the most important, as indicated by Karlsen (2002), they are not necessarily the most powerful stakeholder.

The results of the regression support the argument that powerful stakeholders that influence a project based on their position can be identified by examining the workflow network. The explanatory variables of in-degree and in-closeness workflow centrality can provide a reasonably accurate view of these powerful stakeholders.

6.3 Hypothesis 2

Which network centrality measure is the most important in identifying actors in a project network with high personal power?

The objective of the hypothesis was to assess whether there is a way to identify powerful stakeholders that were powerful because of their personal power in the project using social network centrality. The results of the regression analysis rejected the null hypothesis which stated that the workflow, friendship and communication network would all be equally good at identifying stakeholders with high personal power within a network.

The alternate hypothesis is accepted. The communication network is a better predictor of personal power than the other network types. The regression model identified in-degree and in-closeness centrality as the primary explanatory variables with 31.0% and 3% respectively. The in-closeness centrality measure of the workflow network was the third best predictor and contributed 3.9%. The regression models were significant to a confidence level of 95% with the combined model using all three explanatory variables reaching an $F = 18.377$ ($p < .0005$) and predicting 35.9% of the variance in personal power. The explanatory power of the model with just the communication in-degree and in-closeness centrality is 34.1% which provides moderate support that the workflow network is a reasonably good predictor of personal power.

Interestingly, the communication network mirrors the workflow network in terms of the centrality measures that are most prominent. The communication in-degree and in-closeness centrality measure are the two most important variables in explaining personal power. Yukl (1998) defined personal power as the consisting of information, referent and expert power. The results support this argument because high communication in-degree centrality indicates that these stakeholders are receiving communication from many other stakeholders in the network. This could be as a result of their access to specific information or their expertise in a certain area of the project. As a result these stakeholders increase the dependence of others on them because they have either information or expertise that others need. This once again supports the view of Brass et al. (2004) that centrality is related how much dependency others have on prominent actors.

The results show that the in-closeness centrality variable was the second most important variable in explaining personal power. Once again, this is consistent with Brass's (1984) view that central stakeholders not only create a dependency on themselves but also ensure independence from others. A high in-closeness centrality indicates that a stakeholder has quick access to many other stakeholders in the network. They could therefore reduce their dependence on others by having multiple options available to gather the information or expertise that they need.

The results of the regression also support the findings of Brass (1984) who determined that central actors in the communication network were found to be

more influential. Notably the communication in-degree centrality had far stronger explanatory power than communication in-closeness and workflow in-closeness. This means that stakeholders can ensure a higher level of interaction with other project members because they are critical to the communication flow. This means that the actors in network will gain power by increasing the direct number of relationships with others through regular interaction.

In a project environment where communication is so important it is also therefore no surprise that the density of the communication networks examined was higher than both the workflow and friendship networks. Rowley (1997) believed that as the density of the stakeholder network increased so it became more difficult to control the flow of information. However, Rowley (1997) was not specific about which type of social network this applied to. The communication network had the highest number of observed relationships. This is visible in the sociagraphs that show that the communication network has a far larger number of links than the other network types. The results show that the communication network, on average, has the highest density throughout the projects and that if information flow is to be controlled then central stakeholders from this network must be managed well.

The mean power rating for personal power on the communication network was higher than the power ratings for the workflow and friendship networks. This further supports Rowley's (1997) view that the density of the network allows powerful stakeholders to better enforce their will on the project. This also follows the

assertion from Aaltonen et al. (2008) that stakeholders will use the communication network to provide information on their critical claims and demand action. This means that powerful stakeholders will use the communication network to promote their interest and use their influence. Therefore, stakeholders with higher personal power rating will be more central in the the communication network.

Once again the project manager for each of the three projects is included in the top five ranking stakeholders on personal power. As indicated by Brass (1984) the communication network is based on the exchange of information. So it is not surprising to see project managers rank so highly in the communication network because they carry one of the primary responsibilities in the project team for communicating actions, risks, issues and decisions. Project managers are also key decision makers in a project team so it can be expected that they would be central to communicating those decisions to others. This supports Pryke's (2004) findings that influence and power were correlated to communication network centrality in small decision-making groups.

The results of the regression support the argument that powerful stakeholders that influence a project based on their expertise, charisma and access to information can be identified by examining the communication network. The explanatory variables of in-degree and in-closeness communication centrality can provide a reasonably good outcome in explaining who the powerful personal stakeholders in a project network are.

6.4 Hypothesis 3

Which network centrality measure is the most important in identifying actors in a project network with high political power?

The objective of the hypothesis was to assess whether there is a way to identify powerful stakeholders that were powerful because of their political power in the project using social network centrality. The results of the regression analysis rejected the null hypothesis which stated that the workflow, friendship and communication network would all be equally good at identifying stakeholders with high political power within a network.

The alternate hypothesis is accepted. The friendship network is a better predictor of political power than the other network types. The regression model identified the three friendship centrality measures of in-degree, in-closeness and betweenness centrality as the primary explanatory variables. The most important explanatory variable, friendship in-degree centrality was a much stronger predictor of political power than the other two variables. Friendship in-degree explained 31.0% of the variance in political power, with friendship in-closeness improving the model by 8.8% and friendship betweenness centrality adding a further 5.6%. The regression models were significant to a confidence level of 99% with the combined model using all three explanatory variables reaching an $F = 24.966$ ($p < .0005$) and predicting 43.6% of the variance in political power. The explanatory power of the model with just the friendship in-degree and in-closeness centrality is 34.1% which

provides moderate support that the workflow network is a reasonably good predictor of political power.

Brass (1984) expected central positions in a friendship network to be occupied by highly influential and interconnected individuals because they form strong coalitions. The results of the regression analysis support this view with friendship centrality measures providing significant explanatory power for political power, which Yukl (1998) described as formal and informal alliances that used legitimate and information power. The results indicated that friendship centrality measures were the most important predictors of political power which means that political power is borne from strong alliances and friendships.

In-degree centrality was found to be the most important predictor of political power which means that powerful stakeholders are “well-connected” and have access to resources that are valuable to others. This was followed by in-closeness centrality which means that strong political stakeholders are able to access many other stakeholders in the network quickly.

Krackhardt (1990) described the friendship network as being formed on the basis of trust. Actors typically express liking and friendship to others with similar organisational affiliations and personal characteristics (Ibarra & Andrews, 1993). It is the continued social interaction that allows for the formation of a friendship and

coalitions. Therefore, the reputation and charisma of stakeholders with high political power is likely to attract others, allowing these actors to increase their influence.

These coalitions may be very valuable as they provide access to information and resources that may otherwise not be available to an actor in the network. Therefore, powerful political stakeholders would frequently act as brokers and derive power from being the “middle-person” connecting other adjacent stakeholders that do not otherwise have a strong relationship. The results support this view because the friendship network is the only one where betweenness centrality featured as an important predictor of power.

High betweennness centrality also explains the coalition-forming behaviour of powerful political stakeholders. These stakeholders are likely to route information between adjacent stakeholders and therefore increase others’ dependence on themselves. They also have access to many alternative sources of information which reduces their dependence on others. They can access and control resources using the friendship network that others cannot which gives them power based on ther personality. This was also found by Brass (1984) who determined that central actors in a friendship network have access and control over sources of power based on their reputation and charisma.

Krackhardt (1990) found that more acurate cognitions of certain networks could be a source of power in itself by arguing that central actors had “essential political knowledge”. The results of the regression support this assertion. Powerful political stakeholders have many relationships where others depend on them (in-degree), they are accessible to many stakeholders in the network (in-closeness) and are able to act as brokers between adjacent parties (betweenness). It is possible that this is the political knowledge that Krackhardt (1990) was referring to and that knowledge of the friendship network would allow central actors to form strong coalitions to influence project outcomes.

With the workflow and communication networks, the project managers for each project featured in the list of top five powerful stakeholders but in the case of the political power, none of the project managers appear. This may indicate that project managers do not typically use their political power to try to influence the project outcomes and instead prefer to use their positional and personal power. As a result they may not attract many friendships or seek alliances with others in the network.

Project C was the only one where the mean political power had a higher rating than both personal and positional power. This may be related to the duration that the project has been running for. The longer the project team is active, the more it provides opportunities for stakeholders to form friendships with others in the team. Once these friendships form, they become powerful coalitions that can exert more

influence on the project than either the communication or workflow network provide.

This further supports Ibarra and Andrews (1993) view on the power of friendship-based social networks to transmit influence. The project manager for project C may not have appeared in the top five most powerful stakeholders for political power because he had only recently joined the project. Therefore, it is possible that the influence of stakeholders may change as they build their networks in a project. If stakeholders have a choice of network types to influence the project then they can select the option that suits them best.

The results of the regression support the argument that powerful political stakeholders that influence a project using coalitions and alliances can be identified by examining the friendship network. The explanatory variables of in-degree, in-closeness and betweenness friendship centrality can provide a reasonably good outcome in explaining who the powerful political stakeholders in a project network are.

6.5 Summary

When determining who powerful project stakeholders may be, it is important to understand how a particular stakeholder can influence a project. Stakeholders will make use of personal, political and positional power based on their prominence in

a particular network. This means that power is enacted on a network using different levels of social interaction. A summary of the regression analysis outcomes is presented in Table 32. The centrality measures are ranked based on their explanatory power and significance for each of the power measures that were tested. The centrality measure with the highest predictive power is ranked as 1.

Table 31: Regression Summary

		Power Measure		
		Personal	**Positional**	**Political**
In-degree	**Communication**	1		
	Workflow		1	
	Friendship			1
In-closeness	**Communication**	2		
	Workflow	3	2	
	Friendship		3	2
Betweenness	**Communication**			
	Workflow			
	Friendship			3

The regression results have shown that stakeholders with high positional power in a network can be identified based on their workflow network interactions. Stakeholders with high positional power are likely to have a high in-degree centrality because they have a large number of direct contacts that are reliant of

their workflow output. They are also likely to have high in-closeness centrality, which indicates that they can be accessed easily by many other actors in the network that rely on their output.

The regression has also shown that stakeholders with high personal power can be identified by examining their communication network interactions. Stakeholders with high personal power are likely to have a high in-degree centrality, which indicates that many actors in the network communicate directly with them. The next important predictor would be a high in-closeness centrality, which means that they are easily accessible for others in the network to transmit information.

Lastly, the regression has shown that stakeholders with high political power can be identified by examining their friendship networks. Stakeholders with high political power are likely to have a high in-degree centrality indicating that they have personality characteristics that attract others in the network to them. They also would have a high in-closeness centrality because they are easily accessible to many other actors in the network.

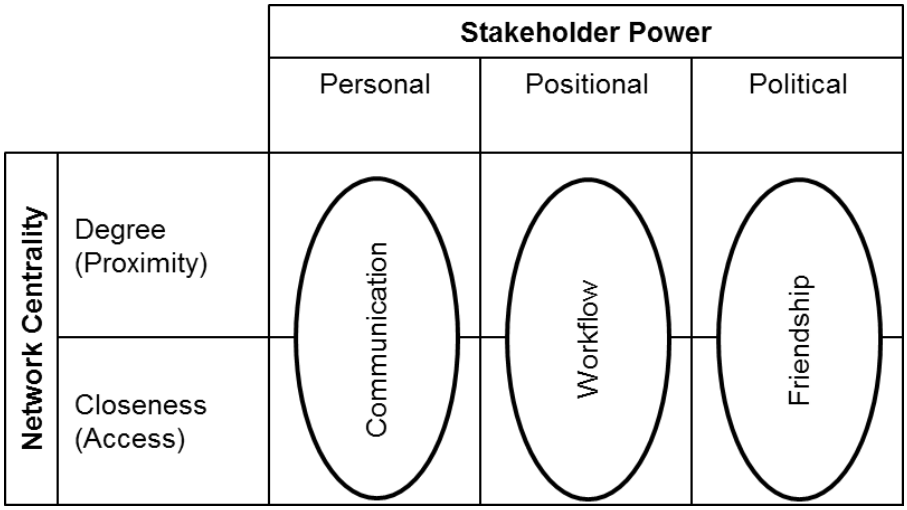
The outcomes of the regression analysis has therefore supported the literature that was reviewed in Chapter 2 by providing empirical evidence that various power bases are used in different social networks. The results suggest that powerful stakeholders can be prominent in all three networks with at least one stakeholder

being identified in the top five most powerful stakeholders across all three network types.

The results of the tests indicate that degree centrality and closeness centrality are the primary determinants of powerful stakeholders. These centrality measures should therefore feature as the major indicators of stakeholder power in IT projects.

See Figure 15 for the updated research model from Chapter 3 which reflects only degree and closeness centrality determinants of stakeholder power. Betweenness centrality is a far smaller predictor of stakeholder power and has been removed. The measures of in-degree and in-closeness centrality are good predictors of stakeholders that have the power to influence a project using communication, workflow and friendship networks.

Figure 15 : Modified Network Stakeholder Power Model



7 Conclusion

7.1 Introduction

Chapter 7 will explore the implications of the findings for organisations and provide recommendations for future research. The limitations of the study are also explored to provide a context of the meaning of the results in practice.

7.2 Findings

The aim of the study was to provide an initial network-based stakeholder model that could be used to determine powerful stakeholders in a project network. The problem with traditional stakeholder models is that they rely heavily on the abilities of the project manager to be able to identify stakeholders that could influence the project outcomes. The traditional approach requires that project managers use certain attributes to identify and classify stakeholders. An alternative stakeholder model can be developed using social networks because they provide a means to identify central individuals based on their power, influence and interactions.

