

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

EXPLORATORY RESEARCH INTO
THE KNOWLEDGE GAP HYPOTHESIS
AND THE EFFECT NETWORK CENTRALITY
HAS ON PRODUCTION, INNOVATION
AND SOCIAL ACTIVITY INFORMATION
GAIN IN KNOWLEDGE BASED ORGANISATIONS

A research report presented in partial fulfilment of the requirements for the degree of Master of Business at Massey University, Palmerston North, New Zealand.

Robyn Leigh Barnes

1999

MASSEY UNIVERSITY



1061439479

ABSTRACT

When information is infused into a system, the likelihood that individuals of high socio-economic status will gain knowledge faster than those individuals with a lower socio-economic status has been described as the knowledge gap hypothesis. The literature relating to the hypothesis maintains that, as the growth in knowledge is greater amongst higher socio-economic status individuals, a relationship tends to exist between education and greater knowledge. The present study explores whether a knowledge gap exists between the most central and the least central individuals in the verbal production, innovation and social activity networks of ten knowledge organisations based in New Zealand.

Once self-reported responses to a sociometric questionnaire were gathered, network analysis was carried out in order to reveal the communication relationships in the three networks. The most and least visible individuals in the network in terms of centrality were then determined by use of the "degree", "closeness" and "betweenness" indices. Once the centrality of the actors in each network was established the socio-economic status, as measured by the educational attainment of each actor, was applied.

A significant difference was found to exist between the means for the most central and least central actors in the innovation network. The closeness and betweenness measures exhibited

much higher mean results for the most central actors in the innovation network. This illustrates that a difference may exist with respect to information access, whereby, the most central actors appear to have more access to, and control over, the information resources.

The demographic characteristics of the most central and the least central actors revealed that actors occupying central positions in the innovation network tended to have managerial roles. Those actors that exhibited a lack of centrality had generally been employed with their respective organisation for between 6 and 10 years. Therefore, the suggestion is that any difference in knowledge concerning information relating to the communication of organisational goals is not related to educational attainment. This may provide a modicum of support for the contention that socio-economic status, as measured by education, is not the only variable that contributes to the existence of a knowledge gap.

Managers in the knowledge organisations were perceived to be influential with respect to control over and access to information relating to solving organisational problems and the development of organisational goals. The implications for organisational environments are briefly discussed, followed by recommendations for future research concerning the application of the knowledge gap hypothesis to organisational settings.

ACKNOWLEDGEMENTS

Acknowledgements are due to my supervisor Frank Sligo who kindly made available the data for this study, organised availability of the software enabling sociometric analysis and provided support throughout the year. I also wish to thank Jillian, Gabrielle and Evelyn for providing support when I needed it the most.

TABLE OF CONTENTS

ABSTRACT	i
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	vii
1. INTRODUCTION	1
2. LITERATURE REVIEW	3
2.1 The knowledge gap hypothesis	3
2.2 Traditions of structural analysis	8
2.3 Network analysis	12
2.4 Communication network linkages	14
2.5 Sociometric technique of network analysis	16
2.6 Network metrics	16
2.7 Research objectives	22
2.8 Importance of this research	24

3.0	METHODOLOGY	26
3.1	Population and sample	26
3.2	Data collection	28
	3.2.1 Data collection instrument	28
	3.2.2 Preliminary data collection	32
	3.2.3 Data collection	32
3.3	Structural measures	33
3.4	Data analysis	37
4.0	RESULTS	43
5.0	DISCUSSION	61
5.1	Communication patterns	61
5.2	Access to and control over information resources	62
5.3	Knowledge gaps	65
5.4	Conclusions	71
5.5	Limitations	73
5.6	Directions for future research	75
	REFERENCES	78

APPENDICES

Appendix A Background data relating to each organisation.

- Appendix B Sociometric questionnaire.
- Appendix C Demographic characteristics of the sample accompanied by a breakdown of the information with respect to educational attainment.
- Appendix D Organisational charts for each organisation.
- Appendix E Binary matrix for each network relating to Organisation One.
- Appendix F Recoded binary matrices and descriptive statistics relating to the centrality measures for Organisation One.
- Appendix G Spreadsheet outlining the centrality of each actor in the production, innovation and social activity networks of Organisation One and their educational attainment.
- Appendix H Spreadsheet outlining the centrality of each actor in the production, innovation and social activity networks of Organisation One and their demographic characteristics.
- Appendix I Spreadsheet outlining the demographic characteristics of the most central and the least central actors in the production, innovation and social activity networks of Organisation One.
- Appendix J Summary of the results organisation by organisation.

LIST OF TABLES

Table	Page
1. The most commonly used structural measures.	17
2. Mean scores for the centrality measures of each network.	44
3. Indicators of the centrality of actors in the production network.	46
4. Indicators of the centrality of actors in the innovation network.	47
5. Indicators of the centrality of actors in the social activity network.	49
6. Characteristics of the most central and the least central actors in the production network.	51
7. Characteristics of the most central and the least central actors in the innovation network.	53
8. Characteristics of the most central and the least central actors in the social activity network.	54
9. Characteristics of the most central and the least central actors according to the degree measure of centrality.	56

10. Characteristics of the most central and the least central actors according to the closeness measure of centrality. 57
11. Characteristics of the most central and the least central actors according to the betweenness measure of centrality. 58

1. Introduction

The knowledge gap hypothesis proposes that when information is infused into any social system, knowledge gaps are likely to occur, resulting in individuals who can be described as being information rich and those who are regarded as being information poor. A knowledge gap has been hypothesised to result when individuals with a higher socio-economic status are more likely to acquire information to which they are exposed than individuals of lower socio-economic status. Despite attempts to reduce the extent of the knowledge gap, the growth in knowledge is relatively greater among the higher socio-economic status segment due to their educational achievement. A significant part of the problem associated with knowledge gaps is an inequality of access to information resources.

The literature relating to this phenomenon to date has predominantly related to mass media communication studies. Little research exploring knowledge gaps in organisational settings has been completed in New Zealand so far. The intention of this study is to see if some beginnings can be made to the application of the knowledge gap hypothesis to organisational communication by exploring whether a knowledge gap exists in knowledge organisations based in New Zealand.

Organisational structures differ by industry, and as, the fundamental hypothesis that this research is based on relates to “knowledge”, the knowledge industry was selected for analysis. Knowledge industries essentially produce and distribute ideas and information rather than goods and services. Therefore,

organisations were selected that perform work which produces or distributes information in some form to the general public.

Organisational communication is the means by which organisations arise, by which developmental goals are set, by which individuals' needs and aspirations are realised, and by which people form themselves and their organisations into coherent structures. The structures formed by individuals in an organisational setting may be formally or informally prescribed. Formal structure is based on the organisational hierarchy as delineated by organisational charts. The informal structure is based on repeated communication exchange, which can be measured by network analysis.

Centrality has historically been the domain of network analysis, wherein the identification of the most visible individuals has been well established. Central actors are those who are extensively involved in communication relationships. Identification of the most central and the least central individuals in the informal networks reveals the basis on which communication patterns exist within an organisational structure. This study aims to see if a relationship exists between socio-economic status, as measured by educational attainment, and access to information in terms of an individual's network centrality. If it appears that the least central actors are less educated and have limited access to, and control over, important information, the implications of this finding will be explored.

2. Literature Review

2.1 The knowledge gap hypothesis

A hypothesis has been in existence since 1970 that states that, as the flow of information into a social system, or an organisation, increases, the segment of the population that has a higher socio-economic status tends to acquire the information at a faster rate than the segment that is characterised by lower socio-economic status (Tichenor, Donohue & Olien, 1970). Individuals of both high and low socio-economic status may gain in knowledge due to the additional information, but individuals of higher socio-economic status will gain more information. This view describes what has been referred to in the literature as “the knowledge gap hypothesis” which is characterised by some members of a system, or organisation, being information rich and others being information poor.

The knowledge gap hypothesis explicitly states that, “as the infusion of mass media information into a social system increases, segments of the population with higher socio-economic status tend to acquire information at a faster rate than lower status segments, so that the gap in knowledge between these segments tends to increase rather than decrease” (Tichenor et al., 1970). Due to the fact that knowledge and information are connected with respect to the hypothesis, the question arises: what is the distinction between knowledge and information?

Nevis, Di Bella and Gould (1995, cited in Sligo, 1997, p. 303) state that “true knowledge is more than information: it includes the meaning or interpretation of the information, and a lot of intangibles such as the tacit knowledge of experienced people that is not well articulated but often determines collective organisational competence”. Therefore, knowledge provides individuals with familiarity of a range of often imperceptible information, which goes far beyond the spoken message. Information, on the other hand, refers to something that the individual does not already know, or “any stimulus that alters cognitive structure in the receiver” (Paisley, 1980, p. 118). In the context of the present study, knowledge specifically refers to a theoretical and practical understanding of a number of aspects of organisational life on the part of individuals in an organisational setting. These understandings include how to get the work of the organisation done, how to solve organisational problems and attain organisational goals, and also the extent of social contact that is taking place amongst the organisation’s members.

Despite being implicit in the literature for some time, but not specifically stated, the knowledge gap hypothesis was proposed by Tichenor et al. (1970) after undertaking research concerning public affairs. Tichenor et al. (1970) concluded that individuals with a high socio-economic status are more likely to acquire information to which they are exposed than individuals of lower socio-economic status. This phenomenon then creates a knowledge gap between the two groups, wherein the knowledge-rich get richer and the knowledge-poor get poorer.

In the same article, Tichenor et al. (1970) suggested that socio-economic status is linked to knowledge through four factors. First, they speculated that education produces more sophisticated communication abilities. Education helps individuals to process information more thoroughly and effectively. Secondly, high socio-economic status individuals have a greater existing pool of knowledge that helps them make better use of new knowledge. Thirdly, the interpersonal contact that high education individuals have with each other is more likely to initiate conversation and provide rewards for gaining knowledge. Fourthly, it was suggested that as a result of their educational experiences, high socio-economic status individuals are socialised to seek more information and pay better attention to the information they receive.

The knowledge gap hypothesis does not hold that lower socio-economic status segments remain completely uninformed, or that the poor in knowledge get poorer in a real sense (Tichenor et al., 1970). Instead, the proposition is that, despite attempts to reduce information gaps, the growth of knowledge is relatively greater among the higher status segments of social structures due to their educational achievement. Therefore, "education can be said to influence the rate of knowledge gain since it is associated with better comprehension, retention and communication capabilities, higher levels of previously stored knowledge, and increased numbers of relevant social contacts" (Griffin, 1990, p. 555).

Based on her reviews of knowledge gap research, Gaziano (1983) notes that a consistent relationship tends to exist between education and greater knowledge. Hyman, Wright and Reed (1975,

p. 56) state that “the process of education creates an enduring receptivity to knowledge which gives highly educated individuals the capacity to respond to and assimilate incoming information”. Consequently, education is assumed to be a valid indicator of the socio-economic status of individuals and will be used for this purpose in this research.

A substantial body of research has been conducted to date on the presence of knowledge gaps to date (Tichenor et al., 1970; Dervin & Greenberg, 1972; Donohue, Tichenor & Olien 1975; Smith 1975; Rogers, 1976; Galloway, 1977; Parker, 1978; Branscomb, 1979; Genova & Greenberg, 1979). Despite the fact that this research has been carried out primarily in the context of mass communication, the hypothesis has generally been supported. These studies revealed that when information becomes available within a social structure, the knowledge rich tend to assimilate it better and get richer and the knowledge poor tend to get poorer.

Reviews undertaken by Caplovitz (1963), Wade and Schramm (1969), Tichenor et al., (1970), Hiltz (1971), Dervin & Greenberg (1972), Smith (1975), and Ettema and Kline (1977) also summarise the plight of individuals who have less education and a lower socio-economic status. Results consistently showed that these individuals are “less likely to be information seekers, be informed generally, have formed interpersonal contacts, be aware of informational sources, have organisational ties, have information processing skills and have sufficient background information that would allow them to become aware of and understand informational messages” (Dervin, 1980 p.78). Similar findings have emerged in research carried out by Bernstein (1961), Hess

(1970), and Ireton, Thriving and Graven (1970), confirming the presence of socio-economic status related knowledge gaps. Therefore, what appears in the literature is that a knowledge gap does exist and that it is caused by the fact that some groups within society are less able and less willing to take in information than other groups.

There is, however, a body of research that has also been conducted exploring the conditions under which the knowledge gap phenomenon might be reduced or eliminated (Donoghue et al., 1975; Wanta & Elliott, 1995). These and other studies revealed that the knowledge gap widened under certain circumstances and reduced under other circumstances. For instance, Donoghue et al. (1975) revealed that, with the input of information that is intended to improve the distribution of knowledge into a system, knowledge gaps tended to widen. The information was utilised more successfully by those with higher education than by those who were less educated. Therefore, the gap in knowledge between the two segments tended to increase rather than decrease.

A study carried out by Sharp (1984) suggested that individual motivation is an important factor in information seeking. Sharp concluded that knowledge gaps might narrow rather than widen when motivation to seek information is strong. Studies carried out by Atkin, Bowen, Nayman and Sheinkopf (1973), Johnson (1973), Ettema and Kline (1977), and Genova and Greenberg (1981) also revealed that the choice of information and the consequent learning stem more directly from the motivational interests of the individual. These studies indicate that knowledge gain tends to

grow more rapidly among more interested segments of a social system or organisation.

However satisfying information acquisition may be for individuals who are highly educated, and who have high socio-economic status, knowledge gaps are not healthy from the standpoint of the system as a whole. Communication gaps, economic gaps, job gaps, social and cultural gaps, and value gaps can be generated as well (Banerjee, 1997). These inequalities can result in dominant groups reinforcing and maintaining control over information resources. For instance, Brass (1984) contends that power is accrued by organisational groups which have the ability to control and mediate others' access to information and resources. Groups of employees who are able to control relevant resources have the ability to increase others' dependence on them while they bring about the organisational outcomes they desire (Salancik & Pfeffer, 1977, cited in Brass, 1984). This form of social control leads to some groups' having little access to primary resources in that they have "no control over information, communication, production or anything" (Smith, 1975, p. 17).

2.2 Traditions of structural analysis

Dervin (1980) maintains that researchers who have asked whether some members of a social system are not gaining information, and are therefore suffering inequities, they have done so using a structural framework. Structuralism in general, and structural analysis in particular, begins by recognising that there are underlying relationships among the parts of a social system (Berkowitz, 1972). These relationships shape the patterns of behaviour in which individuals engage.

Therefore, models of social structure must be designed in a way that reflects exchange relationships, but, at the same time, must allow analysts to turn divergent patterns of interaction into coherent and consistent patterns (Berkowitz, 1972). These regular patterns of person-to-person contact and information sharing between the parts of social structures are referred to as “communication networks” (Berkowitz, 1972; Rogers & Kincaid, 1981). Monge and Eisenberg (1987) and Monge (1987) describe three theoretical perspectives of structural inquiry that have been identified as relating to communication networks. The theoretical perspectives are the relational, positional, and cultural schools of thought.

The relational approach focuses on the direct and indirect connections among members of a communication network. The unit of analysis is a relationship between two or more individuals (Rogers & Kincaid, 1981). Relational analysis places an emphasis on identifying network roles through network analysis and the computation of network metrics. In examining connections amongst network participants and emphasising roles within the network, the relational framework specifically identifies itself with the emergent rather than the formal organisational network. An emergent network is comprised of an informal network or social structure within organisations that functions in the shadows of the formal division of labour and hierarchical control (Bacharach & Lawler, 1980; Mintzberg, 1983). This network is traditionally marked by face-to-face contact between individuals who find one another attractive for one reason or another. As these emergent interactions become recurring patterns of behaviour, further structure is added to the organisation.

Much organisational research has been carried out applying relational techniques. For instance, Levine (1972) undertook a spherical mapping of broad interlocking ties among United States companies; Sonquist and Koenig (1979) analysed interlocks among large United States companies using graph techniques; and Laumann and Pappi (1976) mapped overlapping memberships among organisations using smallest-space analysis.

By contrast, the positional perspective looks at the positions occupied by individuals and the expected communications that arise from those positions (Monge, 1987). The positional model, therefore, focuses on the designated positions that individuals fill and the roles attached to these positions. The positions and their roles are formally defined in the organisation in terms of hierarchical structure and exist independently of the individuals who fill them. For instance, Knoke and Rogers (1979) conducted a block-model analysis of public and private agencies which sought to identify the formal properties of networks, while looking for similar patterns across different networks.

There are similarities between the relational and positional perspectives, particularly between the notion of pre-determined paths for communication and expected communication from certain positions in the hierarchy. The relational approach focuses on the pathways in communication networks, while the positional approach focuses on patterns of similarity based on the hierarchical structure. The crucial distinction between the two approaches is that the relational focuses on emergent interactions between individuals, while the positional does not. However, the positional tradition has been criticised for its inability to take into

account the active part individuals play in creating and shaping organisational structure (Burt, 1976; White, Boorman & Breiger, 1976). Critics claim that this makes the positional view of structure overly simplistic and incomplete.

The cultural perspective concerns the meanings and symbols used in message transmission as a means of conveying information about the 'culture' of an organisation (Monge, 1987). However, the significance of these symbols is not determined by their role in communicating specific messages but by their capacity to create language communities and cultures. Riley (1983) contends that communication is the mechanism by which individuals make sense out of their social world, continually transmitting messages that require collective interpretations of reality.

Ranson, Hinings and Greenwood (1980), Riley (1983) McPhee and Tompkins (1985) are just some of the authors who have applied the cultural approach to organisational studies. These studies concentrate on the continual production and reproduction of meaning through communication and examine how meanings emerge from interaction and how they act to constrain subsequent interaction (Monge & Eisenberg, 1987). A common concern with emergent interaction can be seen between the relational and cultural approaches. However, the cultural perspective differs from the relational perspective due to the increased value placed on the meaning and interpretation of communication and through the depth of exploration of the interaction patterns.

Because these three perspectives are not totally incompatible with one another, various authors have tried to integrate the diverse

traditions (Bacharach & Aiken, 1976; Benson, 1977; Giddens, 1979). Blau (1982) argues that all three theories are true at different times in the development of social structures and that they must all be integrated to provide a complete understanding. However, Blau (1982) considers that the relational view is most applicable to small groups and the positional view more relevant to established communities where positions are less changeable.