The findings provide evidence that social networks are relatively good predictors of stakeholder power in a project network. The research has therefore contributed to the current body of knowledge by showing that social networks offer a potential alternative to traditional stakeholder models. Linking social network types to

different sources of power to identify stakeholders with specific types of influence has provided a foundation for further refinement of a network-based stakeholder model.

Assudani and Kloppenborg (2010) proposed that a network stakeholder model should be constructed using just the workflow and communication networks. The findings indicate that their proposed model needs to be extended to include the friendship network. It is also necessary to distinguish between types of centrality as certain measures are more useful in identifying powerful stakeholders.

The results indicate that powerful stakeholders seem to be consistently identifiable by the number of direct relationships, as measured by degree centrality they have. The direction of the relationship also featured very strongly in identifying powerful stakeholders. In all cases the explanatory variables for the personal, positional and political power were in-directed measures of centrality. Traditional stakeholder models would rely on the out-directed relationships that the project manager holds or perceives in order to identify powerful stakeholders. This approach would have resulted in the identification of the wrong stakeholders in the project network and highlights the weakness of traditional stakeholder models which rely so heavily on the project manager.

7.3 Recommendations

The critical task of identifying and then managing stakeholders must evolve from being just an up-front planning activity to a constant project stakeholder evaluation mechanism. The relationships formed between individuals that execute a project are important in order to understand which individuals influence the outcome of the project the most. The traditional view of stakeholder identification is not robust enough to deal with complex human interactions and relies on the abilities of the project manager to perceive and interpret these interactions accurately.

The outcomes of the study result in several recommendations for organisations as a whole and for project managers in particular:

- Organisations should try to find project managers that are not only proficient in interacting with senior managers, executives, project sponsors and the project steering committee but are also able to establish good working relationships with the entire project team. Project managers must be able to establish rapport with co-workers, build friendships and place themselves into a position where they can interact regularly with a large portion of the project team members. This ability will place project managers at the centre of the projects' social network and allow them to gain access to information and resources from others. It will also enable project managers to communicate decisions, issues, risks and any other important information quickly to the project team.

- Project managers need to invest in building relationships with others so that they can use those relationships to influence the project outcomes positively. Project hierarchies support the project manager by placing them into a central position but the project manager must be aware that the hierarchy means little in the social context of the project. The social network formed through individual's interactions allows stakeholders to influence the outcomes of the project because they can use alliances, expert knowledge and charisma to impose their will on the project. Project managers should therefore try to understand the social structure of their project teams and use this understanding to manage their stakeholders.
- Organisations and project managers should be aware of the sources of power that stakeholders can draw on to influence project outcomes. Traditional stakeholder models are perhaps a little too simplistic in classifying stakeholder based on certain attributes that would then indicate how that stakeholder should be treated. The complexity of project friendship, communication and workflow networks would make it very difficult to understand the extent of a stakeholders' influence. Stakeholders should not be viewed as static actors in the project network and their influence should be assessed continuously as they form new relationships which provide new ways for them to impose their will.

The results of this study also provide some recommendations for academia:

- Assudani and Kloppenborg (2010) called for a stakeholder identification model that made use of communication and workflow networks. The results of the study indicate that stakeholders interact differently on various network types. The friendship network provided an additional perspective on stakeholder power but other networks may need to be explored as well.
- Social networks are a useful tools for visualising stakeholder influence in project networks as Bourne and Walker (2006) suggested. The type of network and source of the influence is however important in providing a project manager with a means to manage stakeholders. The type of social network influence that is being visualised is more nuanced and requires closer examination.
- Traditional stakeholder models may be integrated with network stakeholder models to provide a comprehensive model that uses identifiable stakeholder attributes and dynamic network relations. Social network research often includes actor attributes and network measures to represent the formal and informal structures of a network (Brass, 1984; Ibarra, 1993; Ibarra & Andrews, 1993; Krackhardt, 1990). It is recommended that academia explore holistic models that include both formal and informal structural variables to identify, classify and manage stakeholders.
- Little work has focused validity, reliability and measurement error in social network data (Wasserman & Faust, 1994; Marsden, 1990). Therefore the accuracy of the results in terms of whether they have measured the true

network relationships may be questioned. Furthermore, the validity of the network variables were not tested because of the lack of available techniques for social networks (Wasserman & Faust, 1994, p. 58). The reliability of variables is also not known as a test-re-test assessment is not appropriate for social network studies as it assumes that a “true” value of a variable will not change over time but this does not hold for social networks except possibly over very short periods of time (Wasserman & Faust, 1994, p. 58). These common problems in social network research require further examination.

7.4 Limitations

The following limitations must be considered when examining the research results:

- The sample sizes for each of the project networks was relatively small. Each network is unique in its composition which means that results are not general outcomes for all networks and the findings should not be taken out of context.
- The data collected for each of the three projects was incomplete with none of the projects achieving a 100% response rate. Without a 100% response rate there are a large number of relationships missing which could influence the outcomes of the regression analysis.
- The network boundary was set by the project manager and included active participants in the project only. The selection bias for respondents and the closed nature of the sampling could be improved by applying a snowball

sampling technique that also allows respondents to nominate any actor so that the network is built up in zones (Wasserman & Faust, 1994, p. 34). The influence and power of actors outside of the project boundary may have provided further insight into powerful stakeholders.

- The design of the research may have introduced response bias linking the questions where the respondents first select the actors in the network with whom they interact through a network type (communication, workflow or friendship) and then can only rate the influence (personal, positional or political) for the subset of actors selected. Providing the respondents with a subset of actors to rate influence on may have prevented them from rating powerful stakeholders that were not part of the subset.

7.5 Suggestions for future research

Several suggestions for future research arise from this study:

- A longitudinal study of a single project may be conducted to determine how the social network changes through different phases of a project and whether influential stakeholders change. This may provide suggestions for the emergent stakeholder model proposed by Assudani and Kloppenborg (2010).
- Formal structural variables associated with individuals and the organisational hierarchy were not included in this study. Further research may want to explore a combination of formal and informal measures of power to assess which are better predictors of powerful project stakeholders.

- Future research should try to measure whether certain stakeholder attribute allow them to gain specific sources of power and allow them to form ties with others in the network. This may provide some insight into how project networks are formed and how a project manager can influence this formation.
- Finally, the types of project information that flow over the various network types may be of future interest. Each network type provides access and control of different types of resources, including information. Organisations could benefit from understanding which networks are best at transmitting different kinds of information, such as advice, risks, issues and decisions.

7.6 Conclusion

The use of tools such as social network analysis is encouraged to periodically assess the project network and determine who the powerful stakeholders are. Bourne and Walker (2005) already indicated that social networks provide a good way to visualise stakeholder influence. Social networks also provide an understanding of stakeholder influence and sources of power. It is important for organisations to realise that projects are heavily influenced by the social structure of the team and the organisation more so than the formal structures that confer power to stakeholders. In order to improve project success, organisations must concern themselves with understanding how the people interact with each other to meet the objectives at hand.

8 Bibliography

Aaltonen, K., Jaakko, K., & Tuomas, O. (2008). Stakeholder salience in global projects. *International Journal of Project Management, 26*, 509-516.

Achterkamp, M. C., & Vos, J. F. (2008). Investigating the use of the stakeholder notion in project management literature, a meta-analysis. *International Journal of Project Management, 26*, 749-757.

Albright, C. S., Winston, W. L., & Zappe, C. J. (2009). *Data Analysis & Decision Making with Microsoft Excel* (Rev. 3rd ed.). Mason, USA: South-Western Cengage Learning.

Assudani, R., & Kloppenborg, T. J. (2010). Managing stakeholders for project management success: an emergent model of stakeholders. *Journal of General Management, 35*(3), 67-80.

Blumberg, B., Cooper, D. R., & Schindler, P. S. (2008). *Business Research Methods Second European Edition.* Berkshire (UK): McGraw-Hill Education.

Boddy, D., & Paton, R. (2004). Responding to competing narratives: lessons for project managers. *International Journal of Project Management, 22*(3), 225–233.

Borgatti, S. P. (2002). NetDraw: Graph Visualisation Software. Harvard: Analytic Technologies.

Borgatti, S. P., Everett, M. G., & Freeman, L. C. (2002). Ucinet for Windows: Software for Social Network Analysis. Harvard, MA: Analytic Technologies.

Bourne, L., & Walker, D. H. (2005). Visualising and mapping stakeholder influence. *Management Decision, 43*(5), 649-660.

Bourne, L., & Walker, D. H. (2006). Visualizing Stakeholder Influence - Two Australian Examples. *Project Management Journal*, 5-21.

Bourne, L., & Weaver, P. (2010). Mapping Stakeholders. In E. Chinyio, & P. Olomolaiye, *Construction Stakeholder Management* (pp. 99-120). Wiley-Blackwell.

Brass, D. J. (1984). Being in the Right Place: A Structural Analysis of Individual Influence in an Organization. *Administrative Science Quarterly, 29*(4), 518-539.

Brass, D. J., & Burkhardt, M. E. (1993). Potential power and power use: an investigation of structure and behaviour. *Academy of Management Journal, 36*(3), 441-470.

Brass, D. J., Galaskiewicz, J., Greve, H. R., & Tsai, W. (2004). Taking stock of networks and organisations: a multilevel perspective. *Academy of Management Journal, 47*(6), 795-817.

Carrington, P. J., Scott, J., & Wasserman, S. (2005). *Models and Methods in Social Network Analysis.* New York, NY: Cambridge University Press.

Chinowsky, P. S., Diekmann, J., & Galotti, V. (2008). Social Network Model of Construction. *Journal of Construction Engineering and Management, 134*(10), 804–812.

Chinowsky, P. S., Diekmann, J., & O'Brien, J. (2010). Project Organizations as Social Networks. *Journal of Construction Engineering and Management, 136*(4), 452–458.

Cleland, D. I. (1995). Leadership and the project management body of knowledge. *International Journal of Project Management, 13*(2), 83-88.

El-Gohary, N. M., Osman, H., & El-Diraby, T. E. (2006). Stakeholder management for public private partnerships. *International Journal of Project Management, 24*(7), 595–604.

El-Sheikh, A., & Pryke, S. D. (2010). Network gaps and project success. *Construction Management and Economics, 28*(12), 1205–1217.

Freeman, E. R. (1994, October). The politics of stakeholder theory: Some future directions. *Business Ethics Quarterly*, pp. 409-421.

Freeman, L. C., Romey, A. K., & Freeman, S. C. (1987). Cognitive structure and informant accuracy. *American Anthropologist, 89*(2), 310-325.

Freeman, R. E. (1984). *Strategic Management: A Stakeholder Approach.* Boston: Pitman.

French, J. R., & Raven, B. H. (1959). The bases of social power. In D. Cartwright, *Studies in social power* (pp. 150- 167). Ann Arbor, MI: Institute for Social Research.

Friedman, A. L., & Miles, S. (2002). Developing stakeholder theory. *Journal of Management Studies, 39*(1), 1-21.

Griseri, P., & Seppala, N. (2010). *Business Ethics and Corporate Social Responsibility.* Hampshire, UK: Cengage Learning EMEA.

Hanneman, R. A., & Riddle, M. (2005). *Introduction to social network methods.* Retrieved Sep 2011, from Introduction to social network methods: http://faculty.ucr.edu/~hanneman/nettext

Hansen, W. B., Reese, E., Bryant, K. S., Bishop, D., Wyrick, C. H., & Dyreng, D. I. (2008). *Network genie user's manual.* Greensboro, N.C.: Tanglewood Research.

Haythornthwaite, C. (1996). Social Network Analysis: An Approach and Technique for the Study of Information Exchange. *Library and Information Science Research*, 323-342.

Henttonen, K. (2010). Exploring social networks on the team level—A review of the empirical literature. *Journal of Engineering and Technology Management, 27*, 74–109.

Holland, P. W., & Leinhardt, S. (1973). The structural implications of measurement error in sociometry. *Journal of Mathematical Sociology, 3*(1), 85-111.

Ibarra, H. (1993). Network centrality, power, and innovation involvement: determinants of technical and administrative roles. *Academy of Management Journal, 36*(3), 471-501.

Ibarra, H., & Andrews, S. B. (1993). Power, social influence, and sense making: Effects of network centrality and proximity on employee perceptions. *Administrative Science Quarterly, 38*(2), 277-303.

Inkpen, A. C., & Tsang, E. W. (2005). Social capital, networks, and knowledge transfer. *Academy of Management Review*, 146-165.

Jääskelainen, K., & Pau, L. F. (2009, July 29). *ERP Project's Internal Stakeholder Network and How It Influences the Project's Outcome.* Retrieved from SSRN: http://ssrn.com/abstract=1440687

Jack, S. L. (2010). Approaches to studying networks: Implications and outcomes. *Journal of Business Venturing, 25*, 120-137.

Jepsen, A. L., & Eskerod, P. (2009). Stakeholder analysis in projects: Challenges in using current guidelines in the real world. *International Journal of Project Management, 27*(4), 335–343.

Jugdev, K., & Muller, R. (2005). A retrospective look at our evolving understanding of project success. *Project Management Journal, 36*(4), 19-31.

Karlsen, J. T. (2002). Project Stakeholder Management. *Engineering Management Journal, 14*(4), 19-24.

Kloppenborg, T. J. (2009). *Contemporary Project Management.* Mason: South-Western Cengage Learning.

Knox, S., & Gruar, C. (2007). The Application of Stakeholder Theory to Relationship Marketing Strategy Development in a Non-profit Organization. *Journal of Business Ethics, 75*(2), 115-135.

Krackhardt, D. (1990). Assessing the Political Landscape: Structure, Cognition, and Power in Organizations. *Administrative Science Quarterly, 35*(2), 342-369.

Laumann, E. O., Marsden, P. V., & Prensky, D. (1989). The boundary specification problem in network analysis. In L. C. Freeman, D. R. White, & A. K. Romney,

Research methods in social network analysis (pp. 61-87). Fairfax VA: George Mason University Press.

Littau, P., Jujagiri, N. J., & Adlbrecht, G. (2010). 25 Years of Stakeholder Theory in Project Management Literature (1984–2009). *Project Management Journal, 41*(4), 17-29.

Marsden, P. V. (1990). Network data and measurement. *Annual Review of Sociology, 16*(1), 435-463.

Milosevic, D. Z. (1989). Systems approach to strategic project management. *International Journal of Project Management, 7*(3), 173-179.

Mitchell, R. K., Agle, B. R., & Wood, D. J. (1997). Toward a Theory of Stakeholder Identification and Salience: Defining the Principle of who and what really counts. *Academy of Management Review, 22*(4), 853-886.

Moreno, J. L. (1960). *The sociometry reader.* New York: Free Press.

Newcombe, R. (2003). From client to project stakeholders: a stakeholder mapping approach. *Construction Management and Economics, 21*, 841-848.

Olander, S., & Landin, A. (2005). Evaluation of stakeholder influence in the implementation of construction projects. *International Journal of Project Management, 23*(4), 321–328.

Pallant, J. (2010). *SPSS Survival Manual* (4th ed.). Berkshire, England: McGraw-Hill.

Pinto, J. K. (1990). Project Implementation Profile: a tool to aid project tracking and control. *International Journal of Project Management, 8*(3), 173-182.

Pinto, J. K., & Prescott, J. E. (1987). Changes In Critical Success Factor Importance Over the Life of a Project. *Academy of Management Best Papers Proceedings* (pp. 328-332). Cincinnati: University of Cincinnati.

PMBOK Guide. (2004). *A Guide to the Project Management Body of Knowledge (Third Edition).* Pennsylvania: Project Management Institute.

Podsakoff, P. M., & Schriesheim, C. A. (1985). Field Studies of French and Raven's Bases of Power: Critique, Reanalysis, and Suggestions for Future Research. *Psychological Bulletin, 97*(3), 387-411.

Preble, J. F. (2005). Toward a Comprehensive Model of Stakeholder Management. *Business and Society Review, 110*(4), 407-431.

Pryke, S. D. (2004). Analysing construction project coalitions: exploring the application of social network analysis. *Construction Mangement and Economics, 22*, 787-797.

Rank, O. N. (2008). Formal structures and informal networks: structural analysis in organizations. *Scandinavian Journal of Management, 24*, 145-161.

Raven, B. H. (1965). Social influence and power. In D. Steiner, & M. Fishbein, *Current Studies in Social Psychology* (pp. 371-382). New York, NY: Holt, Rinehart and Winston.

Raven, B. H., Schwarzwald, J., & Koslowsky, M. (1998). Conceptualising and Measuring a Powerl/Interaction Model of Interpersonal Influence. *Journal of Applied Social Psychology, 28*(4), 307-332.

Rowley, T. J. (1997). Moving beyond dyadic ties: A network theory of stakeholder influences. *The Academy of Management Review, 22*(4), 887-910.

Savage, G. T., Whitehead, T. W., Carlton, J., & Blair, J. D. (1991). Strategies for assessing and managing organisational stakeholders. *The Academy of Management Perspectives, 5*(2), 61-75.

Smith-Doerr, L., Manev, I. M., & Rizova, P. (2004). The meaning of success: network position and the social construction of project outcomes in an R&D lab. *Journal of Engineering and Technology Management, 21*(1-2), 51–81.

Steven, E. (2008). Fifty years of influence in the workplace. *Journal of Management History, 14*(3), 267-283.

Stork, D., & Richards, W. D. (1992). Nonrespondents in Communication Network Studies: Problems and Possibilities. *Group & Organization Management, 17*(2), 193-209.

The Standish Group. (2009, April 23). *Newsroom - CHAOS 2009*. Retrieved October 2011, from The Standish Group International: http://www1.standishgroup.com/newsroom/chaos_2009.php

Walker, D. H., Bourne, L. M., & Shelley, A. (2008). Influence, stakeholder mapping and visualization. *Construction Management and Economics, 26*, 645-658.

Wasserman, S., & Faust, K. (1994). *Social Network Analysis Methods and Applications.* New York: Cambridge University Press.

Wellman, B. (1983). Network Analysis: Some Basic Principles. *Socialogical Theory, 1*, 155-200.

ZDNet.com. (2008, December 11). *Study: 68 percent of IT projects fail*. Retrieved October 2011, from ZDNet: http://www.zdnet.com/blog/projectfailures/study-68-percent-of-it-projects-fail/1175

Zwikael, O., & Globerson, S. (2006). From Critical Success Factors to Critical Success Processes. *International Journal of Production Research, 44*(17), 3433–3449.

9 Appendix A – Questionnaire

Consent form:

I am conducting research on identifying powerful project stakeholders using the informal, social networks formed within Absa project teams. This will help us understand how project stakeholder identification, classification and management can be improved to enhance project outcomes. An online survey has been designed to gather data about the project network that requires you to list the people from the <project name> project that you have various types of relationships with and their influence on the project.

The survey should take no more than 20 minutes to complete. By completing the survey, you indicate your participation is voluntary. All data will be kept confidential and you may withdraw at any time. If you have any concerns, please contact me or my supervisor. Out details are below:

Researcher
Karl-Heinz Wessinger
wessingerkh@gmail.com
+27 82 699 1769

Research Supervisor
Pieter Pretorius
Pretoriusp@gibs.co.za
+27 11 771 4000

Below is a template for the survey to be converted into Network Genie for online administration. Network Genie allows for the pre-configuration of a network of actors for a project that the participant can then select to answer the questions in the survey.

1 What is your role on the project?

Project Manager
Project Sponsor
End-user
Core Project Team Member (including consultants and advisors)
External Team Member (including suppliers and sub-contractors)
Other members of the organisation

2a Please check the names of people with whom you frequently discuss what is going on in the project, including any project-related activities to ensure the success of the project.

Name 1	
Name 2	
Name 3	
Name 4	
Name 5	

(all names from project roster)

2b People with personal influence have specific expertise, act as role models or have charisma (personal magnetism) which makes them likable. For each person on the list that you checked, please indicate on the scale from 1 (very little influence) to 5 (very much influence) how much personal influence the person has in the everyday activities of the project.

	Very little influence				Very much influence
Name 1	1	2	3	4	5
Name 2	1	2	3	4	5
Name 3	1	2	3	4	5
Name 4	1	2	3	4	5
Name 5	1	2	3	4	5

(all checked names from Question 3)

3a Please check the names of people who you interact with to complete your work activities on the project. These are people that provide you with inputs for your job or to who you distribute the outputs of your work.

Name 1	
Name 2	
Name 3	
Name 4	
Name 5	

(all names from project roster)

3b People with positional influence have formal authority and can place legitimate demands on the project. For each person on the list that you checked, please indicate on the scale from 1 (very little influence) to 5 (very much influence) how much positional influence the person has in the everyday activities of the project.

	Very little influence				Very much influence
Name 1	1	2	3	4	5
Name 2	1	2	3	4	5
Name 3	1	2	3	4	5
Name 4	1	2	3	4	5
Name 5	1	2	3	4	5

(all checked names from Question 3)

4a Please check the names of people on the project who are very good friends of yours, people whom you see socially outside of work.

Name 1	
Name 2	
Name 3	
Name 4	
Name 5	

(all names from project roster)

4b People with political influence have access to and control formal and informal alliances that allow them to influence the information that is made available to members of the project. For each person on the list that you checked, please indicate on the scale from 1 (very little influence) to 5 (very much influence) how much political influence the person has in the everyday activities of the project.

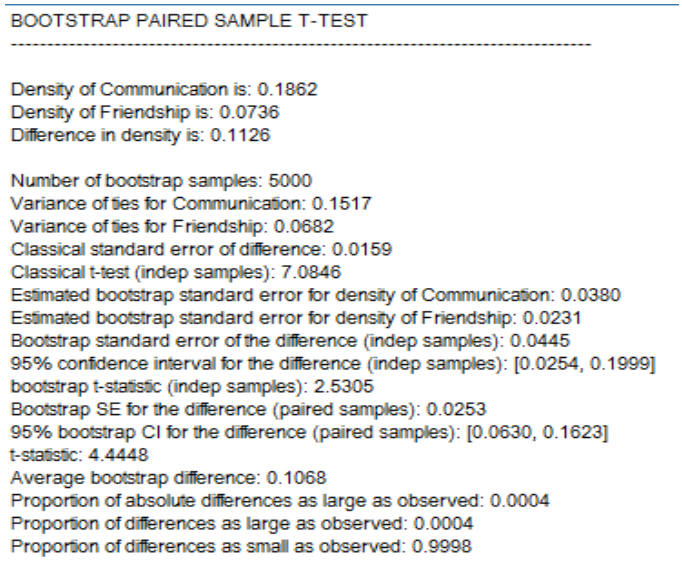
	Very little influence				Very much influence
Name 1	1	2	3	4	5
Name 2	1	2	3	4	5
Name 3	1	2	3	4	5
Name 4	1	2	3	4	5
Name 5	1	2	3	4	5

(all checked names from Question 3)

10 Appendix B – Network Paired T-Test Output – Project A

The output below was generated using UCINet for a paired comparison of network densities for Project A:

Figure 16: Project A - Communication / Friendship Density Comparison

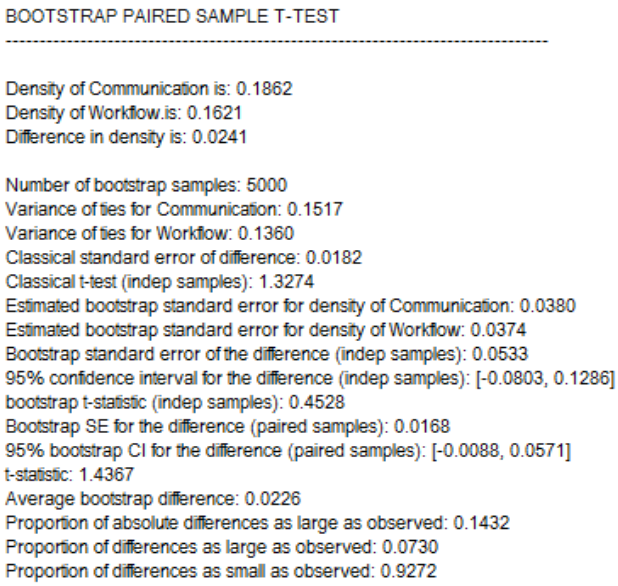


BOOTSTRAP PAIRED SAMPLE T-TEST

Density of Communication is: 0.1862
Density of Friendship is: 0.0736
Difference in density is: 0.1126

Number of bootstrap samples: 5000
Variance of ties for Communication: 0.1517
Variance of ties for Friendship: 0.0682
Classical standard error of difference: 0.0159
Classical t-test (indep samples): 7.0846
Estimated bootstrap standard error for density of Communication: 0.0380
Estimated bootstrap standard error for density of Friendship: 0.0231
Bootstrap standard error of the difference (indep samples): 0.0445
95% confidence interval for the difference (indep samples): [0.0254, 0.1999]
bootstrap t-statistic (indep samples): 2.5305
Bootstrap SE for the difference (paired samples): 0.0253
95% bootstrap CI for the difference (paired samples): [0.0630, 0.1623]
t-statistic: 4.4448
Average bootstrap difference: 0.1068
Proportion of absolute differences as large as observed: 0.0004
Proportion of differences as large as observed: 0.0004
Proportion of differences as small as observed: 0.9998

Figure 17: Project A - Communication / Workflow Density Comparison



BOOTSTRAP PAIRED SAMPLE T-TEST

Density of Communication is: 0.1862
Density of Workflow.is: 0.1621
Difference in density is: 0.0241

Number of bootstrap samples: 5000
Variance of ties for Communication: 0.1517
Variance of ties for Workflow: 0.1360
Classical standard error of difference: 0.0182
Classical t-test (indep samples): 1.3274
Estimated bootstrap standard error for density of Communication: 0.0380
Estimated bootstrap standard error for density of Workflow: 0.0374
Bootstrap standard error of the difference (indep samples): 0.0533
95% confidence interval for the difference (indep samples): [-0.0803, 0.1286]
bootstrap t-statistic (indep samples): 0.4528
Bootstrap SE for the difference (paired samples): 0.0168
95% bootstrap CI for the difference (paired samples): [-0.0088, 0.0571]
t-statistic: 1.4367
Average bootstrap difference: 0.0226
Proportion of absolute differences as large as observed: 0.1432
Proportion of differences as large as observed: 0.0730
Proportion of differences as small as observed: 0.9272

Figure 18: Project A - Friendship / Workflow Density Comparison

BOOTSTRAP PAIRED SAMPLE T-TEST

Density of Friendship is: 0.0736
Density of Workflow is: 0.1621
Difference in density is: -0.0885