Over time, the relational approach has become increasingly popular and is the most prevalent structural tradition in the communication field (Rogers & Kincaid, 1981; Monge & Eisenberg, 1987). Rogers and Kincaid (1981) assert that the model's popularity relates to the crucial distinction between the relational, positional, and cultural perspectives: the relational perspective's focus is on emergent interactions between individuals, seeing structure as bottom-up and individually motivated. The positional perspective, by contrast, sees structure as formal and independent of the individuals in the organisation. Despite a common concern with the emergent network, the relational and cultural approaches differ because more value is placed on the meaning and interpretation of communication from the cultural perspective. The relationships explored between interaction patterns and structures are also more in-depth because they seek to explain the social life of an organisation (Monge and Eisenberg, 1987).

2.3 Network analysis

All three of these perspectives make the assumption that communication between individuals in an organisation will take on a steady, predictable, and recurrent pattern, which will be consistent, open to description, and structurally definable. As a

result, interpersonal communication will be measurable by means of network analysis. Based on this premise, all three models could be used in this research to determine inequities in the flow of information within the sampled knowledge organisations.

However, as illustrated, the relational perspective is primarily concerned with the role of individuals in establishing and maintaining informal communication linkages. Therefore, its focus is on the face-to-face communication which defines the emergent organisational structure. Moreover, this exploratory research is based on small organisational groups, as opposed to established communities. Therefore, a relational perspective has been used as a theoretical basis. The relational model also lends itself to research concerning inequalities in information acquisition because it relates directly to the interdependent relationship individuals have with others. Dyadic and group interaction are important as recurrent patterns of face-to-face communication are generally channels through which relevant resources, such as information, flow.

Communication relations are constructed out of communication networks and can be said to describe the nature of information flow between individuals. As a result, communication network analysis begins with the assumption that actors are embedded in a multitude of social relationships. Granovetter (1985) maintains that it is impossible to understand actors' behaviour without understanding the relational context in which they function. Therefore, relations that are defined by linkages among units are a fundamental component of network theories.

2.4 Communication network linkages

In the case of organisational communication networks, actors represent individuals or groups and linkages represent any sort of interpersonal communication relationship between them. "The link is the basic datum in any type of network analysis and without knowing the existing links among the members of a system, no type of network analysis is possible" (Rogers and Kincaid, 1981 p. 97). The fact that the unit of analysis is not the individual, but an entity consisting of a collection of individuals and the linkages among them is of critical importance to the development of this research.

Galaskiewicz (1996) maintains that the linkages that make up the structure of communication networks are invariably permanent and lasting, and that they can be consolidated into something that is more than the sum of its parts. Through the manipulation of relational data and the application of mathematical formulae, network analysts can see or discover social realities that are unrecognisable to those who are embedded within them.

The content of these communication linkages is important because it allows the nature of message exchange patterns in the network to be specified. Three major types of content have generally been studied in network research to date (Katz & Kahn, 1966; Farace, Monge & Russell, 1977; Tichy, Tushman & Fombrun, 1979; Sherman, Smith & Mansfield, 1986). These communication relationships typically involve flows of information concerning the exchange of goods and services; attempts to influence and control; and affects such as liking and friendship, or disliking and animosity.

Monge and Eisenberg (1987) characterise communication linkage content as concentrating on three types of messages: those concerning production, innovation, and social activity. Production messages relate to getting the work of the organisation done; innovation messages concern solving organisational problems and establishing better ways of achieving organisational goals; and maintenance messages concern individual feelings and supplying and receiving social support for personal problems that are encountered on and off the job (Monge & Eisenberg, 1987). The content of the relationship can be variable in that actors may be seeking advice, giving advice, or both; exchanging technical information; exchanging gossip about others in the organisation; and/or giving and receiving moral support in a time of crisis (Thayer, 1968 and Berlo, 1970, both cited in Farace and MacDonald, 1976).

A network analysis approach to the exploration of whether or not knowledge gaps exist in knowledge organisations is suitable for two reasons. Firstly, network analysis focuses attention on patterns of communication exchange that emerge between actors, with an emphasis on the informal rather than the hierarchical delineation. A network analysis approach, therefore, allows exploration of which actors in each organisation communicate face-to-face regularly about production, innovation and social activity. Secondly, the focus of network analysis is on the communication linkages that are created by the sharing of information in the interpersonal communication structure. Based on reported communication behaviour data are collected at the individual level. This enables exploration of the larger system, while investigating the flow of information through the communication networks.

2.5 Sociometric technique of network analysis

Sociometry “provides the basic methodological tools to measure network variables” by means of “obtaining quantitative data about communication patterns among individuals in a system” (Rogers & Kincaid, 1981 p.91). Sociometrists, such as Coleman (1961), use network diagrams to represent interpersonal relations in small groups. However, early sociometric methods were, by the standards of today, more than a little cumbersome and generally used for smaller organisations. More recently, with the advent of computer algorithms for data analysis, there has been a renewed interest in the use of sociometric techniques for network analysis within an organisation (Roberts & O’Reilly, 1974 and 1979; MacDonald, 1976; Tushman, 1979; Tichy, Tushman & Frombrun, 1979; Tushman & Scanlan, 1981, Madlin, 1987). Tichy, Tushman & Fombrun (1979) and Fombrun (1983) state that, in terms of methodology, the most significant breakthrough for network analysis has been the use of computers for analysing sociometric data. Based on this advancement, a sociometric method of analysing communication networks has been used in this research.

2.6 Network metrics

Within the realm of sociometric research, a number of measures have been developed over the years to quantify the characteristics of individual and organisational networks. Monge and Eisenberg (1987) contend that the best known and most often used metrics consist of size, density, reachability, and centrality.

Table 1 The most commonly used structural measures

1. Size	The number of individuals participating in the network.
2. Density	The number of actual links in the network as a ratio of the number of possible links.
3. Reachability	The average number of links between any two individuals in the network.
4. Centrality	The extent to which an actor is linked to other individuals in the network.

Source: Monge and Eisenberg (1987)

Monge (1987, p. 245) maintains that “size is the simplest metric of all, in that it refers to the number of actors to whom an individual is linked”. Density is the ratio of communication linkages to others in the network and describes the proportion of the total number of people to whom a person in the network is directly connected (Monge and Eisenberg, 1987). Reachability refers to the number of steps or linkages it takes to reach another actor in the network (Alba, 1982). Lastly, centrality refers to the extent to which an actor is involved in many linkages within a communication network, that is, being the most visible communicator (Wasserman & Faust, 1994).

Therefore, the sociometric measurement of individuals can take several forms. However, Monge and Eisenberg (1987) maintain that, from the relational perspective, the concept of centrality is one of the most frequently used network metrics. Centrality refers to the degree to which an actor is involved in communication linkages and is able to be accessed by all other actors in a network (Bavelas 1948 and 1950 cited in Freeman, 1979). The idea was

applied in the late 1940s and early 1950s in laboratory experiments on communication networks. As Freeman (1979) reports, these first experiments led to many more experiments in the 1950s and 1960s (for reviews see Burgess, 1968; Snadowski, 1972; Rogers & Agarwala-Rogers, 1976). In general, these studies concluded that individuals in central positions tended to emerge as being leaders of the group.

Over time, several measures of centrality, each slightly different from the others, have evolved in the study of organisational networks (Freeman, 1979; Knoke & Burt, 1983; Bonacich, 1987; Friedkin, 1991). However, all of the theorists agree on the fact that centrality is an important structural attribute of social networks for determining access to, and potential control over, relevant resources, such as information. Knoke and Burt (1983) confirm that the measurement of information brokerage is well suited to the centrality metric, due to the fact that the difference between the source and the receiver is less important than participation in many interactions.

Beauchamp (1965), Nieminin (1973) and Moxley and Moxley (1974) proposed that centrality measures should be computed as the overall strength of connections between an individual and other actors in the network. Following this, Freeman (1979) reviewed the research literature and identified three indices which have been consistently used by researchers to measure actor centrality (Brass, 1984; Burkhardt & Brass, 1993, Ibarra, 1993; Ibarra and Andrews, 1993). The first measure is degree centrality which refers to network activity or the number of other persons to whom a given person is directly connected (Brass, 1984). The

second measure, closeness centrality, quantifies the extent to which an actor can be reached, which is an indicator of independent access to resources. The third centrality measure, betweenness, represents control or the possibility of increasing the dependence of others on the individual (Freeman, 1977, 1979; Brass, 1984).

The literature with respect to actor centrality in an inter-organisational setting (Laumann & Pappi, 1976; Boje & Whetten, 1981; Knoke, 1983) revealed that a common research practice has historically followed the popular strategy of identifying actors' positions in the network and correlating this with a series of outcome variables. For instance, Laumann and Pappi (1976) and Thurman (1979) looked at the proximity of actors in networks and the formation of coalitions and alliances among them.

Several at the intra-organisational network level that found that an actor's centrality is directly related to political power (Blau & Alba, 1982; Fombrun, 1983; Tushman & Romanelli, 1983; Astley & Sachdeva, 1984; Brass, 1984, 1985; Burkhardt & Brass, 1990, Karckhardt, 1990; Brass & Burkhardt, 1993; Ibarra, 1993; Ibarra and Andrews, 1993). Research revealed that actors occupying central positions in a network are viewed as potentially powerful because of their greater access to, and possible control over, relevant resources (Burkhardt & Brass, 1990; Ibarra, 1993; Ibarra & Andrews, 1993). Network members who offer valuable characteristics are typically more central in their network (Knoke & Burt, 1983) and hold more power and influence within their organisation (Brass & Burkhardt, 1993; Ibarra, 1993).

At the individual level, research has generally focused on communication network roles (Monge & Eisenberg, 1987). For instance, Monge, Edwards, and Kirste (1978) revealed that actors with greater informal status in an organisation tend to be more central in communication networks. Lincoln and Miller (1979) found that actors with higher structural status were located in central positions within the network, and that these persons tended to have a higher level of education. Ibarra and Andrews (1993) observed that an individual's centrality is increased positively by connections to others who are also highly central.

Several of these authors utilised Freeman's (1979) degree, closeness, and betweenness concepts in order to measure centrality (Brass, 1984; Burkhardt & Brass, 1990; Brass & Burkhardt, 1993). Fombrun (1983) exercised the degree measure in research relating to attributions of power; Ibarra (1992) and Ibarra and Andrews (1993) utilised the closeness measure in order to determine how network interaction patterns affect employee perceptions; and Ibarra (1993) employed the betweenness measure in a study of power and innovation involvement.

As illustrated, a number of social network researchers have provided examples of the successful application of structural measures of organisational phenomena by assessing an individual's network centrality. Pettigrew (1995) and Vredenburg and Brendery (1998) regard this method as a sound analytical way of researching informal networks in order to define the underlying structure of an organisation. Investigations of interpersonal relations carried out in a systematic way can contribute significantly to the understanding of social structure.

When this method of investigation is put into the framework of the knowledge gap hypothesis, worthwhile information can be obtained concerning information flows between individuals with high educational qualifications and those with low educational qualifications. The literature review has indicated that individuals have limitations placed upon them by their socio-economic status and level of education. The fact that individuals with high socio-economic status gain more information because they are more willing and able creates knowledge gaps. Assuming that knowledge gaps do exist in knowledge organisations, this research may provide an insight into the type of information that is not acquired or assimilated by the less educated. Awareness can then lead to possible steps to increase information seeking and close the knowledge gap and avoid the knowledge rich becoming even richer while the knowledge poor become substantially poorer.

2.7 Research objectives

While knowledge control is as old as mankind, it has become a more prominent feature of modern civilisation as more and more human activity becomes directed towards production and the accumulation of knowledge. Intensive study of knowledge and information flows has culminated in the theory that consistent relationships tend to exist between socio-economic status, education, motivation, and a greater knowledge of a variety of topics. This has resulted in the knowledge gap hypothesis which states that more educated individuals are better able to comprehend, retain, and draw on stored knowledge, putting them in an advantageous position. These advantaged individuals are said to be “information rich”.

The main objective of this research is to explore whether a knowledge gap exists in knowledge organisations in New Zealand, by researching ten small organisations in the knowledge industry. Knowledge organisations produce information and disseminate it to the public. Therefore, knowledge structures will be examined from the standpoint of the informal structure once the emergent networks have been identified. This will be achieved by analysing of the communication patterns in each organisation.

Once the informal, emergent networks have been established, through network analysis, the aim of the study will be to assess the different positions individuals occupy the production, innovation, and social activity networks. Whether information gaps exist will be determined after individuals exhibiting centrality or a lack of centrality have been identified. It will then become

apparent whether or not socio-economic status, as measured by educational attainment, is a feature of centrality. This result will reveal whether any perceived knowledge gaps occur as predicted by the knowledge gap hypothesis.

The second objective of this study is to determine whether there is a connection between education and the central location of individuals within the organisations, and whether these individuals control the flow of communication. The literature suggests that knowledge gaps do exist, caused by some groups within society being less able or less willing to take in information. The implication is that individuals in central positions within an organisational network have greater access to and control over relevant resources such as information.

If a knowledge gap is found to exist, the research aims to determine whether the gap is associated with production, innovation, or social activity information. Analysis will indicate whether vital organisational information is conveyed to the mass organisation or specifically preserved for particular members of the knowledge organisations. If limited access to and control over information is found to exist, the implications of these dissemination patterns will be explored.

2.8 Importance of this research

The importance of this study lies its contribution to the growing body of research on the knowledge gap hypothesis. Studies investigating the existence of knowledge gaps have generally been confined to mass communication structures. However, unlike previous studies this research tests the hypothesis in an organisational setting. With increased interest in the concepts underlying the hypothesis, research should not be limited to mass communication, it should be extended to include the effects of interpersonal communication. If the results of this research provide support for the hypothesis, by illustrating the same relationship between socio-economic status and information acquisition, then a case can be made for using this type of research as a foundation for future knowledge-based organisational studies.

The literature suggests that individuals operate in groups which are generally linked and overlapping. Putting this into an organisational framework, organisations operate via inter-linked groups. To better understand the organisation and the nature of the group interactions, network analysis has been drawn assist with identification of these groups (Roberts & O'Reilly, 1974 and 1979; MacDonald, 1976; Tushman, 1979; Tichy, Tushman & Frombrun, 1979; Tushman & Scanlan, 1981, Madlin, 1987).. Studies of interactions between and within these groups may only be possible via network analysis. Therefore, network analysis is one of the few methodologies enabling the identification both of groups and the frequency and type of communication within them.

While extensive investigations have been carried out into network analysis and organisational power, few inquiries to date have used network analysis to test the knowledge gap hypothesis. By utilising network analysis, this research will provide insight into how the communication patterns of the knowledge organisations sampled influence access to and acquisition of important information. Whether or not knowledge gaps exist will be able to be determined which may enable this piece of research to be added to existing work relating to communication flows in an organisational setting. Establishing not only who controls information flows but also the existence of communication gaps, by means of network analysis, may make it possible for communication problems associated with knowledge gain to be rectified.

The structural context of network relationships - to whom one is connected via direct and indirect network links - determines access to valued resources. The means of identifying central actors in a network structure has been in existence since the 1950s. Therefore, actors who are centrally located within organisational networks have greater control over relevant resources and enjoy a broad array of benefits and opportunities unavailable to those on the periphery (Burt, 1982 and Ibarra, 1993). By utilising the structural measure of centrality, to determine access to and control over information, this study will contribute to a growing number of studies that have confirmed that the most prominent actors are those who are extensively involved in relationships.

3. Methodology

3.1 Population and Sample

Oral communication networks that actors form when they communicate with each other regarding production, innovation or social activity are the focus of this research. Because most communication in organisations is face-to-face (Luthans & Larsen, 1986), it is important that this channel of communication be chosen for this piece of sociometric research.

Oral communication was also chosen because it allows immediate feedback so that understanding can be checked and interpretations corrected. This medium also allows the simultaneous communication of multiple cues, such as body language, facial expression, and tone of voice. Cues that convey information beyond the spoken message, thereby enhancing understanding of the message beyond its information content, also add to the richness of face-to-face communication (Meherabian, 1971, cited in Huber & Daft, 1987).

The population for the study comprises the entire staff of ten knowledge organisations in New Zealand, which equates to 178 individuals. Due to an 80% response rate to the sociometric questionnaire, the sample for the study totals 148 individuals, 94 (63%) female and 54 (37%) male. Respondents ranged in age from 16 to 56, with the youngest respondent being female and the oldest being male. The mean age is 30 for the female respondents, 32 for the male respondents and 31 years for the complete sample. The sample for the study comprised the production, innovation and

social activity networks formed by the full-time employees of ten knowledge organisations in New Zealand.

The ten knowledge organisations sampled vary in size with the smallest unit of the population being Organisation Six, which has seven members. The largest organisation is Organisation Nine which has 19 members. There were 12 to 16 respondents from most of the organisations with an average of 12. Appendix A details a breakdown of the above-mentioned facets of each organisation as well as supplying a summary of the positions held by the respondents, and their tertiary qualifications.

Thus, the sample comprised the oral communication networks formed by the staff of the ten knowledge organisations, each of which is regarded as a unit of the population (Monge & Contractor, 1988). A second population comprises the most central and second most central actors, and the third population consists of the least central and the second least central actors in the emergent networks.

Rogers and Kincaid (1981, p.103) state that "in order to study a communication structure, network analysis must sample either intact structures, or at least the parts of them relevant to the research objectives". With this consideration in mind, the choice of organisations for this research was based on accessibility and drawn from a group whose data had previously been gathered as part of a larger study. However, in spite of the use of purposive sampling, the sample ultimately provided enough diversity in relation to the age, gender, tenure, position within the

organisation, education and work experience of the respondents to satisfy validity.

The organisations studied were all knowledge based in that their staff dealt directly with gathering, analysing, and distributing information to other department members, other departments within the organisation, and to the general public. Knowledge organisations by their very nature provide an information service (Monge & Eisenberg, 1987). The sample of knowledge organisations included companies specialising in computer services, commercial law, business services, finance, government departments, voluntary organisations, an educational institution and a bank. These organisations are consistent with Malchlug's (1962, cited in Paisley, 1980, p.117) definition of the knowledge industry as including "work performed in research and development laboratories, educational institutions, publishing houses, communication media, etc., all of which produce or distribute information in some form".

3.2 Data Collection

3.2.1 Data Collection Instrument

The raw data for this research were collected by means of a sociometric questionnaire which required self-reporting by the respondents. A copy of the questionnaire is attached as Appendix B. The respondents were required to indicate which of the other members of the group they spoke to during a working week with regard to (i) getting their work done, (ii) new ideas for solving organisational problems, and (iii) social activities.

Participation was voluntary. The respondents were assured that their individual responses were confidential and this assurance was printed in bold letters on the front page of the questionnaire. The fact that the responses would not be made available to anyone in the respective organisations, and that the responses would be used for research purposes only, was also clearly communicated to the respondents.