Number of bootstrap samples: 5000
Variance of ties for Friendship: 0.0682
Variance of ties for Workflow: 0.1360
Classical standard error of difference: 0.0153
Classical t-test (indep samples): -5.7772
Estimated bootstrap standard error for density of Friendship: 0.0231
Estimated bootstrap standard error for density of Workflow: 0.0374
Bootstrap standard error of the difference (indep samples): 0.0439
95% confidence interval for the difference (indep samples): [-0.1746, -0.0024]
bootstrap t-statistic (indep samples): -2.0146
Bootstrap SE for the difference (paired samples): 0.0255
95% bootstrap CI for the difference (paired samples): [-0.1385, -0.0385]
t-statistic: -3.4724
Average bootstrap difference: -0.0842
Proportion of absolute differences as large as observed: 0.0020
Proportion of differences as large as observed: 0.9984
Proportion of differences as small as observed: 0.0018

11 Appendix C – Network Paired T-Test Output – Project B

The output below was generated using UCINet for a paired comparison of network densities for Project B:

Figure 19: Project B - Communication / Friendship Density Comparison

BOOTSTRAP PAIRED SAMPLE T-TEST

Density of Communication is: 0.0960
Density of Friendship is: 0.0162
Difference in density is: 0.0798

Number of bootstrap samples: 5000
Variance of ties for Communication: 0.0868
Variance of ties for Friendship: 0.0159
Classical standard error of difference: 0.0072
Classical t-test (indep samples): 11.0798
Estimated bootstrap standard error for density of Communication: 0.0204
Estimated bootstrap standard error for density of Friendship: 0.0057
Bootstrap standard error of the difference (indep samples): 0.0212
95% confidence interval for the difference (indep samples): [0.0383, 0.1213]
bootstrap t-statistic (indep samples): 3.7646
Bootstrap SE for the difference (paired samples): 0.0177
95% bootstrap CI for the difference (paired samples): [0.0452, 0.1144]
t-statistic: 4.5151
Average bootstrap difference: 0.0770
Proportion of absolute differences as large as observed: 0.0004
Proportion of differences as large as observed: 0.0004
Proportion of differences as small as observed: 0.9998

Figure 20: Project B - Communication / Workflow Density Comparison

BOOTSTRAP PAIRED SAMPLE T-TEST

Density of Communication is: 0.0960
Density of Workflow is: 0.0687
Difference in density is: 0.0273

Number of bootstrap samples: 5000
Variance of ties for Communication: 0.0868
Variance of ties for Workflow: 0.0640
Classical standard error of difference: 0.0087
Classical t-test (indep samples): 3.1251
Estimated bootstrap standard error for density of Communication: 0.0211
Estimated bootstrap standard error for density of Workflow: 0.0168
Bootstrap standard error of the difference (indep samples): 0.0270
95% confidence interval for the difference (indep samples): [-0.0256, 0.0801]
bootstrap t-statistic (indep samples): 1.0109
Bootstrap SE for the difference (paired samples): 0.0096
95% bootstrap CI for the difference (paired samples): [0.0084, 0.0461]
t-statistic: 2.8331
Average bootstrap difference: 0.0261
Proportion of absolute differences as large as observed: 0.0082
Proportion of differences as large as observed: 0.0078
Proportion of differences as small as observed: 0.9924

Figure 21: Project B - Friendship / Workflow Density Comparison

BOOTSTRAP PAIRED SAMPLE T-TEST

Density of Friendship is: 0.0162
Density of Workflow is: 0.0687
Difference in density is: -0.0525

Number of bootstrap samples: 5000
Variance of ties for Friendship: 0.0159
Variance of ties for Workflow: 0.0640
Classical standard error of difference: 0.0064
Classical t-test (indep samples): -8.2680
Estimated bootstrap standard error for density of Friendship: 0.0058
Estimated bootstrap standard error for density of Workflow: 0.0168
Bootstrap standard error of the difference (indep samples): 0.0178
95% confidence interval for the difference (indep samples): [-0.0874, -0.0176]
bootstrap t-statistic (indep samples): -2.9491
Bootstrap SE for the difference (paired samples): 0.0146
95% bootstrap CI for the difference (paired samples): [-0.0812, -0.0238]
t-statistic: -3.5896
Average bootstrap difference: -0.0509
Proportion of absolute differences as large as observed: 0.0012
Proportion of differences as large as observed: 0.9990
Proportion of differences as small as observed: 0.0012

12 Appendix D – Network Paired T-Test Output – Project C

The output below was generated using UCINet for a paired comparison of network densities for Project C:

Figure 22: Project C - Communication / Friendship Density Comparison

BOOTSTRAP PAIRED SAMPLE T-TEST

Density of Communication is: 0.2047
Density of Friendship is: 0.0380
Difference in density is: 0.1667

Number of bootstrap samples: 5000
Variance of ties for Communication: 0.1633
Variance of ties for Friendship: 0.0367
Classical standard error of difference: 0.0242
Classical t-test (indep samples): 6.8931
Estimated bootstrap standard error for density of Communication: 0.0519
Estimated bootstrap standard error for density of Friendship: 0.0172
Bootstrap standard error of the difference (indep samples): 0.0546
95% confidence interval for the difference (indep samples): [0.0596, 0.2738]
bootstrap t-statistic (indep samples): 3.0506
Bootstrap SE for the difference (paired samples): 0.0466
95% bootstrap CI for the difference (paired samples): [0.0754, 0.2579]
t-statistic: 3.5800
Average bootstrap difference: 0.1551
Proportion of absolute differences as large as observed: 0.0012
Proportion of differences as large as observed: 0.0012
Proportion of differences as small as observed: 0.9990

Figure 23: Project C - Communication / Workflow Density Comparison

BOOTSTRAP PAIRED SAMPLE T-TEST

Density of Communication is: 0.2047
Density of Workflow is: 0.1345
Difference in density is: 0.0702

Number of bootstrap samples: 5000
Variance of ties for Communication: 0.1633
Variance of ties for Workflow: 0.1168
Classical standard error of difference: 0.0286
Classical t-test (indep samples): 2.4525
Estimated bootstrap standard error for density of Communication: 0.0521
Estimated bootstrap standard error for density of Workflow: 0.0415
Bootstrap standard error of the difference (indep samples): 0.0666
95% confidence interval for the difference (indep samples): [-0.0604, 0.2007]
bootstrap t-statistic (indep samples): 1.0538
Bootstrap SE for the difference (paired samples): 0.0339
95% bootstrap CI for the difference (paired samples): [0.0037, 0.1366]
t-statistic: 2.0694
Average bootstrap difference: 0.0645
Proportion of absolute differences as large as observed: 0.0412
Proportion of differences as large as observed: 0.0250
Proportion of differences as small as observed: 0.9752

Figure 24: Project C - Friendship / Workflow Density Comparison

BOOTSTRAP PAIRED SAMPLE T-TEST

Density of Friendship is: 0.0380
Density of Workflow is: 0.1345
Difference in density is: -0.0965

Number of bootstrap samples: 5000
Variance of ties for Friendship: 0.0367
Variance of ties for Workflow: 0.1168
Classical standard error of difference: 0.0212
Classical t-test (indep samples): -4.5556
Estimated bootstrap standard error for density of Friendship: 0.0171
Estimated bootstrap standard error for density of Workflow: 0.0415
Bootstrap standard error of the difference (indep samples): 0.0449
95% confidence interval for the difference (indep samples): [-0.1844, -0.0086]
bootstrap t-statistic (indep samples): -2.1510
Bootstrap SE for the difference (paired samples): 0.0397
95% bootstrap CI for the difference (paired samples): [-0.1743, -0.0187]
t-statistic: -2.4316
Average bootstrap difference: -0.0892
Proportion of absolute differences as large as observed: 0.0162
Proportion of differences as large as observed: 0.9866
Proportion of differences as small as observed: 0.0136

13 Appendix E – Network Visualisations

Below are visual representations of the communication, workflow and friendship networks for each of the three projects. The labels for each of the connections have been labelled with the personal, positional and political influence rating assigned by the nominee. The visualisation includes all project members (including non-respondents).

Project A

Figure 25: Project A - Communication network (personal influence)

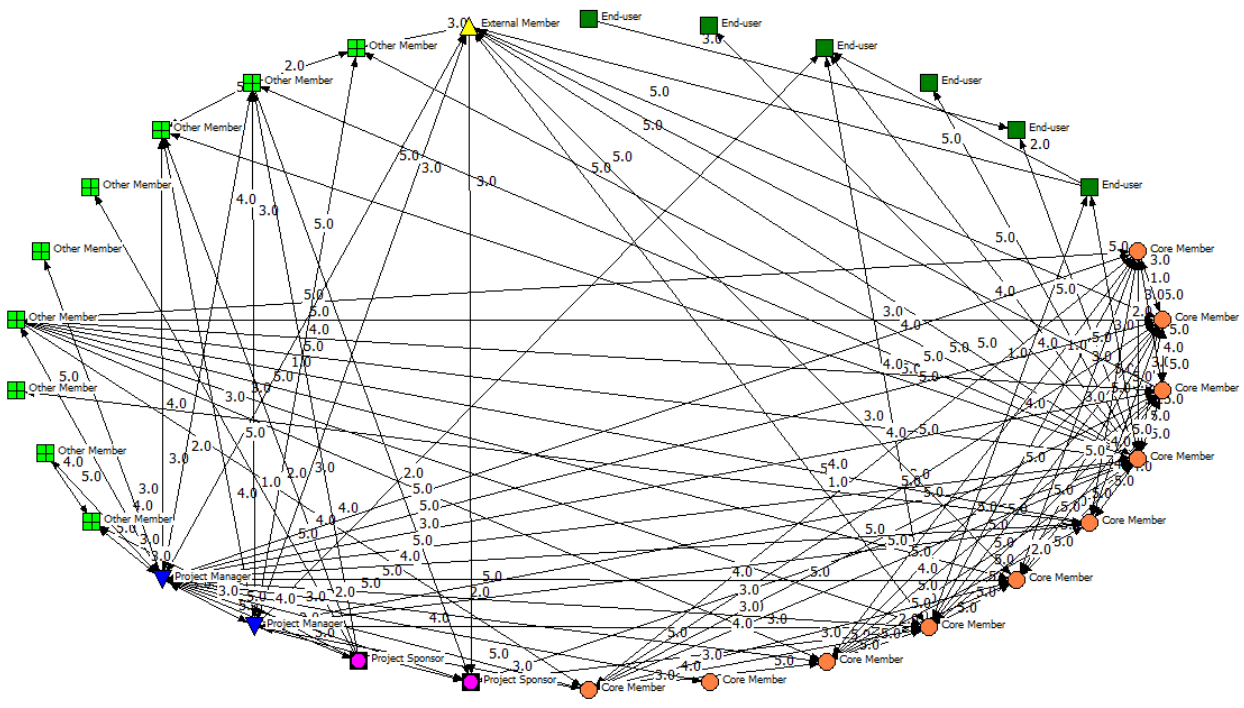


Figure 26: Project A - Workflow network (positional influence)

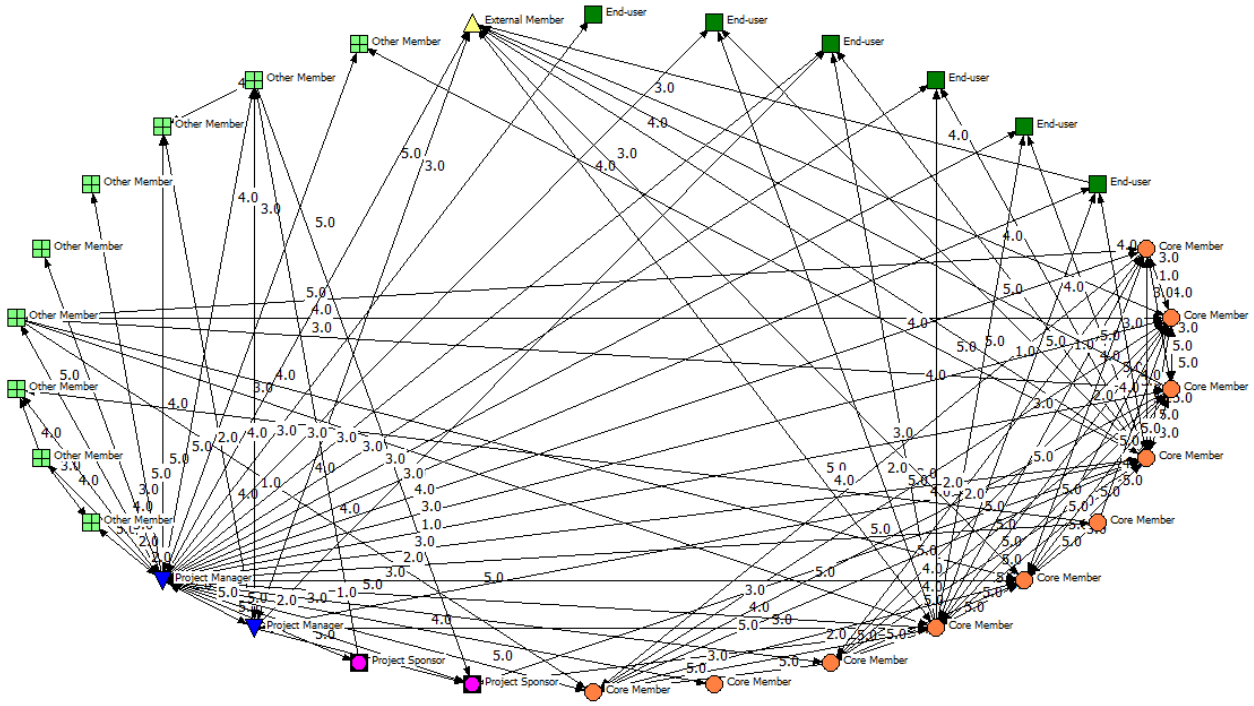
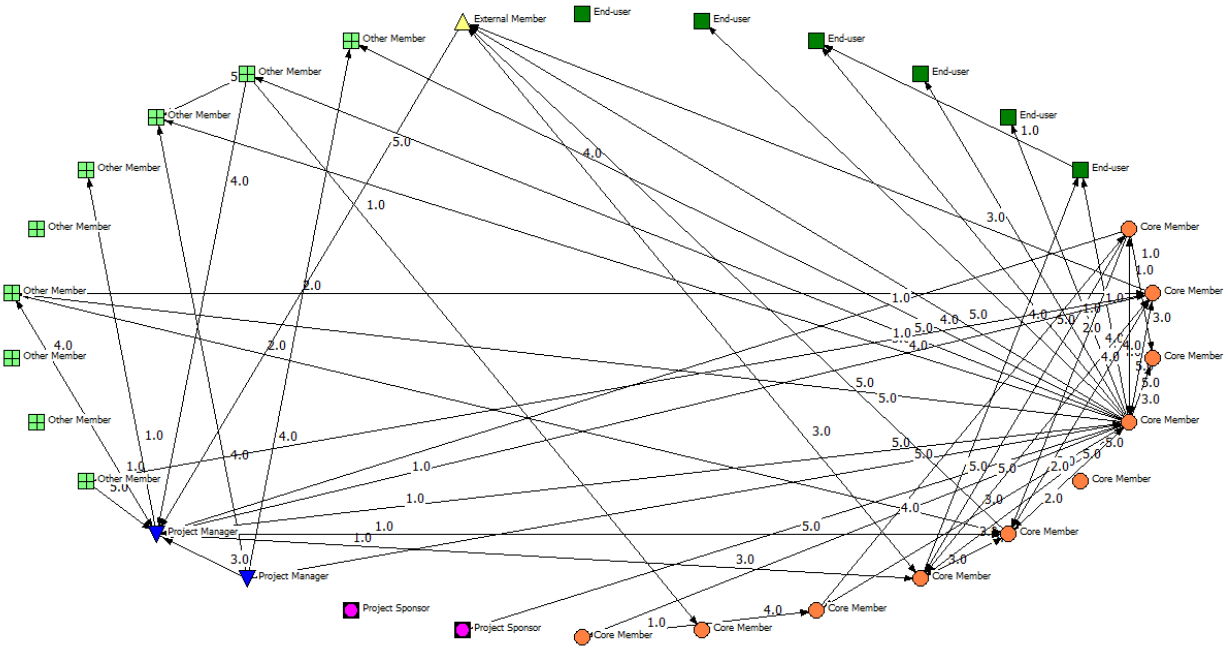


Figure 27: Project A - Friendship network (political influence)



Project B

Figure 28: Project B - Communication network (personal Influence)

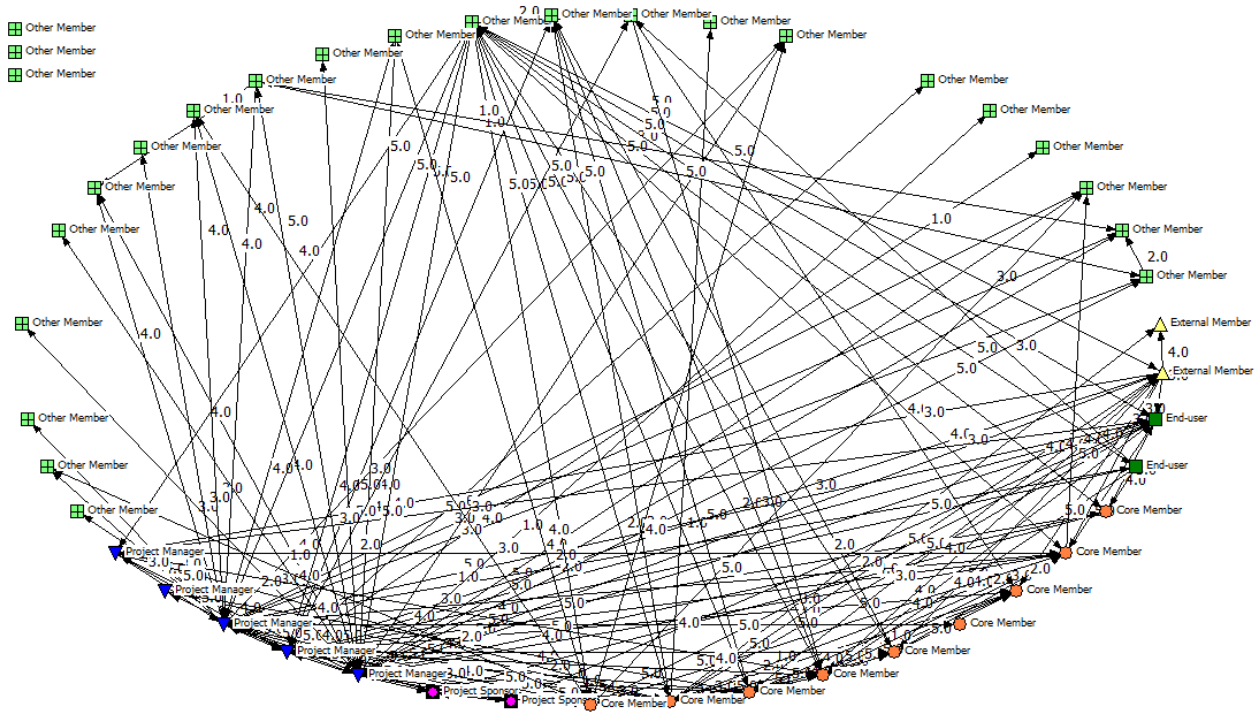


Figure 29 : Project B - Workflow network (positional Influence)

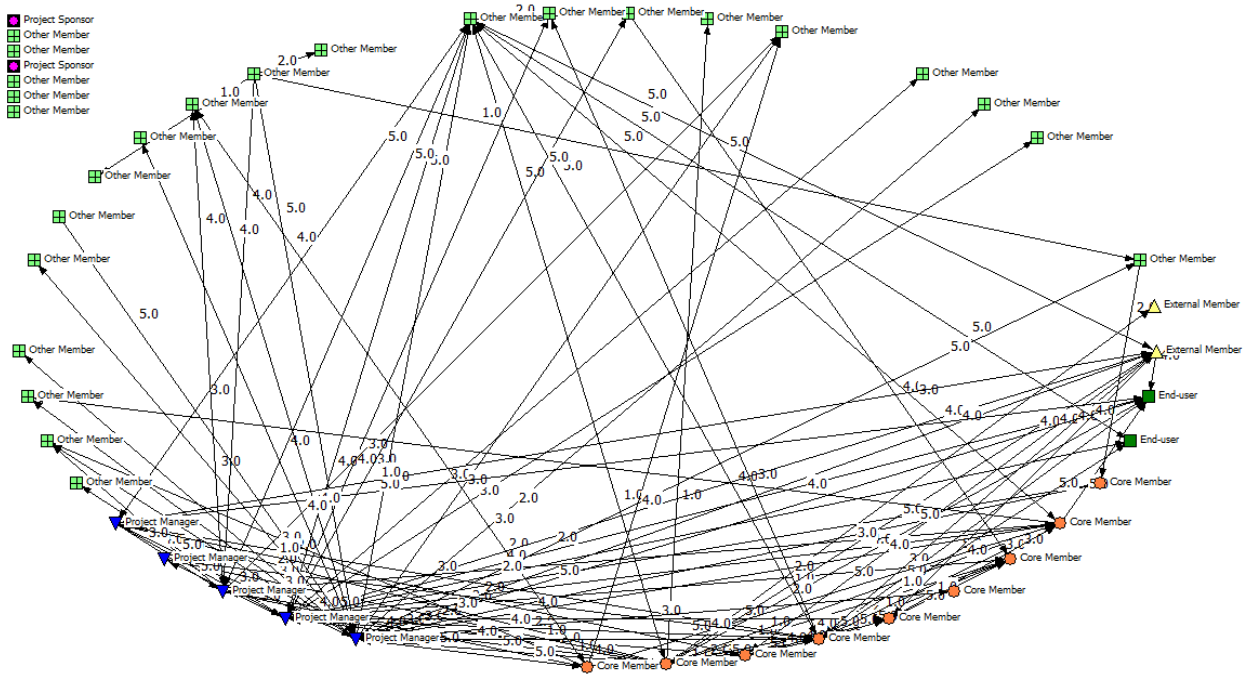
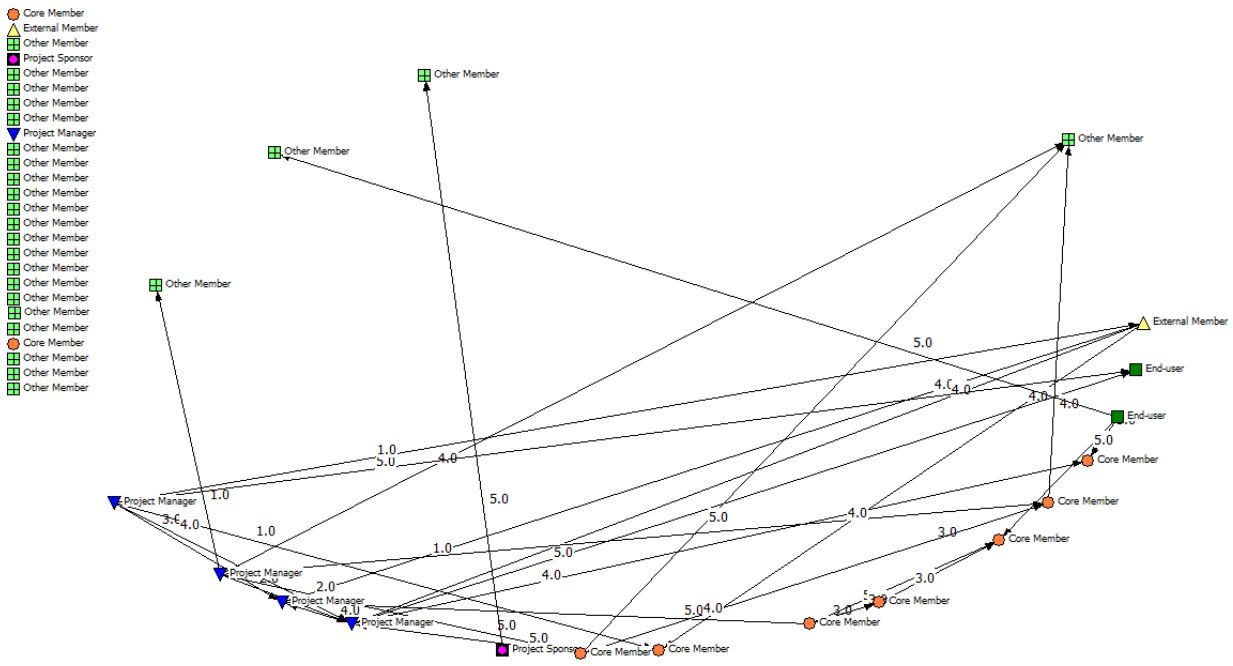


Figure 30: Project B - Friendship network (political Influence)



Project C

Figure 31: Project C - Communication network (personal influence)

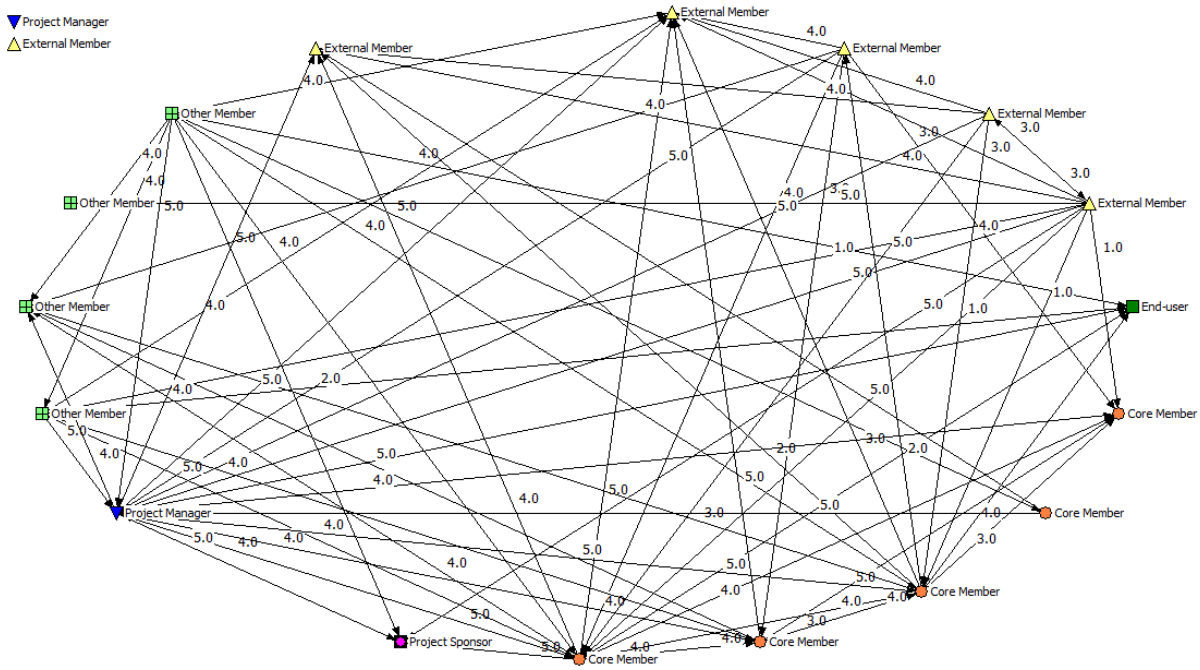


Figure 32: Project C - Workflow network (personal influence)