Moreno (1934, cited in Kincaid & Rogers 1981) maintained that concrete, rather than abstract, questions yield more meaningful sociometric data. To this end, the body of the questionnaire consisted primarily of closed-ended questions requiring ordered responses. The questions asked the respondents how much verbal contact they had with each member of the organisation each week concerning messages relating to getting work done, new ideas, and social activity. The name of each member of the organisation was then listed and the actors were asked to indicate how much they communicated with each member by choosing an answer from a set of alternatives on a five point Likert scale. The scale ranged from 'never', 'rarely' or 'sometimes' to 'often' or 'very often'. The associated responses to the sociometric statements operationalised direct communication links existent between the respondents from each organisation (Kincaid & Rogers, 1981).

The options in the questionnaire included sufficient alternatives to describe respondents' opinions. The aim was to avoid their choosing an alternative that did not appropriately answer the question. Closed-ended questions allow more control over a respondent's range of responses and are easier to summarise and analyse (Dane, 1990).

The questions ascertained from the respondents how much verbal contact they have with each member of the organisation each week concerning production, innovation and social activity. Network analysis cannot take place without respondents 'naming contacts, because ascertaining any emergent network relies upon knowing the links within any network (Rogers & Kincaid, 1981). To this end, the participants' names and the names of their contacts are not deemed to be important. However, what is of importance is whether or not a link is present or absent, as this confirms or denies the existence of central communication positions within these networks.

The reliability of a measure pertains to the degree to which an instrument measures the same variable consistently over time (Bordens & Abbott, 1996). In terms of the reliability of the sociometric questions, Kincaid and Rogers (1981) contend that asking a single sociometric question is equivalent to measuring an attitude with a single-item scale. This results in a measure of unknown reliability. However, as several questions were asked of each respondent, and the responses were combined, the reliability of the measure was increased.

The second section of the questionnaire was entitled "Background Information", and its function was to gather necessary data concerning the sample's demographic details. Age, gender, tenure, position within the organisation, education and work history were among the information categories used, none of which presented obvious measurement problems.

Once again, the questions were closed-ended, with the respondents being offered five relevant options as a response. Tenure and the length of time each respondent had held their present position within the organisation were gauged by their selection of a category spanning five year slots. The nature of respondents' work was assessed by eliciting whether or not they had a non-supervisory role, a supervisory role, or a managerial role. In this case 'other' was another category which offered the respondent the opportunity to describe their current position if it was not covered by the closed-ended options.

Education level was identified by listing the qualifications known to exist in the New Zealand education system. Once again, each respondent was required to select a category which related to their academic achievement by circling their highest attainment. Work history was ascertained in the same way, by offering a selection ranging from "no other organisations" to "more than three other organisations". As with the previous section, and all self-reports, the judgement of the individual was relied upon. (The demographic characteristics of the sample are included in Appendix C accompanied by a breakdown of the information with respect to educational attainment).

Reliability problems were considered to be minor for the 'Background Information' section as the concepts involved are relatively concrete. Questions on each respondent's age, gender, tenure, position within the organisation, education, and work experience can be deemed to be stable in that the concepts should be able to be measured accurately, no matter when they are measured.

3.2.2 Preliminary Data Collection

Belson (1986) suggests the use of a pilot study as one technique for assessing the validity of the data collection procedure. In order to determine the face validity in this research, and to ensure there were no problems for the respondents in answering the questions, a pilot study was conducted. The research procedure was carried out with Organisation One and Organisation Two prior to conducting the full-scale research. Based on the success of the pilot study, it was decided to include the data from the pilot study with the data that were collected when the full-scale research took place.

3.2.3 Data Collection

The questionnaire was administered onsite. 148 respondents completed questionnaires, which equates approximately to an 80% response rate. Response rates varied, with five organisations giving a 100% rate, and the other five giving a rate ranging between 55% and 80%, the average being 70%.

It is estimated that saturation sampling was nearly achieved as 80% of all respondents answered the questionnaire. In practice, it is rare to obtain a 100% response rate (Hartman & Hedblom, 1979). Saturation sampling is historically the basis for network analysis as the overall aim for this type of research is one hundred percent participation. This is important because the unit of analysis is the entire organisation, and, if only 30% of the population is asked to respond, then the unit is not being fully examined. Any sampling design that did not represent the entire set of information exchange relationships within departments would have distorted or misrepresented the research.

3.3 Structural Measures

As stated, the literature that this exploratory research is based on postulates that high socio-economic status individuals who are situated within the emergent communication networks of knowledge organisations are more likely to be exposed to certain types of information, making them “richer”, in terms of information, than individuals of lower socio-economic status. Despite the fact that both low and high socio-economic status individuals gain information, individuals of higher socio-economic status may gain more information (Donoghue et al., 1970), thereby creating a knowledge gap. It can, therefore, be hypothesised that information rich individuals, in general, occupy central positions in the communication network associating with other individuals who also have high socio-economic status. Consequently, it is expected that individuals who have the most access to information via links with other individuals, or sources of information, will possess network centrality.

In line with this theory, regular patterns of oral communication within each organisation concerning production, innovation and social activities were measured using Freeman’s (1979) “degree”, “closeness”, and “betweenness” centrality concepts. These measures yield actor indices which attempt to quantify the prominence of each individual actor embedded within the three networks. This is important because when actors are extensively involved in relationships with other actors their involvement makes them more visible to the others (Knoke & Burt, 1983). Degree, closeness and betweenness measures are not concerned with whether an actor’s centrality is due to being the recipient or the source of information; what is important is that the actor is simply

involved in the oral communication network. Therefore, only those actors circled or chose another actor were included in the measurement.

The links between the actors are undirected; that is, the respondents were not asked to specify the flow of communication. Actors either talk with each other, or they do not. Reciprocity of a link, which refers to the degree to which two people who are presumed to be linked report the same relationship, was not taken into account when defining the emergent network (Wasserman & Faust, 1994).

The structural measure of degree centrality focuses directly on the number of other actors with whom an individual is directly connected and the individual is deemed to be “in the thick of things” (Freeman, 1979, p. 219). To this end, degree centrality is measured by a count of all the other actors who are adjacent to the actor under measurement divided by $n-1$, where n equals the number of persons in the organisation completing the questionnaire. How many actors an actor is in direct contact with can then be determined.

This measure, therefore, focuses on the most visible actors in the network. It is hypothesised that an actor with a high centrality score is recognised by other actors as a major channel of information. Therefore, by occupying a central location, these actors are crucial to the information network. Correspondingly, actors with low degrees are clearly peripheral to the network as they are not active in the communication process at all.

“The closeness measure of centrality accounts for both direct and indirect communication links and conceptually represents ease of access to other actors” (Burkhardt & Brass, 1990, p.113). This measure focuses on how close an actor is to all the other actors in the set of actors. According to Freeman (1979), closeness can be conceptualised as “independence”, the extent to which an actor can avoid the control of others and have independent access to resources, or “efficiency”, the extent to which an actor can reach all other actors in the shortest number of steps.

Therefore, “closeness” is equated with minimum distance. As an actor gets further apart in distance from other actors their centrality decreases. To this end, closeness centrality is measured by adding the minimum number of links between the most central actor and all other actors in the organisation (Freeman, 1979). This sum was then divided by $n-1$ where n , once again, equals the number of persons in the organisation who completed the questionnaire. Actors occupying central locations with respect to closeness can be very productive in communicating information to the other actors.

By contrast, “betweenness” means the extent to which an individual is a central point for the control of the flow of communication between two actors who are not connected to each other (Burkhardt & Brass, 1990). Betweenness reflects potential control, or the extent to which a focal person mediates the relationship between any two other individuals. Actors can be viewed as structurally central in the extent that they stand between other actors and can therefore facilitate, impede or bias the transmission of messages (Freeman, 1977).

Betweenness centrality is measured by ascertaining the sum of the “probability of an actor falling on the shortest indirect path between any two pairs of actors over all unordered pairs of actors” (Brass and Burkhardt, 1993, p.455). This value is then divided by $(n^2 - 3n + 2)/2$, the maximum value when n equals the number of persons in the organisation’s network (Brass, 1984). At this point, the measure reflects the relative extent to which an actor falls on the shortest path, or mediates the relationship, between two other actors. If a point falls on some but not all of the paths connecting a pair of points, its potential for control is more limited (Freeman, 1977). Therefore, actors who have a high betweenness score potentially have more interpersonal influence over the actors whom he/she is between.

Construct validity of these measures is determined by whether or not degree, closeness and betweenness capture what is meant by centrality. Inter-organisational (Boje & Whetten, 1981; Knoke, 1983) and intra-organisational (Fombrun, 1983; Tushman & Romanelli, 1983; Brass, 1984; Burkhardt & Brass, 1990; Brass & Burkhardt, 1993) research over recent years has illustrated that it is possible to simply focus on the actors who are chosen the most to find the most important actor. Centrality, therefore, refers to the prominence or visibility of an actor and contrasts anonymity and isolation with extensive involvement in relations within a network.

Therefore, operationalisation of the stated centrality measures is based on the knowledge of who is interacting with whom, which is derived from the respondent’s self-reported questionnaire responses. Knowing these elements of the pattern of oral

communication means that the structure of the production, innovation and social activity networks can be discerned.

3.4 Data Analysis

Several theorists have outlined a method for analysing structural measures of organisational behaviour by assessing an individual's network centrality (Fombrun, 1982; Brass, 1984; Burkhardt & Brass, 1990; Brass & Burkhardt, 1993). As stated previously, Pettigrew (1995) and Vredenburg and Brendery (1998) regard this method as being a sound, analytical way of researching informal networks in order to define the underlying structure of an organisation. Analysis of the data generated from this research was based upon this technique, that is, a structural analysis of the informal relationships within an organisation as reported by staff members. The analysis is of the total organisation in the first instance, with the most and least central actors being identified as a result of the sociometric analysis.

It is generally acknowledged that an organisational chart bears little relationship to the actual working structure of the organisation (Monge and Eisenberg, 1987). Ibarra (1993) contends that the formal organisational chart delineates lines of authority only and presents a greatly simplified version of the working relationships within the organisation. Nevertheless, the formal chart is able to provide a useful starting point for analysis of the organisation's communication network.

Question five in the 'Background Information' section of the sociometric questionnaire asked the respondents to indicate their position within the organisation. As noted previously, this

question had the option of being open-ended. Therefore, if none of the positions listed was applicable to the respondent, they could make a note of their perception of their position. Once assessed, the respondent's position was then used as an indication of their level in the hierarchy. An organisational chart was prepared for each organisation based on the information provided which are attached as Appendix D. Using the formal organisational hierarchy as a guideline, each respondent was randomly assigned a unique number by which they could be identified. This was thought to be easier to work with than numerous matrices of proper names, and the process improved confidentiality.

Once the responses from the questionnaire were coded, each actor's code and information were entered as a binary matrix into UCINET 5 (Borgatti, Everett & Freeman, 1999). An example of these matrices based on Organisation One is attached as Appendix E. A binary matrix was used as the data obtained from the questionnaire responses lent itself to binary as opposed to value measures. This is because binary measures indicate the presence or absence of a communication link between two actors, whereas value links measure the intensity or importance of each link (Borgatti, Everett & Freeman, 1999).

Therefore, analysis of the production, innovation and social networks for this research was based on symmetrical relationships, that is, knowing who talks with whom. This implies that both actors share the same kind of relationship as opposed to a relationship which is illustrated by superior-subordinate relations, whereby one person gives information and the other receives it (Monge & Eisenberg, 1987).

As operation of the UCINET 5 (Borgatti, et al., 1999) centrality sub-programme required binary data, each matrix had to be recoded so as to dichotomise the responses so that all values were either “0” or “1” as opposed to being between “1” and “5”. “Never” and “rarely” responses became standardised as “0” and indicative of the absence of a link. “Sometimes”, “often” and “very often” became standardised as “1” and indicative of the presence of a link. This determined centrality measures for each network UCINET 5 (Borgatti et al., 1999), made coping with the information load, and standardised the responses from each organisation.

Once the recoded data for each organisation were obtained, it was possible to produce datasets of Freeman’s (1979) degree, closeness and betweenness centrality measures with respect to the three networks. Once calculated by the software, a table for each organisation containing a list of the centrality measures and the normalised centrality percentages for each actor was available. Descriptive statistics which gave the mean, standard deviation, variance, minimum value, maximum value and a network centralisation index for each measure of centrality were also outlined. Appendix F contains an example of the recoded binary matrices and the descriptive statistics relating to each centrality measure for the three networks.

However, upon analysis of the means for the three networks pertaining to each organisation, it became apparent that the data from two female respondents was widely discrepant from other values for the same variable for all of the other respondents. This led to misleading mean values for the centrality measures for each network, especially the innovation network.

It was decided that the two outliers, one from Organisation Nine and one from Organisation Ten, be deleted from the sample. Another respondent in organisation Six did not supply any demographic details. Since the most crucial demographic, socio-economic status, as measured by education, was not available a decision was made to also delete this male respondent from the sample. As a result, the complete sample comprised 145 actors.

After all the centrality measures for the complete sample were determined for each organisation, the means for each network were then totalled and are reported in Table 2 in the results section. Data pertaining to the centrality of each actor within the production, innovation, and social activity networks, was then loaded onto an Excel spreadsheet (Microsoft Corporation, 1995). The educational qualifications of each actor were then added in order to see whether the actors with the highest educational attainment were most central in the networks. An example of one of these spreadsheets based on Organisation One is attached as Appendix G.

Once completed, another Excel spreadsheet (Microsoft Corporation, 1995) was compiled setting out each actor's network positions for the complete sample, plus all of the demographic characteristics pertaining to each individual network. An example based on Organisation One is attached as Appendix H. The demographic data included the individual characteristics which were collected by means of the sociometric survey, i.e., gender, age, length of time with the organisation, length of time in current job, position, education and job history. Education was regarded as significant if the most central actors were the most qualified in the

organisation. Every other demographic measure was taken on face value. This was done in order to determine the true significance of education to network centrality and to assess whether or not any other demographic characteristic proved to be significant.

The next stage of analysis involved isolating the actors at either extreme of centrality. The actors occupying the most central, second most central, least central, and second least central positions in each network, and their demographic characteristics, were then loaded onto an additional Excel spreadsheet (Microsoft Corporation, 1995). An example based on Organisation One is attached as Appendix I. The centrality of these actors within the networks was then put under closer scrutiny while taking into account their demographic details.

A breakdown of all of the demographic characteristics of the most central, second most central, least central, and second least central actors was also undertaken in order to ascertain the significance of education and any similarities or differences between the two groups for the three networks. Once again, education was regarded as significant if the most central actors were the most qualified in the organisation. The other demographic measures were taken on face value. This enabled analysis of whether or not education was a factor contributing to centrality or a lack of centrality.

Due to restrictions imposed by the layout of the data obtained from UCINET 5 (Borgatti et al., 1999) it was not possible to statistically test the significance of the results. The data that was obtained from UCINET 5 (Borgatti et al., 1999) and loaded onto Excel

(Microsoft Corporation, 1995) spreadsheets enabled qualitative analysis of whether or not education was related to an actors' centrality. Therefore, any reference to significance is not based on a statistical foundation; instead, it relates to being a noteworthy finding that is still worth consideration. The findings are important if education is seen to strongly affect network centrality. Consequently, the social significance of the research, provided by an in-depth analysis of the relational data, outweighs the statistical significance.

In summary, having determined the formally defined structure of the organisations representing the task-related context in which the actors operate, the researcher analysed the data in terms of three contexts. Firstly, the complete informal or emergent network was defined from an analysis of the communication relationships in the production, innovation, and social activity networks. Secondly, the centrality of each actor in the networks was assessed in order to determine the actors that were involved in the most communication linkages. Thirdly, the educational qualifications of the most central and the least central actors was taken into account in order to assess whether or not and socio-economic status was related to network centrality.

4. RESULTS

The responses to the sociometric questionnaire completed by the 145 knowledge workers were used to determine whether education was a significant feature of network centrality. Once the responses were coded and the network matrices compiled, UCINET 5 (Borgatti et al., 1999) was used in order to ascertain the centrality of each actor with respect to their visibility in the production, innovation and social activity networks. The subsequent emergent networks for each organisation were set out in Excel spreadsheets (Microsoft Corporation, 1995) based on the centrality score of each actor. The demographic characteristics of each actor were then added, including their highest educational attainment. This assisted with determination of whether or not the centrality of the actors from the ten organisations was correlated with their educational achievement. As education is a measure of socio-economic status, analysis will reveal whether a knowledge gap exists in the knowledge organisations sampled based on the actors' socio-economic status. (A summary of the results organisation by organisation is included as Appendix J).

To explore the existence of knowledge gaps in the knowledge organisations, the mean centrality scores of the actors in each network, was calculated. These descriptive statistic values reflect the average of the set of centrality scores for each organisational network as calculated by UCINET 5 (Borgatti et al., 1999). The mean values for each organisation were collated to obtain a network measure.

Table 2 Mean scores for the centrality measures for each network

	Production Network	Innovation Network	Social Activity Network
Degree Centrality	9.61	6.20	8.38
Closeness Centrality	17.59	22.86	19.76
Betweenness Centrality	7.24	9.24	9.06

Mean scores range between 0.00 and 100

Table 2 reports the mean values of the structural measures for each network. As discussed in the methodology section, degree centrality relates directly to network activity where a high value indicates many channels of communication. Closeness centrality reflect how close actors are to all other actors in the network and represents ease of access to others. The betweenness centrality measure reflects potential control, or the extent to which specific actors mediate the communication relationship between other actors.

The mean values indicate the dispersion or spread of each actor's values for the centrality measures across all of the networks. The larger the mean for each centrality measure, the more likely it would be that individual actors, or groups of actors, are highly central, while other actors would be considerably less central. The fact that the means are all relatively low suggests a certain amount of homogeneity between the actors in the networks. However, this

does not mean that the same message exchange patterns exist among organisational members in each network; instead, it indicates relatively stable communication patterns.

The mean values for degree centrality indicate that there is limited network activity in each of the networks, especially the innovation network. Bearing in mind that the closeness measure is inversely related to the distance between actors, the closeness means would suggest that there is potentially a limited number of links between the actors in each of the networks. Actors are central if they can quickly interact with all other actors. Therefore, the more limited the communication linkages, the less access some actors have to information. This makes it difficult for information to flow through the networks as communication depends to a certain extent on intermediaries. The betweenness centrality means imply that interaction between two actors depends to a certain extent on other actors in the organisation. This influences the flow of information which appears to be the most inhibited in the innovation network.