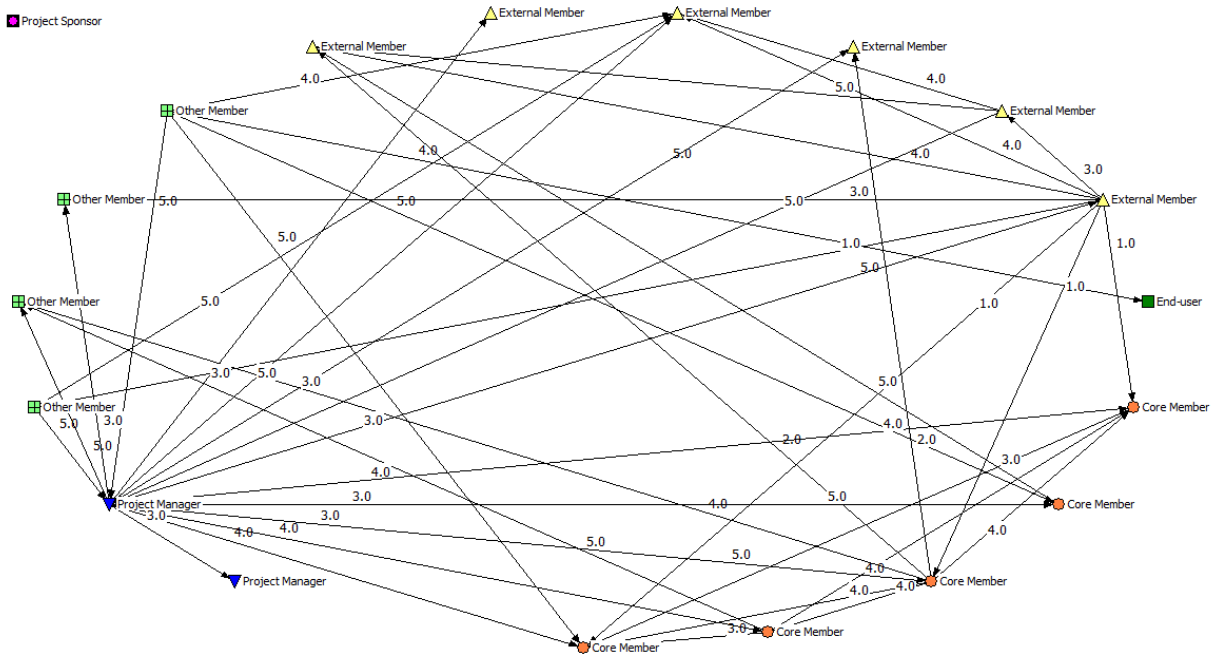
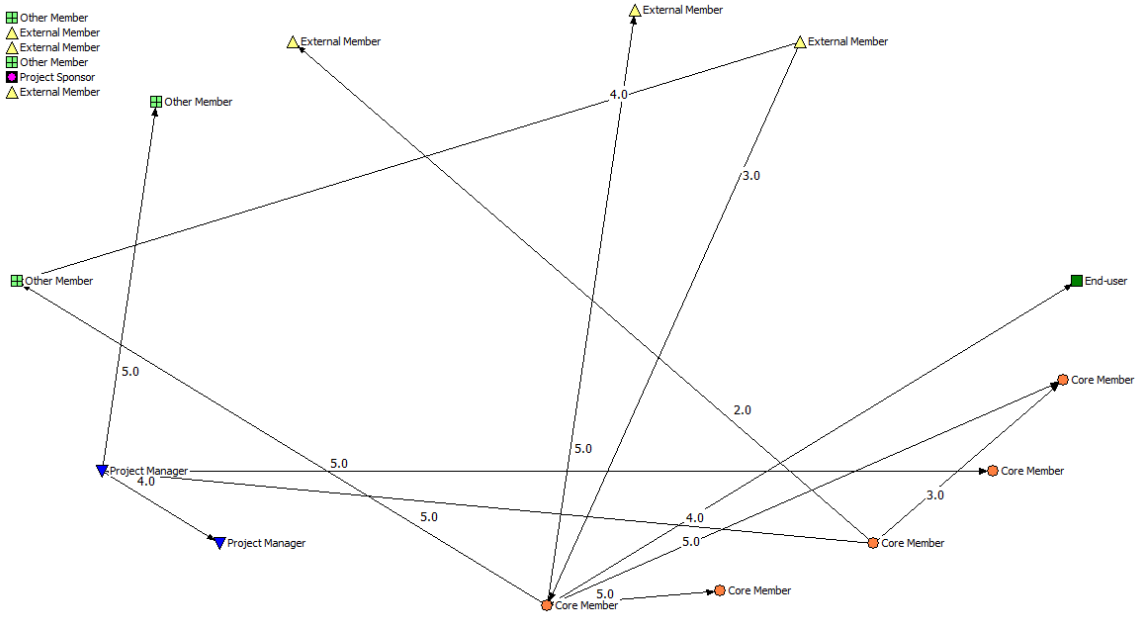


Figure 33: Project C - Friendship network (personal influence)



14 Appendix F – Positional Influence Regression Analysis Output

Correlations

	Scale	1	2	3	4	5	6	7	8	9	10
1	Positional Influence	-	0.447**	0.591**	0.434**	0.352**	0.468**	0.357**	0.291	0.312	0.217
2	Communication_In_Degree		-	0.881**	0.699**	0.221	0.067	0.147	0.577**	0.587**	0.415**
3	Workflow_In_Degree			-	0.738**	0.171	0.156	0.191	0.541**	0.611**	0.439**
4	Friendship_In_Degree				-	0.243	0.185	0.352**	0.526**	0.606**	0.563**
5	Communication_In_Closeness					-	0.794**	0.843**	-0.092	-0.035	0.14
6	Workflow_In_Closeness						-	0.88**	-0.097	-0.04	0.12
7	Friendship_In_Closeness							-	-0.083	-0.021	0.201
8	Communication_Betweenness								-	0.854**	0.388**
9	Workflow_Betweenness									-	0.387**
10	Friendship_Betweenness										-

** p < .001 (1-tailed)

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Workflow_In_Degree	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	Workflow_In_Closeness	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
3	Friendship_In_Closeness	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

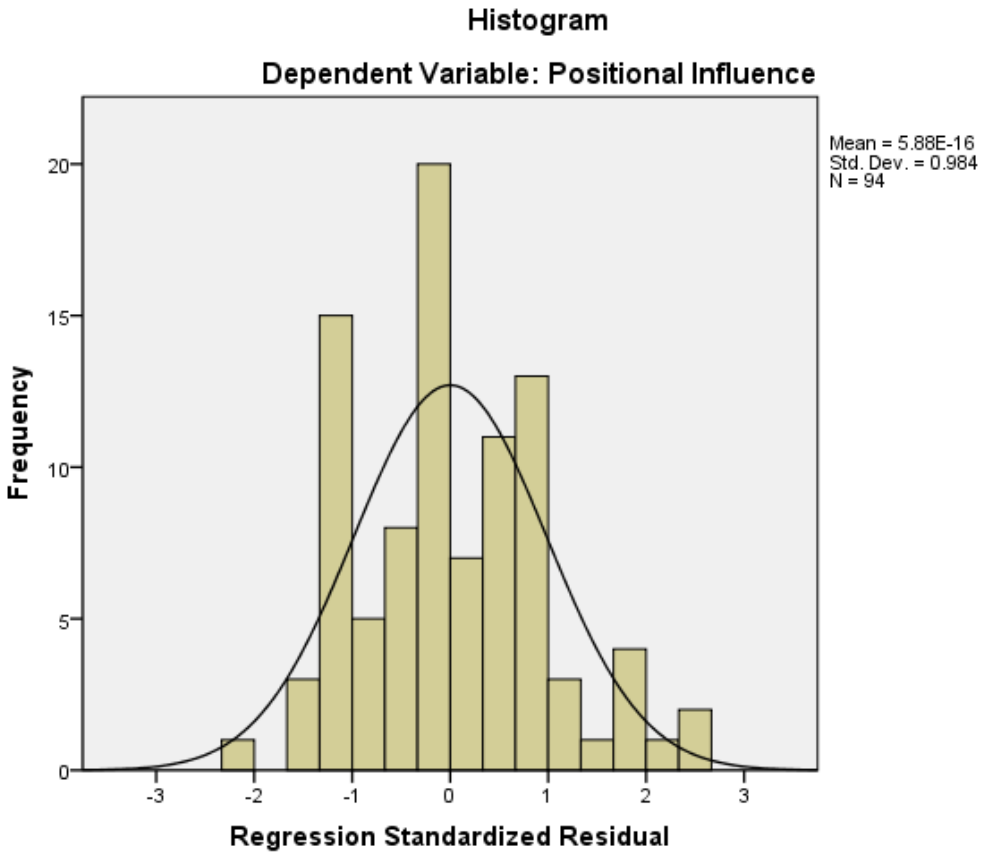
a. Dependent Variable: Positional Influence

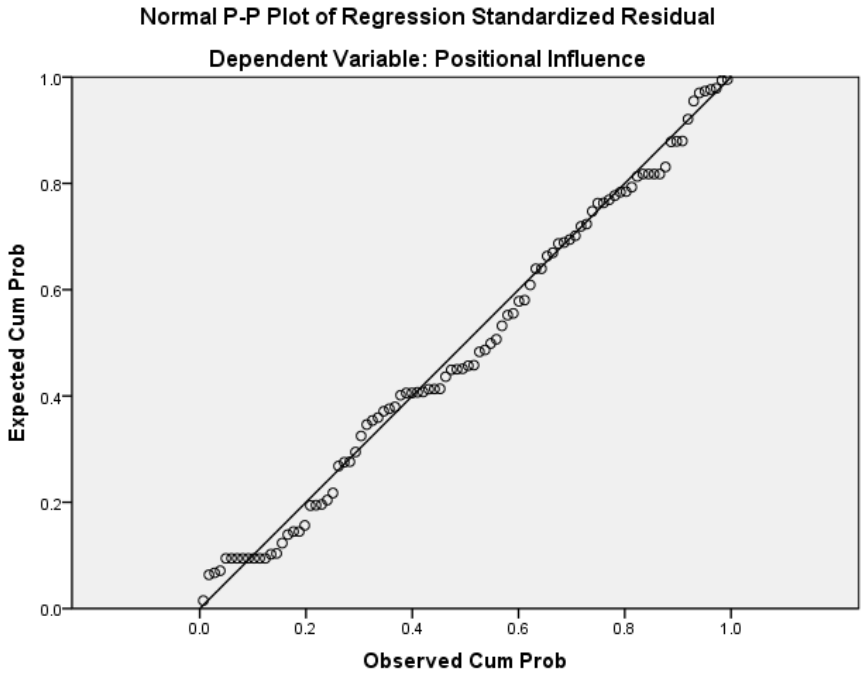
Coefficients[a]

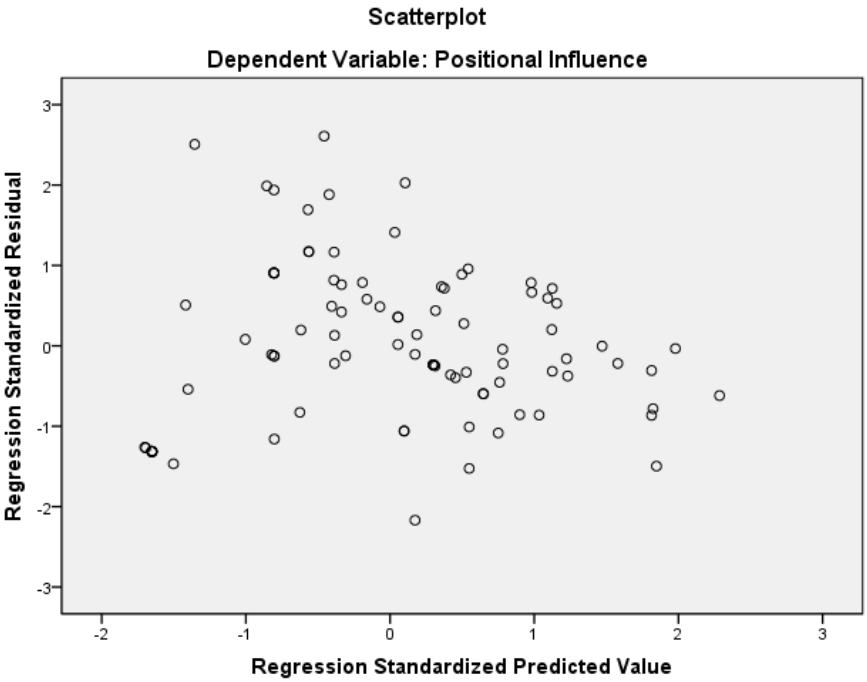
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	95.0% Confidence Interval for B	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	2.08	0.168		12.363	0	1.742	2.409					
	Workflow_ln_Degree	0.25	0.035	0.591	7.018	0	0.178	0.319	0.591	0.591	0.591	1	1
2	(Constant)	0.97	0.263		3.679	0	0.445	1.491					
	Workflow_ln_Degree	0.22	0.032	0.53	7.025	0	0.16	0.286	0.591	0.593	0.524	0.976	1.03
	Workflow_ln_Closeness	0.2	0.039	0.386	5.107	0	0.122	0.278	0.468	0.472	0.381	0.976	1.03
3	(Constant)	1.16	0.269		4.332	0	0.63	1.698					
	Workflow_ln_Degree	0.23	0.031	0.551	7.443	0	0.17	0.294	0.591	0.617	0.541	0.963	1.04
	Workflow_ln_Closeness	0.37	0.079	0.711	4.652	0	0.212	0.527	0.468	0.44	0.338	0.226	4.42
	Friendship_ln_Closeness	-0.32	0.132	-0.373	-2.427	0.017	-0.583	-0.058	0.357	-0.248	-0.176	0.223	4.48

a. Dependent Variable: Positional Influence

Charts




Normal P-P Plot of Regression Standardized Residual
Dependent Variable: Positional Influence
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0


Scatterplot
Dependent Variable: Positional Influence
Regression Standardized Residual
Regression Standardized Predicted Value
-3
-2
-1
0
1
2
3

15 Appendix G – Personal Influence Regression Analysis Output

Correlations

	Scale	1	2	3	4	5	6	7	8	9	10
1	Personal Influence	-	0.557**	0.465**	0.408**	0.293	0.058	0.165	0.233	0.259	0.206
2	Communication_In_Degree		-	0.881**	0.699**	0.221	0.067	0.147	0.577**	0.587**	0.415**
3	Workflow_In_Degree			-	0.738**	0.171	0.156	0.191	0.541**	0.611**	0.439**
4	Friendship_In_Degree				-	0.243	0.185	0.352**	0.526**	0.606**	0.563**
5	Communication_In_Closeness					-	0.794**	0.843**	-0.092	-0.035	0.14
6	Workflow_In_Closeness						-	0.880**	-0.097	-0.04	0.12
7	Friendship_In_Closeness							-	-0.083	-0.021	0.201
8	Communication_Betweenness								-	0.854**	0.388**
9	Workflow_Betweenness									-	0.387**
10	Friendship_Betweenness										-

** p < .001 (1-tailed)

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Communication_In_Degree	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	Communication_In_Closeness	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
3	Workflow_In_Closeness	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

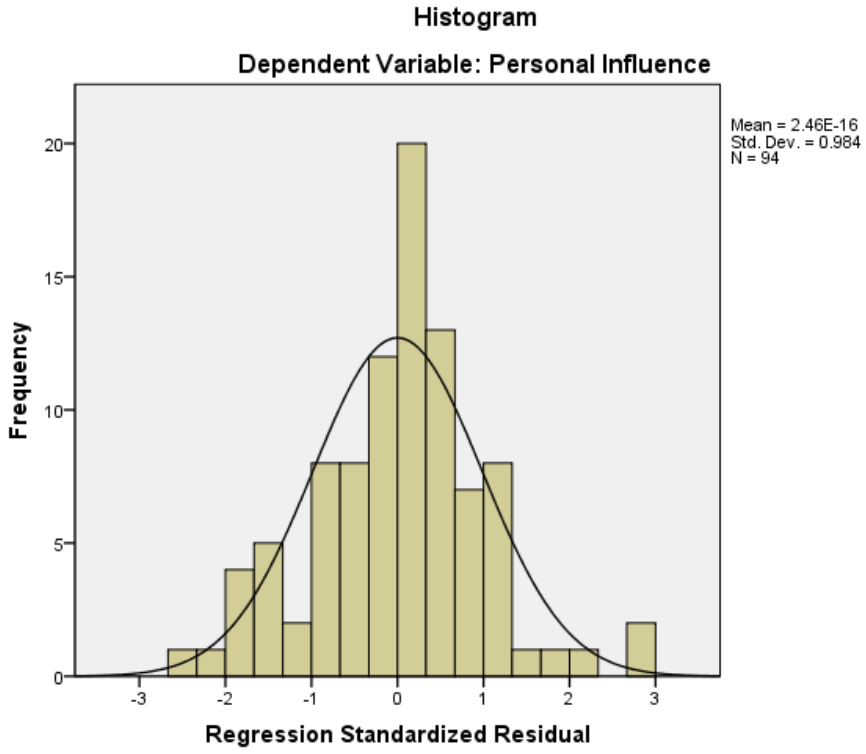
a. Dependent Variable: Personal Influence

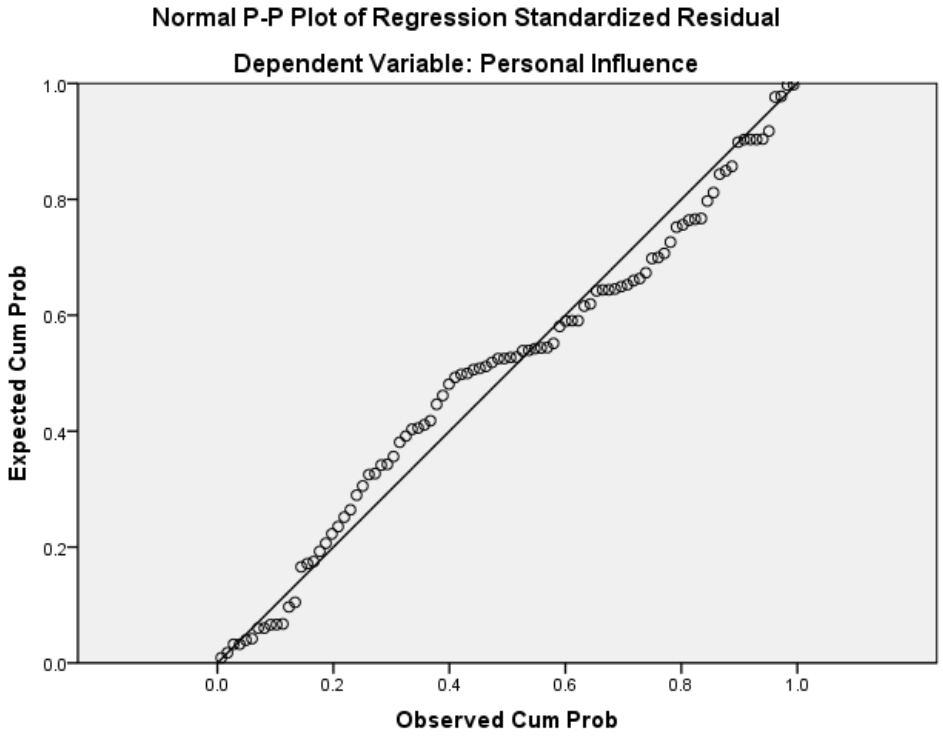
Coefficients[a]

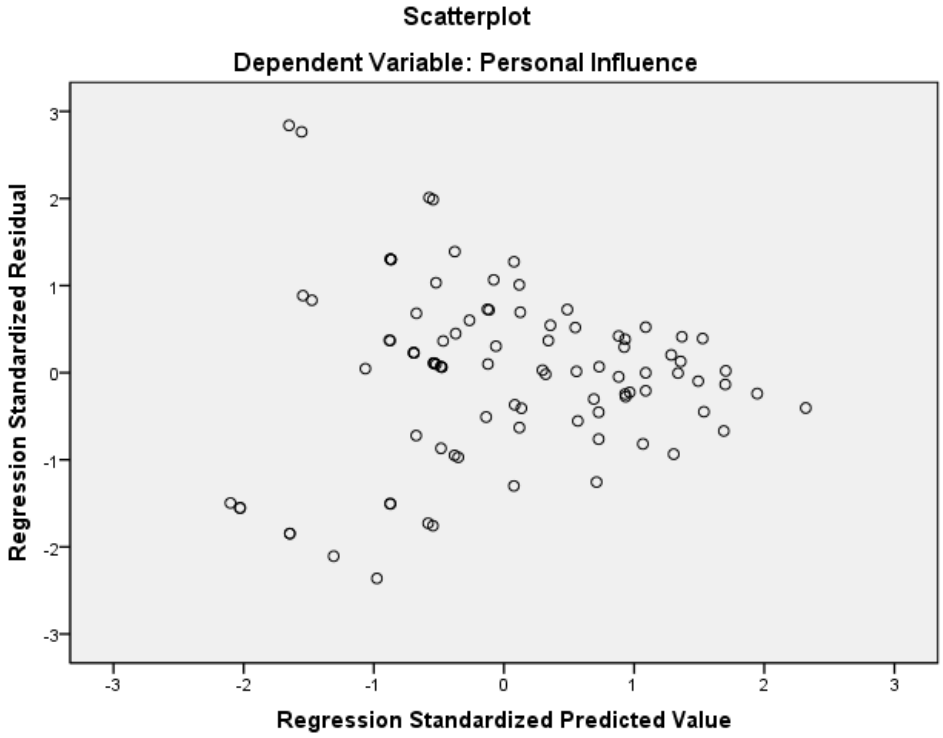
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	95.0% Confidence Interval for B	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	2.46	0.177		13.902	0	2.109	2.812					
	Communication_ln_Degree	0.193	0.03	0.557	6.432	0	0.133	0.252	0.557	0.557	0.557	1	1
2	(Constant)	1.918	0.317		6.057	0	1.289	2.547					
	Communication_ln_Degree	0.179	0.03	0.517	5.927	0	0.119	0.239	0.557	0.528	0.504	0.951	1.052
	Communication_ln_Closeness	0.102	0.05	0.179	2.05	0.043	0.003	0.2	0.293	0.21	0.174	0.951	1.052
3	(Constant)	2.051	0.314		6.536	0	1.427	2.674					
	Communication_ln_Degree	0.166	0.03	0.479	5.534	0	0.106	0.225	0.557	0.504	0.459	0.919	1.088
	Communication_ln_Closeness	0.256	0.081	0.45	3.17	0.002	0.096	0.416	0.293	0.317	0.263	0.341	2.931
	Workflow_ln_Closeness	-0.166	0.07	-0.331	-2.386	0.019	-0.305	-0.028	0.058	-0.244	-0.198	0.357	2.8

a. Dependent Variable: Personal Influence

Charts




Normal P-P Plot of Regression Standardized Residual
Dependent Variable: Personal Influence
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0


Scatterplot
Dependent Variable: Personal Influence
Regression Standardized Residual
Regression Standardized Predicted Value
-3
-2
-1
0
1
2
3

16 Appendix H – Political Influence Regression Analysis Output

Correlations

	Scale	1	2	3	4	5	6	7	8	9	10
1	Political Influence	-	0.447**	0.420*	0.557**	0.362**	0.293	0.474**	0.229	0.23	0.118
2	Communication_In_Degree		-	0.881**	0.699**	0.221	0.067	0.147	0.577**	0.587**	0.415**
3	Workflow_In_Degree			-	0.738**	0.171	0.156	0.191	0.541**	0.611**	0.439**
4	Friendship_In_Degree				-	0.243	0.185	0.352**	0.526**	0.606**	0.563**
5	Communication_In_Closeness					-	0.794**	0.843**	-0.092	-0.035	0.14
6	Workflow_In_Closeness						-	0.880**	-0.097	-0.04	0.12
7	Friendship_In_Closeness							-	-0.083	-0.021	0.201
8	Communication_Betweenness								-	0.854**	0.388**
9	Workflow_Betweenness									-	0.387**
10	Friendship_Betweenness										-

** p < .001 (1-tailed)

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Friendship_In_Degree	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	Friendship_In_Closeness	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
3	Friendship_Betweenness	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

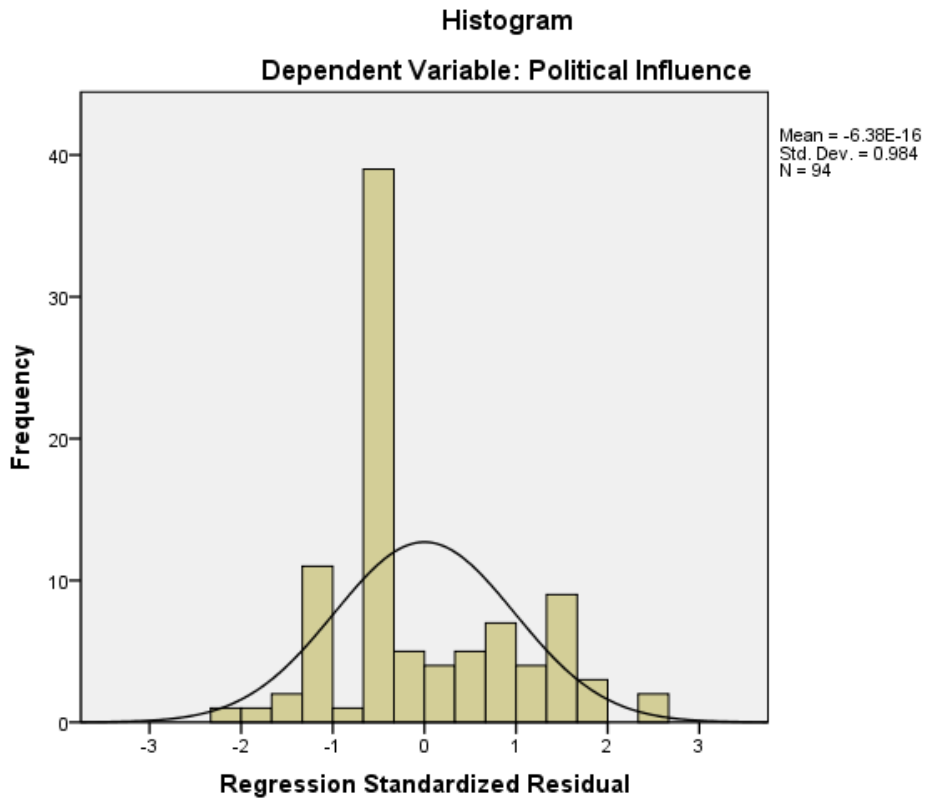
a. Dependent Variable: Political Influence