Overall, the results reported in Table 2 indicate that all three of the networks appear to be similarly centralised. The centralised communication structures may reflect the existence of interdependent information flows across the networks. However, when degree centrality is considered the amount of network activity taking place between the actors appears to be limited. The closeness means imply that there are also limited communication linkages which may result in some actors having less access to information. Means for betweenness centrality indicates that there

seems to be a certain amount of interpersonal influence between actors in each of the networks.

Table 3 Indicators of the centrality of actors in the production network

	Least Central Actors	Most Central Actors
Degree	Position	Length of time in current job
Closeness	Length of time with organisation	Length of time with organisation
Betweenness	Age	Length of time with organisation Length of time in current job Position

Table 3 provides a summary of the most common characteristics of the actors who are in the position of being the most central, second most central, least central or second least central in their production networks. This data was taken from the responses to the “background information” section of the sociometric questionnaire and set out in an Excel spreadsheet (Microsoft Corporation, 1995). As stated, the centrality results and the demographic characteristics of the actors were arranged on the spreadsheet in order to determine whether education was related to centrality. Personal judgement was used to determine the most significant and noteworthy feature that related to the most central and least central actors.

Table 4 shows that the most central actors’ centrality was related to the length of time they had been with their respective organisations and the length of time they had been in their current

job. By contrast, the least central actors in the production network appear to lack centrality due to the length of time they had been with their respective organisation, age, and the position they occupy in the hierarchy.

In terms of the structural measures outlined in Table 3, there seems to be a distinct variation between the characteristics of the most central and the least central actors for the degree and betweenness centrality measures. This indicates that network activity and potential control over information are related to the length of time actors have been in their current jobs. Control over the flow of information in the production network appears to be related to tenure, the length of time actors have been in their current jobs, and position. The closeness measure was the only measure that exhibited any similarity between the most central and least central actors, which is related to the length of time they had been with their respective organisations. This implies that the educational attainment of the actors does not appear to be related to network activity, access to other actors, or the control of information in the production network.

Table 4 Indicators of the centrality of actors in the innovation network

	Least Central Actors	Most Central Actors
Degree	Length of time in current job	Length of time in current job Position
Closeness	Length of time with organisation Length of time in current job	Length of time with organisation Length of time in current job
Betweenness	Length of time in current job	Position

As far as the innovation network is concerned, Table 4 shows that tenure, the length of time actors had been in their current job, and their position within the organisational hierarchy are all factors that relate to occupying positions of centrality. For the least central and the second least central actors in the innovation networks, the actors' length of time in their current jobs as well as the length of time they have been with their respective organisations are both determining factors. This finding implies that length of time spent with an organisation, as opposed to education, is the key factor determining an actor's visibility in the innovation network.

The degree centrality measure indicated that network activity is related to the length of time actors had spent in their current jobs. Results concerning closeness centrality show that the most central and the least central actors exhibited the same attributes concerning closeness. Independent access to other actors was based on the length of time actors have been with their respective organisations and in their current jobs. The attributes of the most central actors when betweenness centrality, which implies potential control of information, is taken into account, relate to their position in the hierarchy. The least central actors for betweenness are in that position due to the length of time they have been in their current job. Therefore, the education demographic did not feature as significant in terms of the centrality of the actors' network activity, access to other actors and the potential control of information in the innovation network.

Table 5 Indicators of the centrality of actors in the social activity network

	Least Central Actors	Most Central Actors
Degree	Length of time in current job	Length of time with organisation
Closeness	Length of time in current job	Age
Betweenness	Length of time in current job	Gender

Table 5 provides a summary of the most common characteristics of the most central and least central actors in the social activity network. The results indicate that centrality was related to the length of time the actors have been with the organisation, age, and gender. A lack of centrality appears to be related to the length of time actors have been in their current job. Once again, the education demographic did not appear to be the key determining factor in the centrality of actors in the social activity network.

When the structural measures relating to social activity are taken into account, network activity appears to be related to the length of time actors have been with the organisation. Independent access to other actors, as exhibited by the closeness measure, appears to be determined by the age of the actors. Potential control over information within the network is related to the gender of the actors. Overall, the differences between the most central and least central actors in the social activity network do not appear to be based on a common demographic. Educational attainment does not feature as a key factor in the centrality of actors in the social activity network.

From the results reported in Tables 3, 4, and 5, it can be inferred that the predicted relationship between the centrality of the actors in the sample and their educational attainment has not been supported. Instead, it has been shown that centrality is related to other demographic characteristics associated with the actors in each of the networks, that is, gender, length of time with the organisation, length of time in current job, and position.

Network activity and the potential control over information in the production and innovation networks is related to the length of time actors have been in their current jobs. For the social activity network activity, potential control of information is related to the length of time actors have been with their respective organisations and their position in the hierarchy. Access to other actors in the networks as appears to be related to tenure and the length of time actors' have been in their current jobs for the production and innovation networks and the age of the actor for the social activity network.

As stated, the demographic characteristics outlined in Tables 4, 5, and 6 were taken from the data gathered from the "Background Information" section of the sociometric questionnaire. The demographic questions allowed for several options within each of the categories of gender, age, length of time with the organisation, length of time in current job, position, education, and work history (Appendix B).

How long an actor has worked with an organisation is broken down into five categories, ranging from less than one year to more than 15 years. The length of time an actor has been in their current job demographic takes into account that an actor may

have started their work history with the organisation in a different position. This demographic is broken down into the same categories as length of time with the organisation, and ranges from up to one year to over 15 years. Position relates specifically to the actor's role in the formal hierarchy. Categories for this demographic encompass non-supervisory staff, supervisors, and managers positions. Educational level is broken down into categories based on the New Zealand education system, ranging from School Certificate to post-graduate work. Lastly, work history refers to the number of other organisations in which the actors have previously been employed, with categories ranging from no other organisations to more than three others.

Table 6 **Characteristics of the most central and the least central actors in the production network**

Most Central	Gender	No result
	Age	No result
	Length of time with organisation	1-5 years
	Length of time in current job	1-5 years
	Position	No result
	Education	No result
	Work history	No result
Least Central	Gender	No result
	Age	Under 31
	Length of time with organisation	1-5 years
	Length of time in current job	No result
	Position	Non-supervisory staff
	Education	No result
	Work History	No result

Table 6 illustrates the specific demographic features that relate to each of the characteristics associated with the actors that were measured as being the most central, second most central, least central and second least central in the production network. The demographic features that showed no relation to centrality are noted as registering “no result”. This means that they do not appear to be significantly related to an actor’s visibility or lack of visibility in the network.

The results in Table 6 suggest that the most central actors in the production network have been with the organisation for between one and five years and in their current job between one and five years. Gender, age, position, education, and work history did not feature as related to actors’ centrality. The least central actors in the production network appear to be non-supervisory staff who are aged under 31 years and who have been with their respective organisations for between one and five years. Gender, length of time in current job, education, and work history bear no relationship to centrality and registered “no result”. Several factors differentiate between the most central and the least central actors, especially age, length of time in current job, and position. This table indicates that the educational attainment of the actors is not a key factor in terms of being central in the production network. Instead, actors who have been with their respective organisations for between one and five years were positively correlated with visibility in the production network.

Table 7 Characteristics of the most central and the least central actors in the innovation network

Most Central	Gender	No result
	Age	No result
	Length of time with organisation	1-5 years
	Length of time in current job	Up to 1 year 1-5 years
	Position	Managerial
	Education	No result
	Work history	No result
Least Central	Gender	No result
	Age	No result
	Length of time with organisation	1-5 years 6-10 years
	Length of time in current job	Up to 1 year 1-5 years
	Position	No result
	Education	No result
	Work history	No result

Table 7 reports that, in terms of the innovation network, actors who have been with the organisation for between one and five years, in their current job for up to five years, and who hold managerial positions are perceived to be the most central. Gender, age, education, and work history showed no relation to centrality and are noted as registering “no result”. Table 7 also illustrates that the least central actors in the innovation network have been with the organisation for between one and ten years and in their current job for up to five years. Gender, age, position, education,

and work history do not appear to be related to a lack of centrality in this network. These results show that two factors distinguish the most central actors from the least central actors in the innovation network. The most central actors tend to occupy managerial positions and the least central actors have been with their respective organisations for between six and ten years. Position, as opposed to educational attainment, is positively correlated with visibility in the innovation network.

Table 8 Characteristics of the most central and the least central actors in the social activity network

Most Central	Gender	Female
	Age	Under 31
	Length of time with organisation	1-5 years
	Length of time in current job	No result
	Position	No result
	Education	No result
	Work history	No result
Least Central	Gender	No result
	Age	Under 31
	Length of time with organisation	No result
	Length of time in current job	1-5 years
	Position	No result
	Education	No result
	Work history	No result

The features relating to the most central actors and least central actors in the social activity network are illustrated in Table 8. The most central actors are generally females, aged under 31 years, who have been employed by their respective organisations between one and five years. Length of time in current job, position, education, and work history do not appear to be related to centrality and are noted as having “no result”. The least central actors in the social activity network are actors aged under 31 years who have been in their current jobs for between one and five years. Gender, length of time with the organisation, position, education, and work history do not appear to be associated with an actor’s lack of centrality. Actors’ educational attainment does not appear to have a bearing on their activity in the network, access to other actors, or potential control over information in the social activity network.

Overall, the results set out in Tables 6, 7, and 8 reveal that educational attainment is not related to centrality or a lack of centrality in either of the emergent networks of the knowledge organisations. This implies that network centrality is not related to the socio-economic status of the actors. Instead, centrality is related to the actors’ length of time in their current job in the production network; position in the innovation network; and length of time in the organisation and gender in the social activity network.

Table 9 Characteristics of the most central and the least central actors according to the degree measure of centrality

Most Central	Gender	No result
	Age	No result
	Length of time with organisation	1-5 years
	Length of time in current job	1-5 years
	Position	No result
	Education	No result
	Work history	No result
Least Central	Gender	No result
	Age	No result
	Length of time with organisation	No result
	Length of time in current job	Up to 1 year
	Position	Non-supervisory staff
	Education	No result
	Work history	No result

Table 9 offers a more specific description of the most central, second most central, least central and second least central actors in terms of network centrality. Once again, the demographic features that showed no relationship to centrality are noted as registering “no result”. The most central actors in terms of degree centrality, which is an indication of network activity, are actors who have been with the organisation and in their current jobs for between one and five years. Gender, age, position, education, and

work history showed no relationship to centrality. The least central and the second least central actors appear to be non-supervisory staff who have been in their current jobs for up to one year. Gender, age, length of time with the organisation, education and work history do not appear to be associated with centrality. This implies that network activity is based around the actors who have been with their respective organisations for between one and five years, as opposed to education.

Table 10 Characteristics of the most central and the least central actors according to the closeness measure of centrality

Most Central	Gender	No result
	Age	Under 31
	Length of time with organisation	1-5 years
	Length of time in current job	Up to 1 year
	Position	Managerial
	Education	No result
	Work history	No result
Least Central	Gender	No result
	Age	Under 31
	Length of time with organisation	1-5 years 6-10 years
	Length of time in current job	Up to 1 year 1-5 years
	Position	No result
	Education	No result
	Work history	No result

In terms of closeness, which indicates independent access of the actors to other actors, the most central and second most

central actors appear to be managers aged under 31, who have been with their respective organisations for between one and five years and in their current job for up to one year. The least central actors are non-supervisory staff aged under 31 years, who have been with the organisation for between one and five years and in their current job for up to five years. For both groups, gender, education, and work history appear to have no association with access to other actors in the network and registered “no result”. This implies that position and time in current job, as opposed to educational attainment, are positively correlated with access to other actors in the networks.

Table 11 Characteristics of the most central and the least central actors according to the betweenness measure of centrality

Most Central	Gender	Female
	Age	No result
	Length of time with organisation	No result
	length of time in current job	1-5 years
	Position	Managerial/Supervisory Non-supervisory staff
	Education	No result
	Work history	No result
Least Central	Gender	No result
	Age	Under 31
	Length of time with organisation	1-5 years
	length of time in current job	Up to 1 year
	Position	Non-supervisory staff
	Education	No result
	Work history	No result

The most central actors with respect to betweenness centrality, which indicates the extent to which actors have control over information, appear to be female, non-supervisory staff, supervisors, or managers who have been with the organisation and in their current job for between one and five years. Betweenness centrality measures revealed the least central actors as being non-supervisory staff, aged under 31 years, who have been with the organisation for between one and five years and in their current job for up to one year. The results reveal that age, education, and work history were not associated with being at either extreme of centrality with respect to the potential control over information resources.

The structural measures in Table 9, Table 10 and Table 11 indicate that centrality was not related to the educational attainment of the knowledge workers sampled. Instead, the most active actors in the network were found to be those who had been with their respective organisations and in their current jobs for between 1 and 5 years. Closeness and independent access to other actors were most common characteristics of managers within the sample. Female managers and supervisors who had been in their current jobs for between one and five years tended to have potential control over the flow of information in the networks. This implies that managers who have been in their current jobs for between 1 and 5 years tend to be the most active in the networks, and have access to and potential control over resources such as information.

The demographic characteristics of the whole sample reported in Appendix C revealed that a predominant amount of the sample (50%) have been with their respective organisations for between

one and five years. The results also revealed that 55% of the sample have been in their current jobs for between one and five years. Lastly, in terms of age 56% are aged between 17 and 30 years and 50% of the sample are aged between 20 and 30 years. However, 41% of the sample stated that they have attained a tertiary qualification which includes post-graduate study. Therefore, the fact that education was not associated with centrality or a lack of centrality was not due to the sample being biased in favour of a lack of educational attainment.

Overall, the findings indicate that the production, innovation and social activity networks are similarly centralised, which illustrates a certain level of homogeneity and stable communication patterns. However, the structural measures indicate that there are a limited number of paths linking the actors in the networks together, which is especially the case for the innovation network. This highlights that the information flow through the network is likely to be inhibited, which could potentially create a knowledge gap.

The educational attainment of the actors sampled does not appear to be directly related to an actor's network activity, access to other actors, or their control over information resources. Instead, tenure, length of time in current job, and position in the network appear to be the demographic features that are most commonly related to centrality in the three networks. When the knowledge gap hypothesis is taken into consideration, these results indicate that acquisition of, and access to, information are not related to socio-economic status. The implications of these findings with respect to organisational communication will now be addressed in the discussion.

5. Discussion

As previously stated, the purpose of this study is to explore the existence of knowledge gaps in knowledge organisations in New Zealand. The knowledge gap hypothesis maintains that socio-economic status, as measured by educational attainment, is directly related to access to and acquisition of information. Exploration of the existence of knowledge gaps has involved determination of the highest educational attainment of the most central and least central actors in the production, innovation, and social activity networks. If the most central actors are most highly qualified and the least central actors the least qualified, this would indicate that a knowledge gap may exist. Those actors with higher education and higher socio-economic status would be in advantageous positions within the network structures.

5.1 Communication patterns

As seen in Table 2, the production, innovation, and social activity networks appear to have stable communication patterns, which may indicate a certain amount of homogeneity between the actors in each of the networks. Despite a slight discrepancy in the means, the results imply that all three networks could be equally homogeneous. Lincoln and Miller (1979) claim that homogeneity in the workplace is thought to make communication easier, while fostering relationships of trust, which results in the enhancement of important relationships. Brass (1984) contends that, as actors interact, they become more similar, which in turn facilitates further interaction. Accordingly, similarity generates attraction, attraction generates interaction and interaction, generates further similarity and more homogeneous relationships. However, it must

be considered that resultant homogeneity could be related to the size of the knowledge organisations sampled. In other words, small organisations rely less on formal mechanisms of control and instead emphasise personal face-to-face processes which enhance homogeneity (Lincoln, 1982).

5.2 Access to and control over information resources

In terms of the structural measures of centrality, the results in Table 2 suggest that the amount of network activity between the actors appears to be limited, especially in the innovation network. Network activity is related to degree centrality and actors being “where the action is”. This indicates that actors tend to be reasonably independent in terms of solving organisational problems and achieving organisational goals. Few actors seem to be recognised as major channels of information in the network. This may imply that the limited interpersonal contact amongst the most central actors could provide rewards associated with knowledge gain. Therefore, actors who are at the centre of communication activity would tend to be in advantageous positions in terms of access to important information.

Table 2 also indicates the highest mean scores for closeness centrality. Closeness centrality is associated with ease of access to other actors; therefore, the findings suggest that there are limited communication paths linking the actors, especially in the innovation network. This result appears to indicate that the efficiency with which information flows through the network may be impeded. Limited access to information could result in important information flowing through intermediaries, which can lead to problems concerning information gain and distortion.

“Missing links in communication networks will more than likely cause information flows within networks to detour around vacant links, adding linkages to networks and increasing information loss or distortion in transmission” (Bluedorn, 1982 cited in Bacharach, 1982, p. 725).

Table 10 suggests that closeness centrality and an actor’s position are positively correlated, that is, actors who occupy managerial positions seem to be the most central which is significant as only 13% of the sample occupied managerial positions. Therefore, the structural position of each actor is proving to be an important source of power in that it provides access to other actors, information, and other resources. If access to information concerning innovation is not available on a global scale, throughout an organisation, then those who are already information rich may reap the benefits, while the information poor get relatively poorer.

O’Reilly (1978) suggests that hierarchy may act to encourage distortion of information among organisational members by decreasing trust between the senders and receivers. Numerous communication studies have shown that the level of trust between sender and receiver affects both the amount and type of information transmitted (Gains, 1980; Jablin, 1982). This can have an unfortunate effect and result in some actors having limited access to innovation information, thus, widening any existing knowledge gaps (Severin and Tankard, 1997).

Out of the three networks, the innovation network also registered the highest mean for betweenness centrality. As previously stated,

betweenness centrality pertains to control of information in the networks. Therefore, result illustrates that interaction between two actors depends on other actors in the innovation network. Consequently, there is potential for the most central actors to control the flow of information through the network. Freeman (1979) states that actors who stand between other actors can facilitate, impede, or bias the transmission of information. To this end, the results in Table 7 and Table 11 reveal that the actors in these pivotal roles tend to be managers who have been in their current jobs for between one and five years.

The actors who are able to control resources, and thereby increase others' dependency on them, could be said to be information rich. However, in addition to increasing other actors' dependence on them, these actors also decrease their dependence on others and have access to knowledge that is not mediated or controlled by other actors. Therefore, the resources upon which the organisation depends for achieving its goals do not appear to be communicated through the innovation network (Hannan & Freeman, 1977; Ulrich & Barney, 1984). Naturally, the availability and accessibility of these resources can have considerable influence on an organisation's effectiveness.

Actors are dependent on their environment for information resources that are required for organisational survival (Euske & Roberts, 1987). Thus, the organisational environment can be viewed as a complex pool of vital resources. To this end, a manager's job is to improve or maintain his or her organisation's resource exchange. Pfeffer and Salancik (1978) argue that the environment influences the organisation through its impact on the

distribution of power inside the organisation. This power distribution in turn influences who succeeds to managerial positions and, therefore, who influences the character of the organisation's decision making. The content of these decisions, in turn, affects the actions and the structure of the organisation. Thus, in contrast to the traditional emphasis on formal control and consensus of goals, information control and social control by management are integrally related. In other words, while the environment sets the stage for the distribution of information in organisations, it is through the interplay of various coalitions and interest groups within the organisation that the information is actually disseminated.

Blau (1982) reported positive correlations between closeness and betweenness measures and ratings of power. Thus, having access to and control over information increases an actor's power. Therefore, the closeness and betweenness centrality measures reflect involvement in communication and, therefore, index actors' access to and control over information. Actors who occupy central positions in a communication network may well have access to, and potential control over, relevant resources such as information.

5.3 Knowledge gaps

It can be inferred from these results that there is a gap between the most central and the least central actors in the innovation network in terms of access to and control over information. However, any gaps in knowledge that may exist are not related to the socio-economic status of the actors. Tichenor et al. (1970) maintain that more sophisticated communication abilities, an existing pool of knowledge, interpersonal contact, and information

seeking are socio-economic factors that are linked to knowledge. These qualities may well be exhibited by the most central actors in this study, but they do not appear to be related to educational attainment. This may imply that socio-economic status and education are not the only variables that could be related to a gap in knowledge.

Differentiating factors do exist between the most central and the least central actors in each network. Table 3 and Table 6 indicate three differentiating factors between the most central and least central actors in the production network. The most central actors have been employed by their respective organisation and in their current jobs for between one and five years. The least central actors are generally non-supervisory staff who are aged under 31 years.

Communication in the production networks of knowledge organisations is generally conducted to ensure that members carry out the tasks that must be done in order to produce and distribute information. The fact that the least central actors are non-supervisory staff under the mean age may indicate that the flow of information is along the lines of authority as established in the organisational chart. Interdependence among actors, as illustrated by the stable communication patterns, may partially result from the division of labour. Because the organisational tasks are divided, actors performing different functions are dependent on communicating with each other. Information is a relevant resource to both the organisation and the actors.

The innovation process, from idea generation to adoption and implementation, must cross organisational boundaries. Therefore, innovation generally differs from more routine exchanges in that actors must cross vertical and horizontal boundaries to gain necessary information resources. Table 7 indicates that two features differentiated the most central actors from the least central actors. The most central actors tended to be in managerial positions, whereas the least central actors tended to have been employed by their respective organisation for between six and ten years which is significant as only 10% of the sample exhibited this characteristic. Therefore, the apparent existence of a difference between the most central and the least central actors in the innovation network of the knowledge organisations does not appear to be related to the actors' socio-economic status as measured by education.

Research carried out by Baldrige and Burnham (1975) and Knight (1967) revealed that formal authority plays a critical role in innovation networks as the higher their position in the formal hierarchy, the more likely actors are to be successful innovators. Zenger and Lawrence (1989) maintain that innovators are likely to have high seniority, which indicates knowledge of how to navigate an organisation's political waters. This implies that a gap in knowledge exists between managers and other staff in the knowledge organisations.

By contrast, the social activity network serves a purpose which is quite distinct from production or innovation communication. Based on the actors' attractiveness to and familiarity with each other, the social activity network provides them with social support

for events that may be encountered on and off the job. The results in Table 5 and Table 8 suggest that female actors who have been employed by their respective organisations for between one and five years were the most central. The least central in the social activity network had been in their current jobs for between one and five years and were aged under 31. Therefore, these different groups of actors must get some sense of satisfaction with and reward from interaction with each other (Huber & Daft, 1987).

The apparent differentiating factors between the most central actors and the least central actors could imply a gap in knowledge. However, due to the lack of research to date, it cannot be confirmed whether or not centrality is directly associated with the acquisition of information. In other words, the centrality of actors in a communication network may or may not be indicative of information acquisition. Likewise, it cannot be confirmed whether or not a lack of centrality is directly associated with limited acquisition of information.

Potentially uneven acquisition of information has practical implications for the pervasive power that the most central actors may have to direct the development and protection of organisational policies affecting large groups of people within the organisation. A group of the most central actors may form an alliance to accomplish limited political goals (Monge & Eisenberg, 1987). The emphasis of these alliances can be to control the rate and kind of innovation that may take place within the organisation. Being able to have control over the direction and nature of organisational outcomes, while controlling resources and keeping other members of the organisation at a disadvantage,

inevitably creates a gap between the information rich and the information poor. Therefore, more focus needs to be given to the dominant coalitions in organisations that are responsible for policy-making and for providing access to and control over information resources.

Since the differences between the most central and the least central actors are not related to educational attainment, the results of this research do not provide support for the knowledge gap hypothesis. When information is infused into organisational networks, it does not appear to be the actors with higher socio-economic status who acquire the information. Viswanath, Kahn, Finnegan and Hertog (1993) suggest that socio-economic status and education are not the only variables that could be related to the presence of a gap in knowledge. Research carried out by Viswanath et al. revealed that a combination of group membership, information functionality, motivation, and education enhanced knowledge. Evidence of differentiating features between the most central and least central actors in each of the networks shows some support for the contention made by Viswanath et al. (1993).

Several studies have found that the motivation of an actor is a stronger predictor of knowledge gained than education (Atkin et al., 1973; Ettma & Kline, 1977; Genova & Greenberg, 1981). These studies suggest that an actor's information interests may be a central factor in what knowledge is gained. Interest may have something to do with education or socio-economic status, but these studies do not directly assess that issue. Although it was concluded that education is likely to widen an individual's overall scope of interest, it cannot be assumed that there are common

information interests among similarly educated actors. This evidence suggests that interest in information content can yield more expectations about information gain than socio-economic factors such as education.

However, Weir (1995 cited in Severin & Tankard, 1997) contends that an actor's motivation is determined by his or her place in the organisational hierarchy and that only after information needs on one level are satisfied can the actors focus on securing information from higher levels. Weir's study found that knowledge gaps occur when information is directed at actors who find it unimportant because of their position in the hierarchy. Therefore, motivation to gain information can be seen to be based on perceived personal usefulness.

A study conducted by Perse and Perse (1994) found that individuals perceive different information as useful and derive rewards from different types of information. The study also found that perceived utility of information was significantly related to knowledge, so that perceived usefulness contributed to differences in the amount of knowledge gained. A perceived lack of usefulness of innovation information by long standing actors in the knowledge organisations can have implications for organisational development. Innovation can be defined as the essence of business behaviour; therefore, in order to keep one step ahead of competitors, it is necessary for an organisation to develop in a way that ensures maximum effectiveness.

Kimberly (1978 cited in Nystrom & Starbuck, 1981) maintains that diffusion of information about managerial innovation involves a combination of active search by potential adopters of innovation

and active dissemination by brokers of the innovation information. A strategy for the diffusion of innovation information needs to be designed that not only provides useful information, but also highlights the utility of the information presented (Perse & Perse, 1994). In other words, managers should begin any attempt to disseminate information with the needs of the potential user in mind. Armed with this awareness, a potentially widening knowledge gap could be significantly reduced or closed.

5.4 Conclusions

Overall, does a knowledge gap exist in the knowledge organisations? On the basis of the findings, the present study suggests that a difference exists between the most central and the least central actors in the knowledge organisations that were sampled. However, the difference does not appear to be related to the knowledge gap hypothesis in that socio-economic status, as measured by education, was not found to be a causal factor. In light of this, it may well be that socio-economic status is not the only variable that could be related to differences in knowledge.

Despite a certain amount of homogeneity in the networks, there appears to be a difference between actors concerning who may have information related to solving organisational problems and establishing better ways of achieving organisation goals. The closeness and betweenness structural measures indicated that access to and control over information resources in the organisations was the domain of actors who occupied managerial positions. Therefore, the innovation network, where actors must cross vertical boundaries to gain necessary information, appears to be formally prescribed. This can have major implications for

organisational development, whereby the resources for achieving organisational goals may not be being communicated through the network. A communication gap may well be purposeful in that management may wish to limit access to information and increase the potential power of any dominant coalition. After all, the characteristics of jobs, tasks and the organisation as a whole have a significant influence over the inherent patterns of communication.

However, overlooking the political reasoning behind access to and control over information, it may well be that a knowledge gap exists due to a lack of willingness by long standing employees to assimilate new information. Therefore, in a more general sense, any gaps in knowledge may widen as a result of a lack of motivation of the least central actors to solve organisation problems and accomplish goals. Nevertheless, it must also be considered that the manner in which information is being delivered may also be a contributory factor.

It is difficult to evaluate the efficacy of most kinds of managerial communication in a direct, quantitative sense. Be that as it may, knowledge concerning innovation may have to be disseminated to actors on a different basis. In other words, the messages may need to be modified to exhibit usefulness to the actors for purposes of assimilation. Actor enthusiasm may vary but once the audience has been identified through mapping the patterns of communication at the organisational level, the uninterested or neutral actors will have been identified. Therefore, an awareness and knowledge of an organisation's network structure may be able to elucidate ways in which motivation can be provided to the less

willing and less able actors. This will potentially result in closing any perceived gaps in knowledge, developing trust of management and allowing for equal access to and control over important organisational information.

5.5 Limitations

There were a number of limitations associated with the design of this research that may have contributed to the fact that the knowledge gap hypothesis was not supported. Firstly, the need for saturation sampling, that is, a response from all members of the knowledge organisations, involves high costs to both the researcher and to the organisation. The researcher has questionnaire printing costs and costs related to analysis, whereas, the organisation's main cost is that of the time involved for all staff to complete the questionnaires. Saturation sampling may be one of the reasons why no other network studies known to the researcher have been conducted with respect to the knowledge gap hypothesis.

Secondly, there is more than one method for analysing network data. Algorithms contained in UCINET 5 (Borgatti et al., 1999) software were used to analyse the network data for this study. UCINET 5 (Borgatti et al., 1999) is technically set up to handle larger networks. However, the software appeared to be limited in terms of a number of functions that were required to complete this study.

UCINET 5 (Borgatti et al., 1999) proved to be very beneficial in terms of calculating centrality values for all 145 respondents. However, once the centrality scores were calculated, the

information had to be manually transferred to Microsoft Excel software (Microsoft Corporation, 1995) for structural analyses. Another limitation of UCINET 5 is the fact that a means for statistical analysis of the data using *t*-tests was not provided. As a result, personal judgement was used in order to determine the significance of the data. An additional disadvantage associated with the use of UCINET 5 is that the software did not provide for graphical compilation of the data in the form of sociograms. Sociograms are the most common form of representation of sociometric data, which would have provided readers with a clearer picture of the communication networks.

Thirdly, the self-reporting by respondents as to who they communicate with the most during a working week relies on the respondent's memory and interpretations of the interaction. Relying on the answers provided by the respondents means acceptance of any perceptual distortions the respondent may have. However, it needs to be remembered that self-reports are primarily used for social network analysis and there can be few means other than self-report of gaining insight into the perceptions of individuals about their interactions with others in their organisation. It must be considered that when reporting their interactive counterparts the participants themselves would be the best judges of their regular communication patterns.

Fourthly, the research provides a cross-section of organisational life which is essentially the focus of sociometric studies. However, a limitation of cross-sectional studies is that they rely on the time period being studied as representative of other time periods. Dane (1990) maintains that use of an abstract time frame may go some way towards reducing this limitation. This study asks respondents

to indicate who they orally communicate with in a typical week. Therefore, it is considered that the fact that an abstract time frame is encompassed in the questionnaire design goes some way towards counteracting the effects of this limitation.

Lastly, Network studies provide researchers with a snapshot of a relational field at one point in time (Galaskiewicz, 1996). In almost every study the network is taken as a kind of social fact that has an enduring or permanent quality about it. However, the phenomena that network analysis studies is vulnerable to change. Not only is the population constantly changing, but the relationships among actors can also change. Therefore, a limitation of this study, is the fact that not only is the population changing, but the relationships between the actors may also have changed as well. This limitation inhibits any generalisation of the results to the knowledge industry as a whole.

5.6 Directions for Future Research

The network based view of knowledge acquisition presented here potentially takes us one step closer to furthering understanding of the most visible actors in the emergent networks in knowledge organisations. Although the present study may have made a contribution to research concerning the knowledge gap hypothesis, further research is warranted concerning interpersonal communication in organisational settings. Clearly, further research needs to extend the focus on the emergence and effects of differing patterns of communication by looking at knowledge in terms of the actual message content along with the network centrality indicators.

The communication activities associated with the formal leadership roles embedded within organisational structures also need to be considered to a greater extent. In particular, the communication processes associated with providing access to information resources. Additional communication related research is needed which delves into the communication dynamics of coalition formation and considers the process by which common knowledge is shared across groups forming coalitions. Specifically with respect to the power-gain that is associated with the formation of coalitions and the subsequent consequences for ongoing communication. By linking coalition formation, knowledge acquisition, power processes, and social networks, a framework can be utilised to further examine information exchanges between coalitions in organisations from a knowledge gap perspective.

Greater exploration of network centrality may provide additional insights into the relationship between knowledge and participation and the achievement of organisational goals. Interaction data gathered during organisational meetings regarding organisational development would provide unique information concerning how differences between individuals' level of knowledge and involvement are both enacted and facilitated within the group. Researchers might also consider how useful and unimportant message are differentiated from one another by actors in organisations.

Overall, a variety of communication processes that could be examined in more depth in light of the knowledge gap hypothesis have been unveiled by this research. However, further research on the effects of network centrality, specifically focusing on the extent

to which access to important information resources is controlled by management, should provide the most important insights into knowledge gain and effective organisational development.

References

- Astley, W., & Sachdeva, P. (1984). Structural sources of inter-organisational power: A theoretical synthesis. Academy of Management Review, 9, 104-113.
- Atkin, C., Bowen, L., Nayman, O., & Sheinkopf, K. (1973). Quality versus quantity in televised political ads. Public Opinion Quarterly, 37, 209-24.
- Bacharach, S.B. (Ed.). (1982). Research in the sociology of organisations, (Volume I). London, England: JAI Press.
- Bacharach, S.B., & Aiken, M. (1976). Structural and process constraints on influence in organisations. Administrative Science Quarterly, 21, 623-642.
- Bacharach, S.B., & Lawler, E.J. (1980). Power and politics in organisations. San Francisco: Jossey-Bass.
- Baldrige, J. V., & Burnham, R. A. (1975). Organisational innovation: Individual, organisation and environmental impacts. Administrative Science Quarterly, 20, 165-176.
- Banerjee, J.K. (1997). The gap management. [On-line]. Computers and Industrial Engineering. 33(1,2), 175-178. Abstract from: ABI Inform: Accession Number: 01558026.
- Beauchamp, M.A. (1965). An improved index of centrality. Behavioural Science, 10, 161-163.

- Belson, W.A. (1986). Validity in survey research. Alershot: Gower Publishing.
- Benson, J.K. (1977). Organisations: A dialectical view. Administrative Science Quarterly, 22, 1-21.
- Berkowitz, S.D. (1972). An introduction to structural analysis: The network approach to social research. Toronoto, Canada: Butterworth and Company Limited.
- Bernstein, B. (1961). Some sociological determinants of perception. British Journal of Sociology, 12, 159-175.
- Blau, P.M. (1982). Structural sociology and network analysis: An overview. In Marden, P.V., & Lin, N. (Eds.). Social structure and network analysis (pp 273-280). Newbury Park, California: Sage Publications.
- Blau, P.M., & Alba, R. (1982). Empowering nets of participation. Administrative Science Quarterly, 27, 363-379.
- Boje, D.M., & Whetten, D.A. (1981). Effects of organisational strategies and contextual constraints on centrality and attributions of influence in inter-organisational networks. Administrative Science Quarterly, 26, 378-395.
- Bonacich, P. (1987). Power and centrality: A family of measures. American Journal of Sociology. 92, 1170-1182.
- Bordens, K.S., & Abbott, B.B. (1996). Research designs and methods: A process approach (3rd Ed). Mountain View, California: Mayfield Publishing Company.

- Borgatti, S., Everett, M., Freeman, L.C., & MacEvoy, B. (1999). UCINET 5: A microcomputer package for network analysis. Natick, Massachusetts: Analytic Technologies Limited.
- Branscomb, L.M. (1979). Information: The ultimate frontier. Science. 203, 143-147.
- Brass, D.J. (1984). Being in the right place: A structural analysis of individual influence in an organisation. Administrative Science Quarterly. 29, 518-539.
- Brass, D.J. (1985). Mens and womens networks: A study of interaction patterns and influence in an organisation. Academy of Management Journal. 29, 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.
- Burgess, R. L. (1968). Communication networks and behavioural consequences. Human Relations, 22, 137-159.
- Burkhardt, M.E., & Brass, D.J. (1990). Changing patterns or patterns of change: The effects of a change in technology on social network structure and power. Administrative Science Quarterly. 35, 104-127.
- Burt, R.S. (1976). Positions in networks. Social Forces, 55, 93-122.
- Burt, R.S. (1982). Toward a structural theory of action. New York: Academic Press.

- Caplovitz, D. (1963). The Poor Pay More. New York: Free Press of Glencoe.
- Coleman, J.S. (1961). The adolescent society: The social life of the teenager and its impact on education. New York: Free Press of Glencoe.
- Dane, F.C. (1990). Research methods. Belmont, California: Brooks Cole Publishing Company.
- Dervin, B. (1980) Communication gaps and inequities: Moving toward a reconceptualisation. In Dervin, B., and Voight, M.J (Eds). Progress in communication sciences (Volume II pp73-112). Norwood New Jersey: Ablex Publishing Corporation.
- Dervin, B., & Greenberg, B.S. (1972). The communication environment of the urban poor. In Kline, F.G., & Tichenor, P.J. (Eds). Current perspectives in mass communication (pp 17-40). Beverly Hills, California: Sage Publications.
- Donohue, G. A., Tichenor, P. J. & Olien, C.N. (1975). Mass media and the knowledge gap: A hypothesis reconsidered. Communication Research. 3, 135-154.
- Ettema, J.S., & Kline, F.G. (1977). Deficits, differences and ceilings: Contingent conditions for understanding the knowledge gap. Communication Research, 4, 179-202.