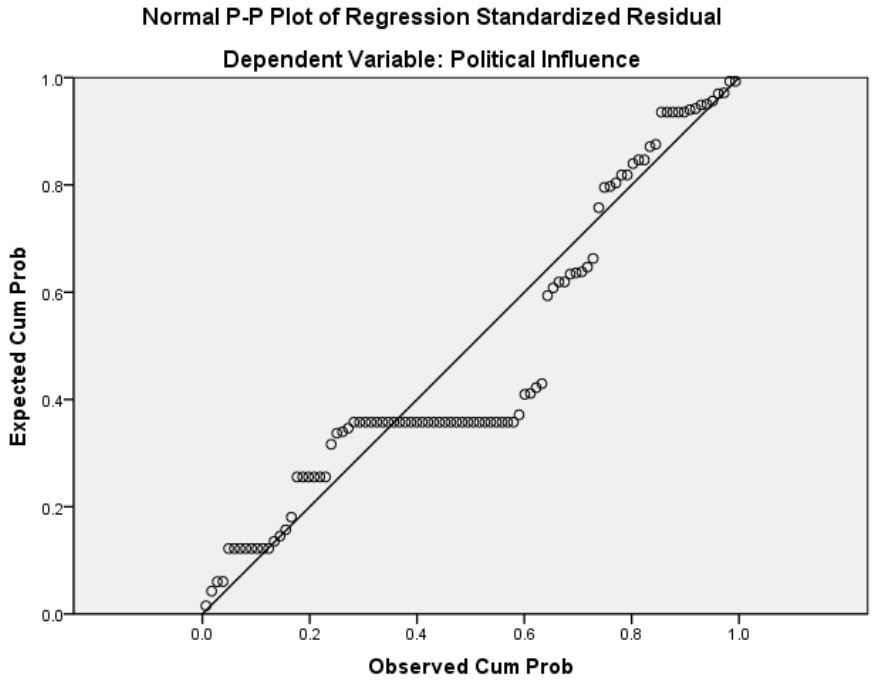
Coefficients[a]

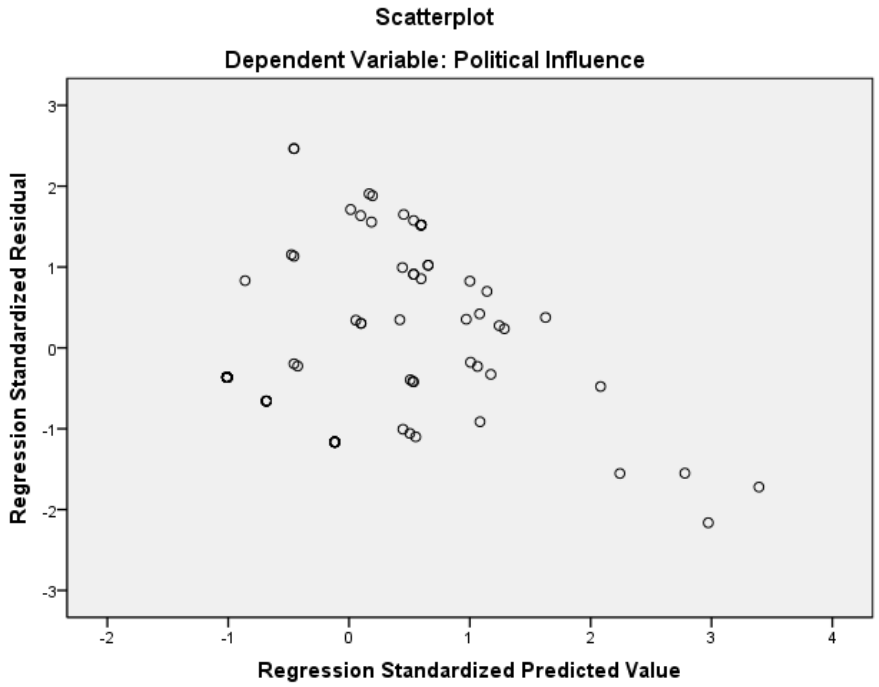
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	95.0% Confidence Interval for B	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	1.136	0.21		5.399	0	0.718	1.554					
	Friendship_ln_Degree	0.668	0.104	0.557	6.426	0	0.462	0.874	0.557	0.557	0.557	1	1
2	(Constant)	-0.226	0.422		-0.535	0.594	-1.064	0.612					
	Friendship_ln_Degree	0.534	0.104	0.445	5.121	0	0.327	0.741	0.557	0.473	0.417	0.876	1.141
	Friendship_ln_Closeness	0.394	0.108	0.317	3.652	0	0.18	0.608	0.474	0.358	0.297	0.876	1.141
3	(Constant)	-0.33	0.405		-0.815	0.417	-1.136	0.475					
	Friendship_ln_Degree	0.727	0.118	0.606	6.146	0	0.492	0.962	0.557	0.544	0.479	0.624	1.603
	Friendship_ln_Closeness	0.395	0.103	0.318	3.826	0	0.19	0.601	0.474	0.374	0.298	0.876	1.141
	Friendship_Betweenness	-0.029	0.01	-0.287	-3.043	0.003	-0.048	-0.01	0.118	-0.305	-0.237	0.683	1.464

a. Dependent Variable: Positional Influence

Charts




Normal P-P Plot of Regression Standardized Residual
Dependent Variable: Political Influence
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0


Scatterplot
Dependent Variable: Political Influence
Regression Standardized Residual
Regression Standardized Predicted Value
-3
-2
-1
0
1
2
3
4

17 Appendix I – Network sociomatrices

Several sociomatrices have been listed below which resulted from the questions asked in the web survey. The matrices are for Project A only and there is one sociomatrix for every network question asked in the survey.

Q1: *Please select the names of people with whom you frequently discuss what is going on in the project, including any project-related activities to ensure the success of the project.*

0	0	0	1	0	0	1	0	0	0	1	1	1	1	1	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0
0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	1	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	0	0	1	0	1	1	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	0	0	0	0
0	1	1	1	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	0	1	0	0	1	1	1	1	1	1	1	0	1	0	0	0	0	1	1	1	1	0	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	1	1	0	1	0	0	0	0	1	1	1	1	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0
0	0	0	1	1	0	1	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	0	1	0	0	1	0	0	0	1	1	0	1	1	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0
0	0	0	1	0	0	1	0	0	0	1	1	1	0	1	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0
1	0	0	1	1	0	1	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	1	0	1	0	0	1	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	1	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0
0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Q2: People with personal influence have specific expertise, act as role models or have charisma (personal magnetism) which makes them likable. For each person on the list that you selected on the prior question, please indicate on the scale from 1 (very little influence) to 5 (very much influence) how much personal influence the person has in the everyday activities of the project.

na	na	na	3	na	na	5	na	na	na	5	5	3	5	4	4	na	na	1	na	na	na	na	5	na	na	na	na	na	na
na	na	2	4	3	4	5	5	na	na	na	na	na	na	na	na	1	na	2	na	na	na	na	5	na	2	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	3	na	na	5	na	5	3	na	na	5	5	5	5	5	5	na	na	na	na	na	na	na	4	2	2	na	na	na	na
na	3	3	5	na	na	5	3	na	na	5	5	na	na	na	na	na	na	na	na	na	na	na	5	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
3	5	5	5	5	5	na	5	na	na	5	5	5	5	5	5	5	na	4	na	na	na	na	5	5	5	5	na	4	3
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
3	na	na	5	5	na	5	na	na	na	na	5	3	5	5	4	na	na	3	na	na	na	na	5	na	na	na	na	na	na
na	na	na	5	4	na	5	na	na	na	5	na	5	5	5	5	na	na	na	na	na	na	na	5	na	na	na	na	na	na
na	na	na	5	na	na	5	na	na	na	4	5	na	5	5	5	na	na	2	na	na	na	na	5	na	na	na	na	na	na
na	na	na	5	na	na	3	na	na	na	3	3	1	na	1	1	na	na	2	na	na	na	na	4	na	na	na	na	na	na
4	na	na	4	4	na	5	na	na	na	5	5	5	4	na	5	na	na	na	na	na	na	na	5	na	na	na	na	na	na
na	3	na	4	na	na	4	na	na	na	3	3	3	4	3	na	na	na	na	na	na	na	na	5	na	na	na	na	na	na
na	3	2	na	na	5	na	5	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	4	na	na	na	na	na	na
na	na	na	na	na	4	na	na	na	5	na	na	na	na	na	na	4	na	na	na	na	3	na	na	na	na	na	na	na	na
4	5	na	na	na	na	na	na	na	na	4	na	2	na	na	na	na	na	na	1	na	na	na	5	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	4	na	5	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	5	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
4	3	na	5	5	3	5	5	3	na	5	5	2	5	3	4	2	3	4	na	3	3	3	na	na	na	na	na	na	na
na	na	na	5	5	na	5	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	2	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	3	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na

Q3: Please select the names of people who you interact with to complete your work activities on the project. These are people that provide you with inputs for your job or to who you distribute the outputs of your work.

0	0	0	1	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	0	0	1	0	1	1	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	0	1	1
0	1	0	1	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	1	1	1	0	0	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	0	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	1	0	1	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	0	1	1	0	1	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	0	0	1	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	0	1	1	0	1	0	0	0	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1
0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Q4: People with positional influence have formal authority and can place legitimate demands on the project. For each person on the list that you selected on the prior question, please indicate on the scale from 1 (very little influence) to 5 (very much influence) how much positional influence the person has in the everyday activities of the project.

na	na	na	3	na	na	na	na	na	na	4	4	na	5	3	4	na	na	na	na	na	na	na	5	na	na	na	na	na	na
na	na	na	4	4	4	5	5	na	na	na	na	na	na	na	na	1	na	na	na	na	na	na	5	na	3	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	3	na	na	5	na	5	2	na	na	5	5	5	5	5	5	na	na	na	na	na	na	na	4	2	2	2	na	2	2
na	3	na	4	na	na	4	na	na	na	3	3	na	na	na	na	na	na	na	na	na	na	na	5	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	4	5	5	5	na	na	5	na	na	5	5	4	5	3	na	na	na	na	na	na	na	na	5	5	5	5	na	5	4
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	4	4	na	4	na	na	na	na	4	2	4	3	3	na	na	na	na	na	na	na	4	na	na	na	na	na	na
na	na	na	5	3	na	5	na	na	na	5	na	5	5	5	5	na	na	na	na	na	na	na	5	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	4	5	na	5	4	5	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	5	na	na	3	na	na	na	3	3	1	na	1	1	na	na	na	na	na	na	na	4	na	na	na	na	na	na
na	na	na	5	5	na	5	na	na	na	5	5	na	5	na	5	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	5	na	na	5	na	na	na	3	3	na	na	na	na	na	na	na	na	na	na	na	5	na	na	na	na	na	na
na	3	na	na	na	4	na	5	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	4	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	4	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	4	3	na	na	na	na	na	na	na	4	na	na	na	5	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	4	na	3	na	4	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	5	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
4	2	2	5	4	5	3	5	3	5	3	3	1	4	1	2	5	5	2	3	2	2	3	na	3	3	3	3	3	3
na	na	na	4	4	na	4	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na

Q5: Please check the names of people on the project who are good friends of yours, people whom you would see socially outside of work.

0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	0	1	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	0	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	1	0	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Q6: People with political influence have access to and control formal and informal alliances that allow them to influence the information that is made available to members of the project. For each person on the list that you selected on the prior question, please indicate on the scale from 1 (very little influence) to 5 (very much influence) how much political influence the person has in the everyday activities of the project.

na	na	na	na	na	na	na	na	na	na	2	2	na	na	na	na	na	na	na	na	na	na	na	4	na	na	na	na	na	na
na	na	4	na	na	4	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	3	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	3	na	3	na	na	na	3	3	na	na	na	na	na	na	na	na	na	na	na	3	2	na	na	na	na	na
na	na	na	4	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	5	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
5	5	4	5	5	5	na	5	na	na	5	5	3	5	3	5	5	na	na	na	na	na	na	5	4	5	4	na	4	2
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	4	3	na	3	na	na	na	na	4	na	na	na	na	na	na	na	na	na	1	na	4	na	na	na	na	na	na
na	na	na	5	5	na	2	na	na	na	2	na	na	na	na	na	na	na	na	na	na	na	na	5	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	4	na	4	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	1	na	na	1	na	na	na	na	1	na	na	1	na	na	na	na	na	na	na	na	1	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	1	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	5	na	na	1	na	na	na	na	na	na	na	na	na	na	na	na	na	na	4	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	5	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
1	na	na	1	na	na	1	na	na	1	1	1	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	1	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na