- Euske, N. A., & Roberts, K. H. (1987). Evolving perspectives in organisation theory: Communication implications. In Jablin, F.M., Putnam, L.L., Roberts, K.H., & Porter, L.W. (Eds.). Handbook of organisational communication: An interdisciplinary perspective (pp 41-69). Newbury Park, California: Sage Publications Limited.
- Fombrun, C.J. (1983). Attributions of power across a social network. Human Relations, 36, 493-508.
- Freeman, L.C. (1977). A set of measures of centrality based on betweenness. Sociometry, 40(1), 35-41.
- Freeman, L. C. (1979). Centrality in social networks conceptual clarification. Social Networks. 1, 215-239.
- Friedkin, N.E. (1991). Theoretical foundations for centrality measures. American Journal of Sociology. 96, 1478-1504.
- Gains, J. (1980). Upward communication in industry: An experiment. Human Relations, 33, 923-942.
- Galaskiewicz, J. (1996). The "new network analysis" and its application to organisational theory and behaviour. In Iacobucci, D. (1996). Networks in marketing (pp 19-31). Thousand Oaks, California: Sage Publications.
- Galloway, J. J. (1977). The analysis and significance of communication effects gaps. Communication Research. 4, 363-386.

- Genova, B.K.L., & Greenberg, B.S. (1979). Interests in news and the knowledge gap. Public Opinion Quarterly, 41, 79-91.
- Genova, B.K.L., & Greenberg, B.S. (1981). Interests in news and the knowledge gap. In Wilhoit, G.C., De Bock, H. (Eds.). Mass Communication Review Yearbook (Volume 2, pp 494-506). London, England: Sage Publications.
- Gaziano, C. (1983). The knowledge gap: An analytical review of media effects. Communication Research, 10, 447-486.
- Giddens, A. (1979). Central problems in social theory: Action, structure and contradiction in social analysis. London, England: MacMillan Press Limited.
- Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. American Journal of Sociology, 91, 481-510.
- Griffin, R.J. (1990). Energy in the eighties: Education, communication and the knowledge gap. Journalism Quarterly, 67, 554-566.
- Hannan, M.T., & Freeman, J.H. (1977). The population ecology of organisations. American Journal of Sociology, 82, 929-964.
- Hartman, J.J., & Hedblom, J.H. (1979). Methods for the social sciences: A handbook for students and non-specialists. London, England: Greenwood Press.

- Hess, R.D. (1970). Social class and ethnic influences on socialisation. In Mussen, P.H. (Ed) Carmichael's Manual of Child Psychology (Volume II). New York: John Wiley.
- Hiltz, S.R. (1971). Black and white in the consumer financial system. American Journal of Sociology, 76, 987-998.
- Huber, G.P., & Daft, R.L. (1987). The information environments of organisations. In Jablin, F.M., Putnam, L.L., Roberts, K.H., & Porter, L.W. (Eds.). Handbook of organisational communication: An interdisciplinary perspective (pp. 130-164). Newbury Park, California: Sage Publications Limited.
- Hyman, H.H., Wright, C.R., & Reed, J.S. (1975). The enduring effects of education. Chicago, Illinois: University of Chicago Press.
- Ibarra, H. (1992). Homophily and differential returns: Sex differences in network structure and access in an advertising firm. Administrative Science Quarterly, 37(3), 422-447.
- Ibarra, H. (1993). Network centrality, power and innovation involvement: Determinants of technical and administrative roles. Academy of Management Journal, 36(6), 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.

- Ireton, H., Thriving, E., & Graven, H. (1970). Infant mental development and neurological status, family socio-economic status and intelligence at age four. Child Development, 41, 937-945.
- Jablin, F. (1982). Formal structural characteristics of organisations and superior-subordinate communication. Human communication Research, 8, 338-347.
- Johnson, N. (1973). Television and politicisation: A test of competing models. Journalism Quarterly, 50, 447-55.
- Katz, D., & Kahn, R. (1966). The social psychology of organisations. New York: Wiley Publishers Limited.
- Knight, K.E. (1967). A descriptive model of intra-firm innovation process. Journal of Business, 40, 478-496.
- Knoke, D. (1983). Organisational sponsorship and influence reputation of social influence associations. Social Forces, 61, 1,065-1,087.
- Knoke, D., & Burt, R.S. (1983). Prominence. In Burt, R.S., & Miner, M.J. (Eds.). Applied network analysis: A methodological introduction (pp 195-222). Beverly Hills, California: Sage Publishers.
- Knoke, D., & Rogers, D.L. (1979). A block-model analysis of inter-organisational networks. Sociology and social Research, 64, 28-52.

- Laumann, E.O., & Pappi, F.U. (1976). Networks of collective action: A perspective on communication influence systems. New York: Academic Press.
- Levine, J. (1972). The sphere of influence. American Sociological Review, 37, 14-27.
- Lincoln, J.R., & Miller, J. (1979). Work and friendship ties in organisations: A comparative analysis of relational networks. Administrative Science Quarterly, 24, 181-199.
- Luthans, F., & Larsen, J.K. (1986). How managers really communicate. Human Relations, 39, 161-178.
- MacDonald, D. (1976). Communication roles and communication networks in a formal organisation. Human Communication Research, 4, 365-375.
- McPhee, R.M., & Tompkins, P. (Eds.). Organisational communication: Traditional themes and new directions (pp 149-177). Newbury Park, California: Sage Publishers.
- Madlin, N. (1987). Remapping the corporation. Management Review, 76(5), 60-61.
- Microsoft Corporation. (1995). Excel. Sydney, Australia: Microsoft Corporation.
- Mintzberg, H. (1983). Power in and around organisations. Englewood Cliffs, New Jersey: Prentice Hall.

Monge, P.R. (1987). The network level of analysis. In Berger, C.R., & Chaffee, S.H. Handbook of communication science pp 239-270. Beverley Hills, California: Sage Publications Limited.

Monge, P.R., & Contractor, N. (1988). Communication networks: Measurement techniques. In Tardy, C.H. (Ed.). A Handbook for the study of human communication: Methods and instruments for observing, measuring and assessing communication processes pp107-138. Norwood, New Jersey: Ablex Publishing Corporation.

Monge, P.R., Edwards, J., & Kirste, K. (1978). The determinants of communication and communication structure in large organisations: A review of research. In Ruben, B. (Ed.), Communication Yearbook 2 (pp 311-331). Beverley Hills, California: Sage Publishers.

Monge, P. R., & Eisenberg, E. M. (1987). Emergent communication networks. In Jablin, F.M., Putnam, L.L., Roberts, K.H., & Porter, L.W. (Eds.). Handbook of organisational communication: An interdisciplinary perspective (pp 304-342). Newbury Park, California: Sage Publications Limited.

Moxley, R.L., & Moxley, N.F. (1974). Determining point-centrality in uncontrived social networks. Sociometry, 37, 122-130.

Nieminen, J. (1973). On centrality in a directed graph. Social Science Research, 2, 371-378.

Nystrom, P.C., & Starbuck, W.H. Handbook of organisational design (Volume 1) Adapting organisations to their environments. New York: Oxford University Press.

- O'Reilly, C.A. (1978). The intentional distortion of information in organisational communication: A laboratory and field approach. Human Relations, 31, 173-193.
- Paisley, W, (1980). Information and work. In Dervin, B., and Voight, M.J (Eds). Progress in Communication Sciences (Volume II) pp 113-166. Norwood New Jersey: Ablex Publishing Company.
- Parker, E. B. (1978). An information based hypothesis. Journal of Communication. 28(1), 81-83.
- Perse, D.M., & Perse, E.M. (1994). Direct and indirect effects of socio-economic status on public affairs knowledge. Journalism Quarterly, 71(2), 433-443.
- Pettigrew, A. (1995). Power and influence in and around the boardroom. Human Relations, 48(8), 845-873.
- Pfeffer, J. & Salancik, G. R. (1978). The external control of organisations. New York: Harper and Row.
- Ranson, S., Hinings, B., & Greenwood, R. (1980). The structuring of organisational structures. Administrative Science Quarterly, 25, 1-17.
- Riley, P. (1983). A structurationist account of organisational culture. Administrative Science Quarterly, 28, 414-437.
- Roberts, K.H., & O'Reilly, C.A. (1974). Measuring organisational communication. Journal of Applied Psychology, 59, 321-326.

- Roberts, K.H., & O'Reilly, C.A. (1979). Some correlations of communication roles in organisations. Academy of Management Journal, 22, 42-57.
- Rogers, E.M. (1976). Communication and development: The passing of the dominant paradigm. Communications Research, 3, 213-240.
- Rogers, E.M., & Argarwala-Rogers, R. (1976). Communication networks in organisations. New York: Free Press of Glencoe.
- Rogers, E.M., & Kincaid, D.L. (1981). Communication networks: towards a new paradigm for research. London: Collier Macmillan Publishers.
- Severin W.J., & Tankard, J.W. (1997). Communication theories: Origins, methods and uses. The mass media (4th ed). New York: Longman Paul.
- Sharp, E.B. (1984). Consequences of local government under the klieg lights. Communication Research, 11, 497-517.
- Sherman, J.D., Smith, H.L., & Mansfield, E.R. (1986). The impact of emergent network structure on organisational socialisation. The Journal of Applied Behavioural Science, 22, 53-63.
- Sligo, F.X. (1997). The Matthew effect in information use: Implications for the new enterprise. International Journal of Management Science, 25(3), 301-312.
- Smith, A.G. (1975). The primary resource. Journal of Communication. 25(2), 15-20.

- Snadowski, A. (1979). Communication network research: An examination of controversies. Human Relations, 25, 283-306.
- Sonquist, J.A., & Koenig, T. (1979). Interlocking directorates in the top U.S corporations: A graph theory approach. Insurgent Sociologist, 5, 196-229.
- Thurman, B. (1979). In the office: Networks and coalitions. Social Networks, 2, 47-64.
- Tichenor, P.J., Donohue, G.A., & Olien, C.N. (1970). Mass media and differential flow of knowledge. Public Opinion Quarterly, 34, 713-720.
- Tichy, N.M., Tushman, M.L., & Fombrun, C. (1979). Social network analysis for organisations. Academy of Management, 4, 507-519.
- Tushman, M.L. (1979). Work characteristics and sub-unit communication structure: A contingency analysis. Administrative Science Quarterly, 14, 82-98.
- Tushman, M.L., & Romanelli, E. (1983) Uncertainty, social location and influence in decision making: A sociometric analysis. Administrative Science Quarterly, 29, 12-23.
- Tushman, M.L. & Scanlan, T.J. (1981). Characteristics and external orientations of boundary spanning individuals. Academy of Management Journal, 24, 83-98.
- Ulrich, D., & Barney, J.B. (1984) Perspectives in organisation: Resource dependence, efficiency and population. Academy of Management Review, 9, 471-481.

- Viswanath, K.E., Kahn, J.R., Finnegan, J., Hertog, H., & Potter, J.D. (1993). Motivation and the knowledge gap: Effects of a campaign to reduce diet-related cancer risk. Communication Research, 20, 546-563.
- Vredenburg, D., & Brendery, Y. (1998). Hierarchical abuse of power in work organisations. Journal of Business Ethics, 17(2), 1337-1347.
- Wade, S., & Schramm, W. (1969). The mass media as sources of public affairs, science, and health knowledge. Public Opinion Quarterly, 33, 197-209.
- Wanta, W., & Elliott, R. (1995). Did the "magic" work? Knowledge of HIV/AIDS and the knowledge gap hypothesis. Journalism Quarterly, 72, 312-321.
- Wasserman, S., & Faust, K. (1994). Social network analysis: Methods and applications. Cambridge, New York: Press Syndicate of the University of Cambridge.
- White, H., Boorman, S., & Breiger, R. (1976). Social structure from multiple networks. (Volume I). Block-models of roles and positions. American Journal of Sociology, 81, 730-779.
- Zenger, T.R., & Lawrence, B.A. (1989). Organisational demography: The differential effects of age and tenure distributions on technical communications. Academy of Management Journal, 32, 353-376.

APPENDIX A

ORGANISATION 1

Computer Services - Government Agency - 14 respondents

The respondents from this organisation consisted of computer programmers, operators and contractors. Programmers can also be business analyst or a systems analyst, anyone that has a programming background. It can be considered that this department contains a large majority of individuals who have considerable experience and who are highly qualified.

Male	12	Mean age	=	30.5	
Female	<u>2</u>	Youngest	=	21	(M) (F)
n =	14	Oldest	=	47	(M)
 Managers	 2	2 males		(35) 1 post-grad (38) 1 tertiary	
Supervisors	4	3 males		(33, 36, 36) tertiary (47) s/tertiary	
Non-supervisory staff	8	7 males		(21, 28, 36) s/tertiary (22, 23, 27, 36) tertiary	
		2 females		(21) s/tertiary (25) tertiary	

ORGANISATION 2

Commercial Law Firm - 16 respondents

The respondents from this organisation consisted of a senior partner, partners, lawyers and secretaries. It can be considered that this organisation contains a majority of highly qualified individuals who have considerable experience and some qualified individuals who have been with this organisation for a limited amount of time.

Male	10	Mean age	=	28.2	
Female	<u>6</u>	Youngest	=	21	(F x 2)
n =	16	Oldest	=	39	(M)
 Managers	 4	4 males		(30, 33) tertiary (33,39) post-grad	
Supervisor	6	6 males		(25, 25, 27, 30) post-grad (29, 35) tertiary	
Non-supervisory staff	6	6 females		(26, 28) S.C (21) U.E (21, 25, 25) tertiary	

ORGANISATION 3

Consumer Products Manufacturer - 15 respondents

The respondents in this organisation consist of a majority of individuals who have considerable experience but who are not very highly qualified.

Male	3	Mean age	=	27.2
Female	<u>12</u>	Youngest	=	19 (F)
n =	15	Oldest	=	41 (F)

Managers	3	2 males	(33) (tertiary) (25) s/tertiary
		1 female	(27) tertiary
Supervisors	3	1 male	(22) tertiary
		2 females	(41) U.E (33) s/tertiary
Non-supervisory staff	9	9 females	(16, 19, 22, 26, 37, 40) S.C (24) U.E (20, 23) s/tertiary

ORGANISATION 4

Polytechnic - 16 respondents

The respondents from this organisation consist of a head of department, tutors and departmental administration staff who have considerable experience and who are reasonably well qualified.

Male	0	Mean age	=	43
Female	<u>16</u>	Youngest	=	32 (F)
n =	16	Oldest	=	55 (F x2)

Manager	1	1 female	(55) S.C
Supervisors	3	3 females	(50) U.E (34) s/tertiary
Non-supervisory staff	12	12 females	(32, 37, 50, 45, 55) s/tertiary (36, 36, 38, 42, 43, 39, 52) tertiary

ORGANISATION 5

Provincial Branch - Bank - 12 respondents

The respondents from this organisation consist of supervisors, clerks and machinists. It can be considered that this organisation contains a large majority of individuals who have had considerable experience but who are reasonably unqualified.

Male	3	Mean age	=	22	
Female	<u>9</u>	Youngest	=	19	(F x 2)
n =	12	Oldest	=	26	(F) (M)

Manager	0				
Supervisors	4	2 males		(24,26)	U.E
		2 females		(23, 26)	U.E
Non-supervisory staff	8	1 male		(22)	S.C
		7 females		(19, 20, 21, 21)	S.C
				(19, 20, 23)	U.E

ORGANISATION 6

Field Enquiry Unit - Government Department - 7 respondents

The respondents from this organisation consist of a senior divisional officer, divisional officers and field officers who have had considerable experience but who are reasonably unqualified.

Male	1	Mean age	=	33.8	
Female	<u>6</u>	Youngest	=	25	(F)
n =	7	Oldest	=	46	(F)

Manager	1	1 male		(34)	S.C
Supervisors	3	3 females		(30, 46)	S.C (42) s/tertiary
		3 females		(25)	S.C (30, 30) s/tertiary
Non-supervisory staff	3				

ORGANISATION 7

Radio Station - Broadcasting Corporation of New Zealand - 16 respondents

The respondents from this organisation consist of a station manager, supervisors and general staff. It can be considered that this organisation contains a large majority of individuals who have had considerable experience and who are reasonably qualified and a handful of individuals who have not been with the organisation for long and who are essentially unqualified.

Male	8	Mean age	=	27	
Female	<u>8</u>	Youngest	=	17	(F)
n =	16	Oldest	=	37	(M)
Manager	1	1 male		(34) S.C	
Supervisors	6	5 males		(25, 33) S.C	(34, 37) s/tertiary
				(28) tertiary	
		1 female		(24) U.E	
Non-supervisory staff	9	2 males		(24) S.C	(29) tertiary
		7 females		(17, 19, 23, 26) U.E	
				(31) s/tertiary	(25) tertiary
				(26) post-grad	

ORGANISATION 8

Fund-raising Section - Voluntary Organisation - 12 respondents

The respondents from this organisation consist of a national executive director, national projects officer, accountant, public relations director, public relations research assistant, training co-ordinator and clerical staff. It can be considered that this organisation contains a majority of individuals who have had a lot of experience and who are reasonably highly qualified.

Male	3	Mean age	=	39	
Female	<u>9</u>	Youngest	=	21	(F)
n =	12	Oldest	=	57	(F)
Managers	3	1 male		(47) S.C	(54) s/tertiary
				(35) post-grad	
Non-supervisory staff	9	9 females		(23, 28) S.C	
				(21, 47, 51, 57) s/tertiary	
				(24, 42) tertiary	
				(1 female did not mention age)	

ORGANISATION 9

Provincial Office - Government Department - 19 respondents

The respondents from this organisation consist of a majority of individuals who have had a lot of experience but who are reasonably unqualified.

Male	6	Mean age	=	33.2	
Female	<u>13</u>	Youngest	=	18	(M)
n =	19	Oldest	=	57	(M)

Managers	2	1 male	(57) S.C
		1 female	(54) S.C
Supervisors	5	1 male	(38) tertiary
		4 females	(35) S.C (37, 47, 47) tertiary
Non-supervisory staff	12	4 males	(27) S.C (18, 20) U.E
			(33) s/tertiary
		8 females	(24) S.C (19, 20, 20, 25, 29) U.E
			(36, 45) tertiary

ORGANISATION 10

Business Services - Consultancy Company - 18 respondents

The respondents from this organisation consist of partners, managers, accountants and clerical staff who have had a lot of experience and who are highly qualified.

Male	8	Mean age	=	31.4	
Female	<u>10</u>	Youngest	=	21	(M) (F)
n =	18	Oldest	=	56	(M)

Managers	2	2 males	(40, 50) tertiary
Supervisors	5	4 males	(28, 33, 42, 56) tertiary
		1 female	(26) tertiary
Non-supervisory staff	11	3 males	(21, 24, 35) tertiary
		8 females	(40) S.C (22) U.E
			(23, 26) s/tertiary
			(21, 22, 24, 24, 24, 25) tertiary

APPENDIX B

QUESTIONNAIRE SURVEY

Thank you for taking the time to answer the following questions.

Please answer all questions. Each answer may help to improve the working of your organisation. If you find any questions unclear or ambiguous, please ask the researcher about them.

Confidentiality

The individual responses from people will be kept confidential.

No one will be identified in the research report, and individual responses will not be made available to anyone in your organisation.

Purpose

The purpose of this survey is to assess the ability of your organisation to give people the information they need to do their work effectively.

(1) (2) (3) (4) (5)
NEVER RARELY SOMETIMES OFTEN VERY OFTEN

In a normal working week I talk to these people about the *work I do*:

1 2 3 4 5

1 2 3 4 5

1 2 3 4 5

1 2 3 4 5

1 2 3 4 5

(1) (2) (3) (4) (5)
NEVER RARELY SOMETIMES OFTEN VERY OFTEN

In a normal working week I talk to these people about *new ideas* related to work:

1 2 3 4 5

1 2 3 4 5

1 2 3 4 5

1 2 3 4 5

1 2 3 4 5

(1) (2) (3) (4) (5)
NEVER RARELY SOMETIMES OFTEN VERY OFTEN

In a normal working week I talk to these people about *social activities*:

1 2 3 4 5

1 2 3 4 5

1 2 3 4 5

1 2 3 4 5

1 2 3 4 5

Background Information

This section is for statistical purposes only. It will be used to study how different groups of people view your organisation.

1. Sex Male _____ Female _____

2. Age _____

3. How long have you worked in this organisation?

- 1) Less than 1 year
- 2) 1 to 5 years
- 3) 6 to ten years
- 4) 11 to 15 years
- 5) More than 15 years.

4. How long have you held your present position?

- 1) Less than 1 year
- 2) 1 to 5 years
- 3) 6 to 10 years
- 4) 11 to 15 years
- 5) More than 15 years.

5. What is your position in this organisation?

- 1) I don't supervise anybody
- 2) First-line supervisor
- 3) Middle management
- 4) Top management
- 5) Other: (Please specify _____)

6. What is your highest educational level?

- 1) Up to and including School Certificate
- 2) U.E or higher school qualifications
- 3) Some technical or university study
- 4) Completed a technical or university qualification
- 5) Post-graduate work.

7. During the past ten years, in how many other organisations have you been employed?

- 1) No other organisations
- 2) One other organisation
- 3) Two other organisations
- 4) Three other organisations
- 5) More than three others.

Thank you for your assistance

APPENDIX C

Demographic characteristics of the respondents

Question 1 Gender characteristics of the respondents

	Female	Male	Total
Organisation 1	12	2	14
Organisation 2	6	10	16
Organisation 3	3	12	15
Organisation 4	16	0	16
Organisation 5	9	3	12
Organisation 6	6	1	7
Organisation 7	8	8	16
Organisation 8	9	3	12
Organisation 9	13	6	19
Organisation 10	<u>10</u>	<u>8</u>	<u>18</u>
Total	92	53	145

Question 2 Age of the respondents

	Under 20	20-30	31-40	41-50	Over 50	Total
Organisation 1	0	7	6	1	0	14
Organisation 2	0	12	4	0	0	16
Organisation 3	2	8	4	1	0	15
Organisation 4	0	0	8	3	5	16
Organisation 5	2	10	0	0	0	12
Organisation 6	0	4	1	2	0	7
Organisation 7	2	9	5	0	0	16
Organisation 8	0	4	2	3	3	12
Organisation 9	2	7	5	3	2	19
Organisation 10	<u>0</u>	<u>11</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>18</u>
Total	8	72	39	14	12	145

Age

	Total	Female		Male	
Under 20 years	5%	88%		12%	
		S.C	43%	S.C	0%
		U.E	57%	U.E	100%
		Some		Some	
		Tertiary	0%	Tertiary	0%
		Tertiary	<u>0%</u>	Tertiary	<u>0%</u>
			100%		100%
21 to 30 years	50%	67%		33%	
		S.C	27%	S.C	8%
		U.E	31%	U.E	17%
		Some		Some	
		Tertiary	17%	Tertiary	0%
		Tertiary	<u>25%</u>	Tertiary	<u>75%</u>
			100%		100%
31 to 40 years	27%	46%		54%	
		S.C	22%	S.C	14%
		U.E	0%	U.E	0%
		Some		Some	
		Tertiary	39%	Tertiary	19%
		Tertiary	<u>39%</u>	Tertiary	<u>67%</u>
			100%		100%
41 to 50 years	10%	79%		21%	
		S.C	9%	S.C	34%
		U.E	9%	U.E	0%
		Some		Some	
		Tertiary	27%	Tertiary	33%
		Tertiary	<u>55%</u>	Tertiary	<u>33%</u>
			100%		100%
50+ years	8%	73%		33%	
		S.C	24%	S.C	25%
		U.E	13%	U.E	0%
		Some		Some	
		Tertiary	50%	Tertiary	25%
		Tertiary	<u>13%</u>	Tertiary	<u>50%</u>
			100%		100%

Question 3 Length of time the respondents have been employed by their respective organisations

	Less than one year	1 to 5 years	6 to 10 years	11 to 15 years	Over 15 years	Total
Organisation 1	1	9	0	0	4	14
Organisation 2	4	9	2	1	0	16
Organisation 3	2	13	0	0	0	15
Organisation 4	1	4	4	4	3	16
Organisation 5	1	7	4	0	0	12
Organisation 6	1	0	2	3	1	7
Organisation 7	4	6	5	1	0	16
Organisation 8	2	7	2	0	1	12
Organisation 9	2	11	5	1	0	19
Organisation 10	<u>4</u>	<u>6</u>	<u>2</u>	<u>3</u>	<u>3</u>	<u>18</u>
Total	22	72	26	13	12	145

Length of time employed by the organisation

	Total	Female		Male	
Up to 1 year	15%	27%		73%	
		S.C	0%	S.C	13%
		U.E	0%	U.E	31%
		Some		Some	
		Tertiary	17%	Tertiary	19%
		Tertiary	<u>83%</u>	Tertiary	<u>37%</u>
			100%		100%
1 to 5 years	50%	65%		35%	
		S.C	28%	S.C	12%
		U.E	23%	U.E	12%
		Some		Some	
		Tertiary	17%	Tertiary	12%
		Tertiary	<u>32%</u>	Tertiary	<u>64%</u>
			100%		100%
6 to 10 years	18%	69%		31%	
		S.C	22%	S.C	25%
		U.E	22%	U.E	12%
		Some		Some	
		Tertiary	34%	Tertiary	25%
		Tertiary	<u>22%</u>	Tertiary	<u>38%</u>
			100%		100%
11-15 years	9%	54%		46%	
		S.C	14%	S.C	33%
		U.E	29%	U.E	0%
		Some		Some	
		Tertiary	43%	Tertiary	0%
		Tertiary	<u>14%</u>	Tertiary	<u>67%</u>
			100%		100%
15+ years	8%	25%		75%	
		S.C	0%	S.C	11%
		U.E	0%	U.E	0%
		Some		Some	
		Tertiary	100%	Tertiary	22%
		Tertiary	<u>0%</u>	Tertiary	<u>67%</u>
			100%		100%

Question 4 Length of time the respondents have been in their current job

	Less than one year	1 to 5 years	6 to 10 years	11 to 15 years	15+ years	Total
Organisation 1	1	12	1	0	0	14
Organisation 2	5	10	0	1	0	16
Organisation 3	7	8	0	0	0	15
Organisation 4	2	7	6	0	1	16
Organisation 5	1	11	0	0	0	12
Organisation 6	5	1	1	0	0	7
Organisation 7	8	8	0	0	0	16
Organisation 8	3	7	1	0	1	12
Organisation 9	5	10	3	1	0	19
Organisation 10	<u>7</u>	<u>6</u>	<u>2</u>	<u>0</u>	<u>3</u>	<u>18</u>
Total	44	80	14	2	5	145

Length of time in current job

	Total	Female		Male	
Up to 1 year	30%	70%		30%	
		S.C	23%	S.C	0%
		U.E	19%	U.E	7%
		Some		Some	
		Tertiary	23%	Tertiary	8%
		Tertiary	<u>35%</u>	Tertiary	<u>85%</u>
			100%		100%
1 to 5 years	55%	49%		31%	
		S.C	29%	S.C	16%
		U.E	20%	U.E	10%
		Some		Some	
		Tertiary	20%	Tertiary	13%
		Tertiary	<u>31%</u>	Tertiary	<u>61%</u>
			100%		100%
6 to 10 years	10%	86%		14%	
		S.C	34%	S.C	0%
		U.E	0%	U.E	0%
		Some		Some	
		Tertiary	41%	Tertiary	0%
		Tertiary	<u>25%</u>	Tertiary	<u>100%</u>
			100%		100%
11-15 years	2%	0%		100%	
		S.C	0%	S.C	50%
		U.E	0%	U.E	0%
		Some		Some	
		Tertiary	0%	Tertiary	0%
		Tertiary	<u>0%</u>	Tertiary	<u>50%</u>
			0%		100%
15+ years	3%	20%		80%	
		S.C	0%	S.C	0%
		U.E	0%	U.E	0%
		Some		Some	
		Tertiary	100%	Tertiary	40%
		Tertiary	<u>0%</u>	Tertiary	<u>60%</u>
			100%		100%

Question 5 Position within the organisational hierarchy

	Non-supervisory Staff	Supervisor	Manager	Total
Organisation 1	8	4	2	14
Organisation 2	6	6	4	16
Organisation 3	9	3	3	15
Organisation 4	12	3	1	16
Organisation 5	8	4	0	12
Organisation 6	3	3	1	7
Organisation 7	9	6	1	16
Organisation 8	9	0	3	12
Organisation 9	12	5	2	19
Organisation 10	<u>11</u>	<u>5</u>	<u>2</u>	<u>18</u>
Total	87	39	19	145

Position

	Total	Female		Male	
Managers	13%	16%		84%	
		S.C	67%	S.C	25%
		U.E	0%	U.E	0%
		Some		Some	
		Tertiary	0%	Tertiary	12%
		Tertiary	<u>33%</u>	Tertiary	<u>63%</u>
			100%		100%
Supervisors	27%	44%		56%	
		S.C	18%	S.C	9%
		U.E	24%	U.E	9%
		Some		Some	
		Tertiary	29%	Tertiary	14%
		Tertiary	<u>29%</u>	Tertiary	<u>68%</u>
			100%		100%
Non-supervisory Staff	60%	82%		18%	
		S.C	25%	S.C	19%
		U.E	20%	U.E	13%
		Some		Some	
		Tertiary	25%	Tertiary	25%
		Tertiary	<u>30%</u>	Tertiary	<u>43%</u>
			100%		100%

Question 6 The highest educational attainment of the respondents

	Up to S.C	U.E	Some Technic al/ University study	Technical/ University Qualification	Post-grad	Total
Organisation 1	0	0	5	8	1	14
Organisation 2	2	1	0	7	6	16
Organisation 3	6	2	4	3	0	15
Organisation 4	1	1	7	7	0	16
Organisation 5	5	6	0	0	0	12
Organisation 6	4	0	3	0	0	7
Organisation 7	4	5	3	3	1	16
Organisation 8	3	0	6	2	1	12
Organisation 9	5	7	1	6	0	19
Organisation 10	<u>2</u>	<u>1</u>	<u>2</u>	<u>14</u>	<u>0</u>	<u>18</u>
Total	32	23	31	50	9	145

Education

	Total	Female	Male
Up to School Certificate	22%	71%	29%
University Entrance	16%	70%	30%
Some Tertiary Study	21%	71%	29%
Tertiary Qualification (including post-graduate qualifications)	<u>41%</u> 100%	<u>44%</u> 100%	<u>56%</u> 100%

Question 7 The number of other organisations the respondents have been employed by during the past ten years

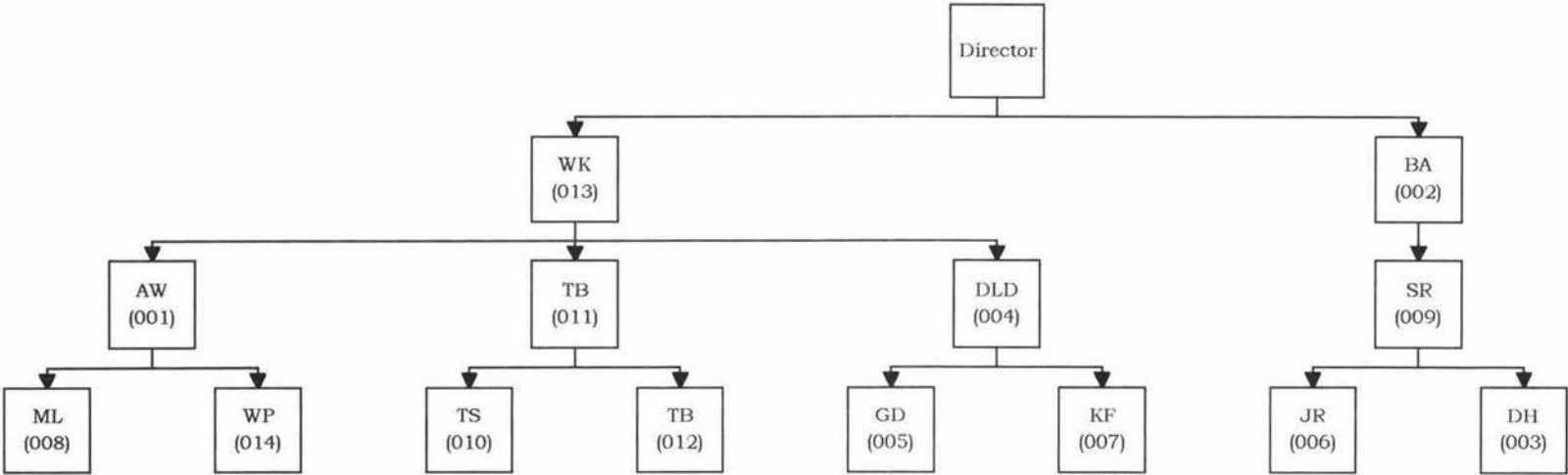
	No other	1 other	2 others	3 others	3+ others	Total
Organisation 1	8	3	3	0	0	14
Organisation 2	2	5	2	1	6	16
Organisation 3	4	4	4	2	1	15
Organisation 4	6	0	5	0	5	16
Organisation 5	6	4	2	0	0	12
Organisation 6	5	1	1	0	0	7
Organisation 7	7	3	3	0	3	16
Organisation 8	1	5	3	1	2	12
Organisation 9	8	4	4	2	1	19
Organisation 10	<u>10</u>	<u>4</u>	<u>3</u>	<u>0</u>	<u>1</u>	<u>18</u>
Total	57	33	30	6	19	145

Number of Previous Employers

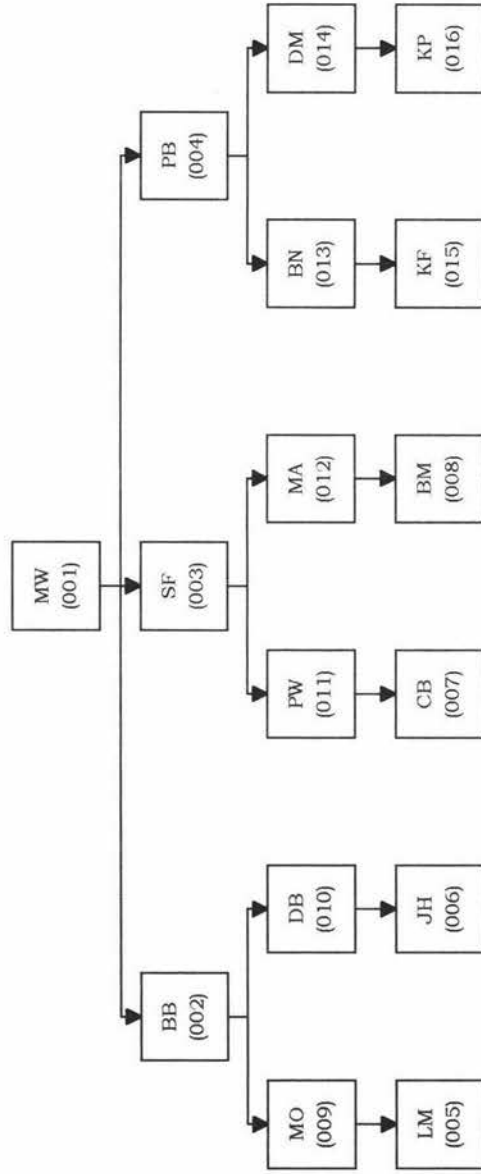
	Total	Female		Male	
None	39%	60%		40%	
		S.C	24%	S.C	13%
		U.E	29%	U.E	13%
		Some		Some	
		Tertiary	12%	Tertiary	13%
		Tertiary	<u>35%</u>	Tertiary	<u>61%</u>
			100%		100%
1 other	23%	70%		30%	
		S.C	26%	S.C	20%
		U.E	26%	U.E	0%
		Some		Some	
		Tertiary	18%	Tertiary	0%
		Tertiary	<u>30%</u>	Tertiary	<u>80%</u>
			100%		100%
2 others	21%	70%		30%	
		S.C	24%	S.C	12%
		U.E	14%	U.E	22%
		Some		Some	
		Tertiary	33%	Tertiary	44%
		Tertiary	<u>29%</u>	Tertiary	<u>22%</u>
			100%		100%
3 others	4%	50%		50%	
		S.C	67%	S.C	0%
		U.E	33%	U.E	0%
		Some		Some	
		Tertiary	0%	Tertiary	0%
		Tertiary	<u>0%</u>	Tertiary	<u>100%</u>
			100%		100%
3+ others	13%	63%		39%	
		S.C	33%	S.C	43%
		U.E	8%	U.E	0%
		Some		Some	
		Tertiary	33%	Tertiary	0%
		Tertiary	<u>26%</u>	Tertiary	<u>57%</u>
			100%		100%

APPENDIX D

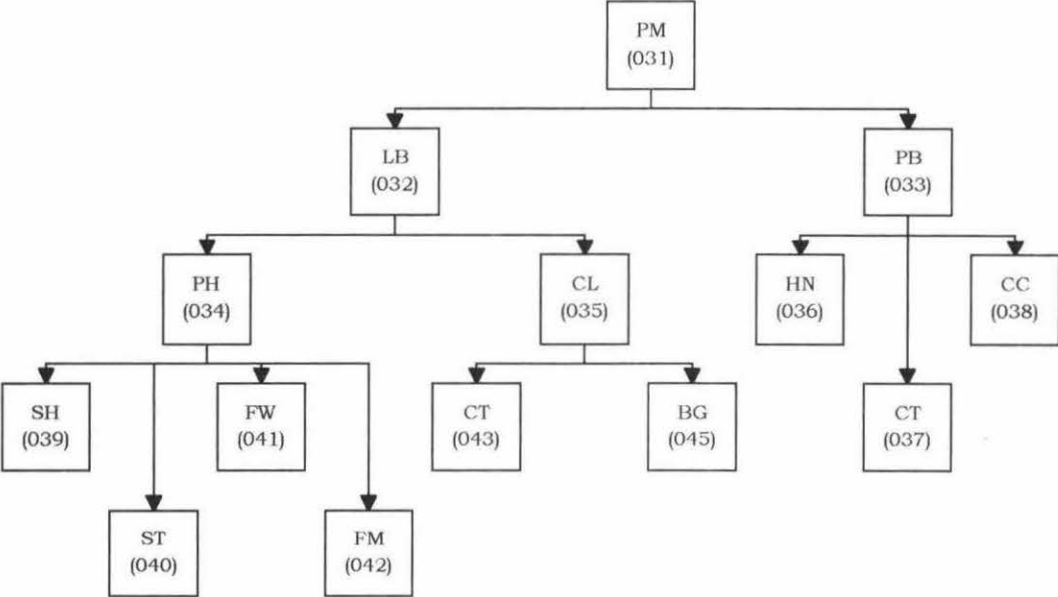
Organisation 1



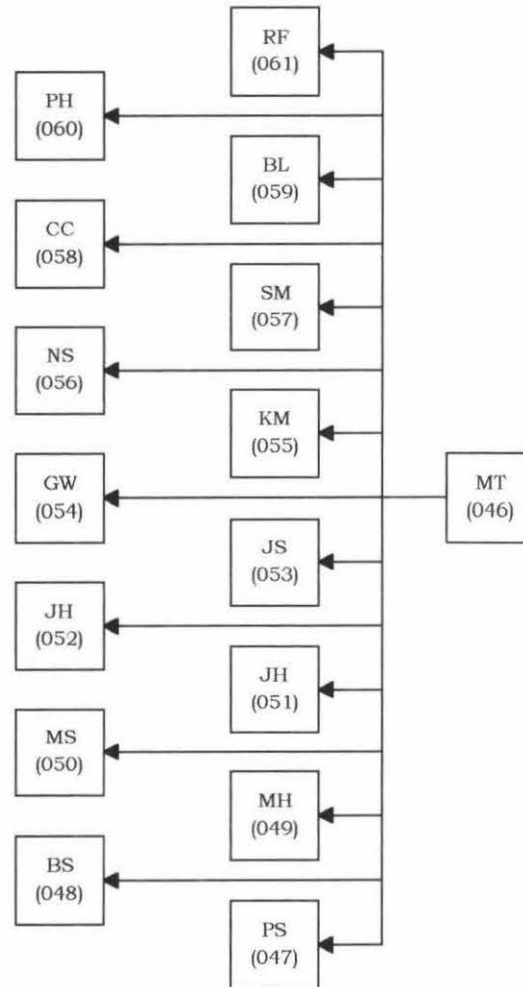
Organisation 2



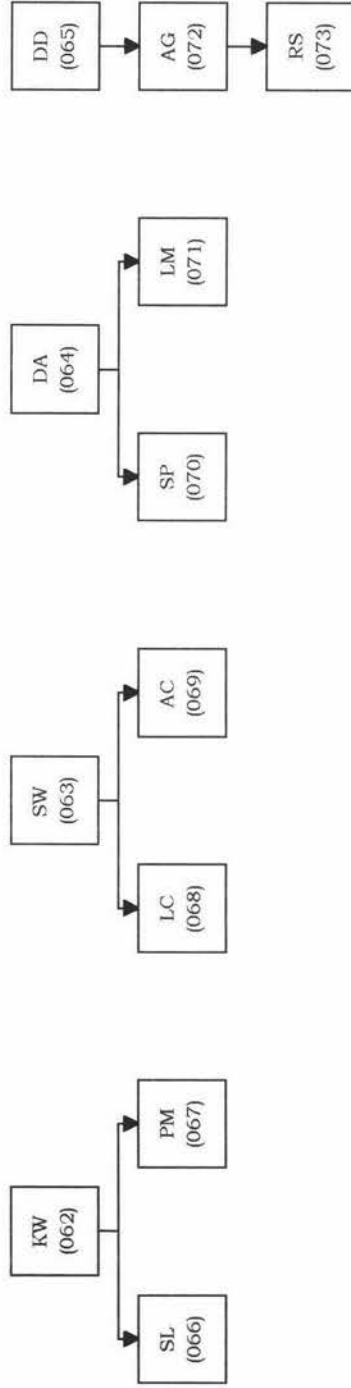
Organisation 3



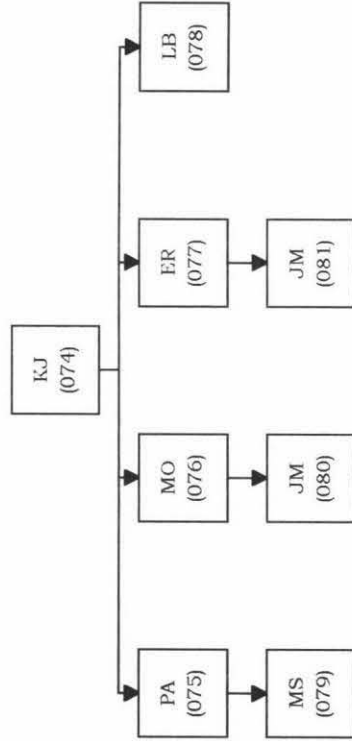
Organisation 4



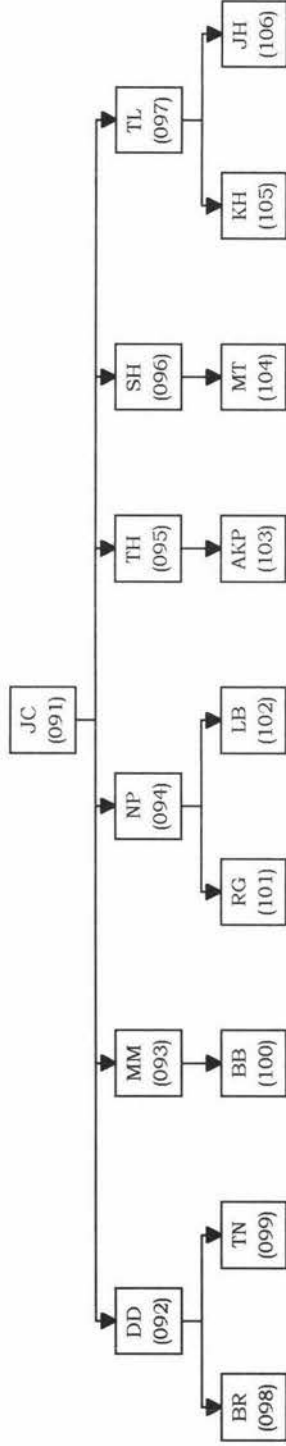
Organisation 5



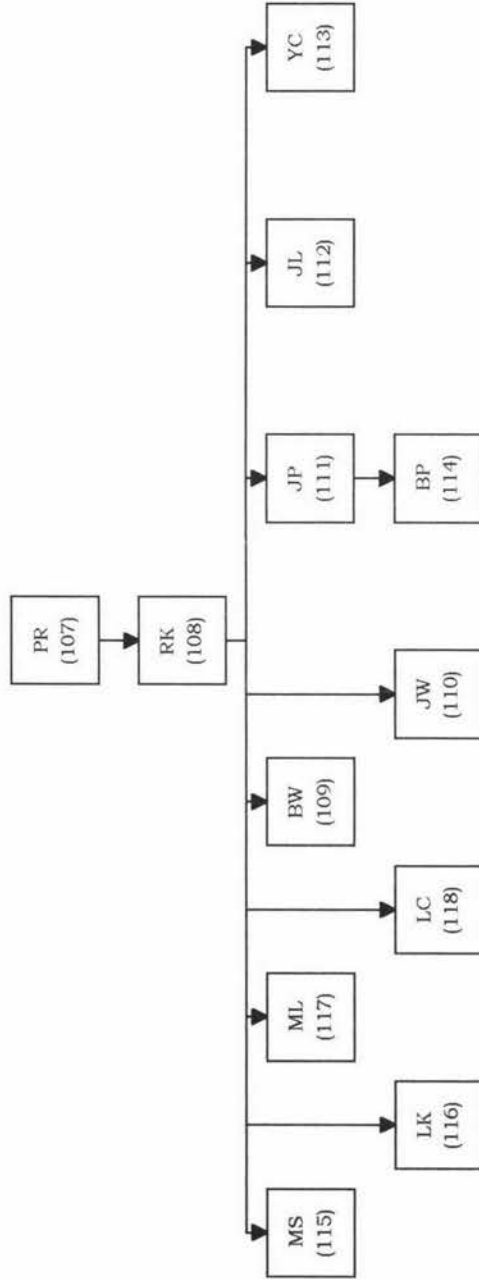
Organisation 6



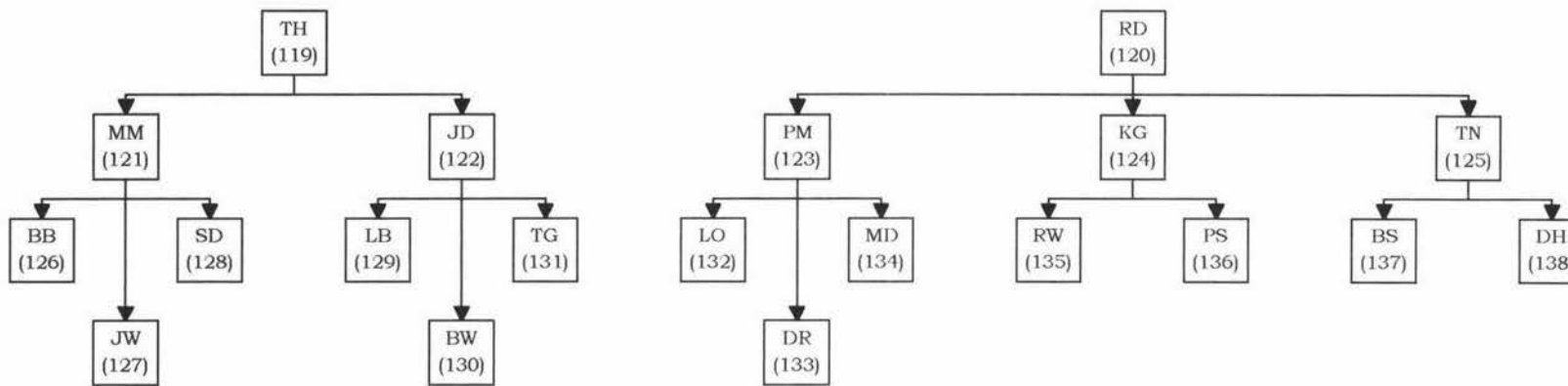
Organisation 7



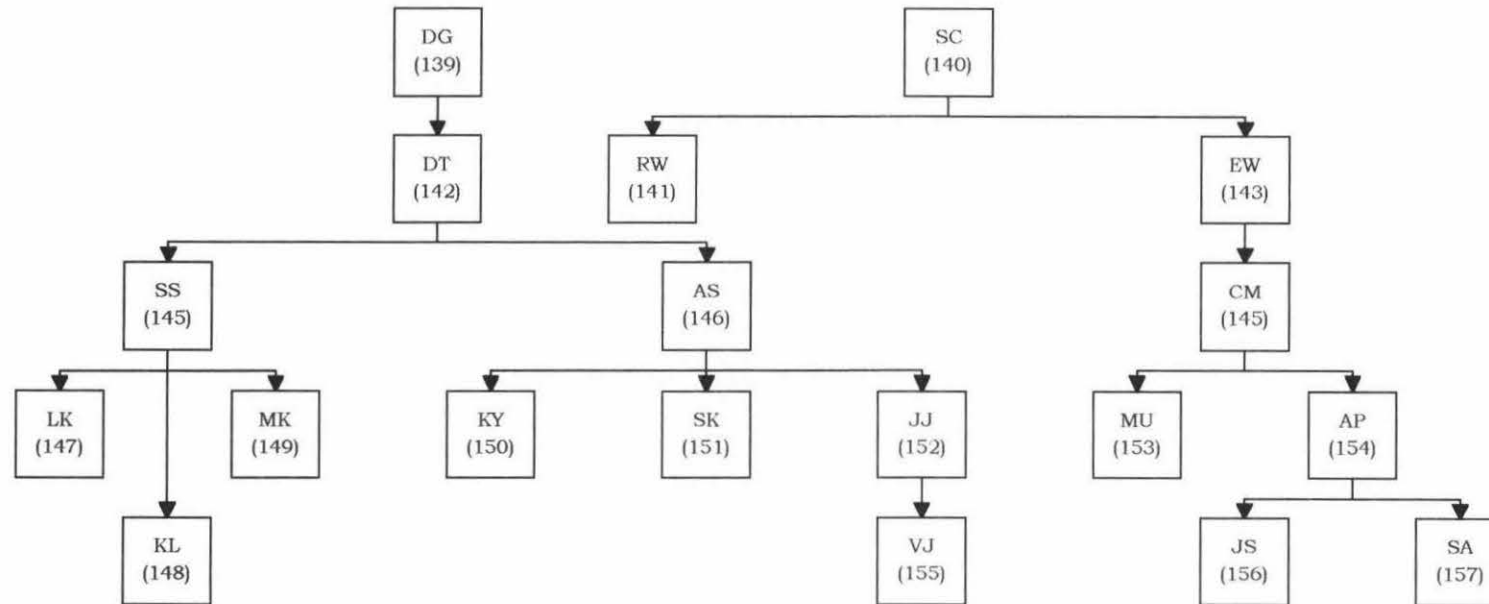
Organisation 8



Organisation 9



Organisation 10



APPENDIX E

Production Conversation

	AW001	BA002	DH003	DLD004	GD005	JR006	KF007	
AW001	9.99999968E+037		3	2	3	2	3	3
BA002	1	9.99999968E+037		3	1	1	3	1
DH003	2	2	9.99999968E+037		2	4	3	2
DLD004	3	3	2	9.99999968E+037		4	4	5
GD005	1	2	5	4	9.99999968E+037		3	2
JR006	2	2	3	2	2	9.99999968E+037		3
KF007	1	2	3	5	1	4	9.99999968E+037	
ML008	4	2	3	2	3	2	2	2
SR009	2	4	2	1	2	3	2	2
TS010	1	1	2	4	1	2	1	1
TB011	2	3	3	2	2	3	2	2
TB012	1	2	4	3	3	4	4	4
WK013	4	4	3	5	2	3	3	3
WS014	5	2	2	2	2	2	2	2

Production Conversation

ML008	SR009	TS010	TB011	TB012	WK013	WS014
	5	2	1	3	1	3
	2	4	1	2	1	3
	3	3	1	2	2	3
	2	2	4	3	3	4
	3	2	2	2	4	3
	1	3	2	2	4	1
	3	1	1	2	3	3
9.99999968E+037		2	2	2	1	3
1	9.99999968E+037		2	2	2	1
3		1	9.99999968E+037	3	5	2
1		2	4	9.99999968E+037	3	3
2		3	5	3	9.99999968E+037	3
1		3	3	4	2	9.99999968E+037
3		1	1	2	1	3
						9.99999968E+037

Social Acitivity Conversation

	AW001	BA002	DH003	DLD004	GD005	JR006	KF007	
AW001	9.99999968E+037		4	4	1	1	3	2
BA002	1	9.99999968E+037		3	1	1	1	1
DH003	2	2	9.99999968E+037		3	3	4	5
DLD004	1	2	4	9.99999968E+037		2	3	3
GD005	1	2	5	3	9.99999968E+037		3	3
JR006	2	2	4	2	2	9.99999968E+037		4
KF007	1	2	5	2	2	4	9.99999968E+037	
ML008	1	3	4	1	2	1		3
SR009	1	3	2	1	1	1		1
TS010	1	1	2	3	2	2		3
TB011	2	3	2	1	1	2		1
TB012	1	2	5	2	3	5		5
WK013	2	4	2	2	1	1		2
WS014	4	2	4	2	2	2		3

Social Activity Conversation

ML008	SR009	TS010	TB011	TB012	WK013	WS014
	2	3	3	3	1	2
	1	2	1	1	1	2
	2	3	4	1	1	2
	1	2	2	2	2	2
	2	1	4	1	3	2
	1	3	3	2	4	1
	2	2	4	1	3	2
9.99999968E+037		3	5	1	1	2
1	9.99999968E+037		1	2	1	2
2		1	9.99999968E+037	1	1	2
1		2	2	9.99999968E+037	1	2
2		1	4	3	9.99999968E+037	2
1		3	2	2	1	9.99999968E+037
2		2	2	1	1	2
						9.99999968E+037

APPENDIX F

RECODE

Input dataset: C:\Program Files\Ucinet 5\DataFiles Org 1 - NZ Post - Computer Services Dept\Work Conversation Abbrev
 Rows to recode: ALL
 Columns to recode: ALL
 Attributes to recode: ALL
 Output dataset: C:\Program Files\Ucinet 5\DataFiles Org 1 - NZ Post - Computer Services Dept\Recode

Recoding Schedule:

Values 1 to 2 recoded to 0
 Values 3 to 5 recoded to 1

Work Conversations NZ Post

		1	2	3	4	5	6	7	8	9	0	1	2	3	4
	A	B	D	D	G	J	K	M	S	T	T	T	W	W	
1	AW001		1	0	1	0	1	1	1	0	0	1	0	1	1
2	BA002	0		1	0	0	1	0	0	1	0	0	0	1	0
3	DH003	0	0		0	1	1	0	1	1	0	0	0	1	0
4	DLD004	1	1	0		1	1	1	0	0	1	1	1	1	0
5	GD005	0	0	1	1		1	0	1	0	0	0	1	1	0
6	JR006	0	0	1	0	0		1	0	1	0	0	1	0	0
7	KF007	0	0	1	1	0	1		1	0	0	0	1	1	0
8	ML008	1	0	1	0	1	0	0		0	0	0	0	1	1
9	SR009	0	1	0	0	0	1	0	0		0	0	0	0	0
10	TS010	0	0	0	1	0	0	0	1	0		1	1	0	0
11	TB011	0	1	1	0	0	1	0	0	0	1		1	1	0
12	TB012	0	0	1	1	1	1	1	0	1	1	1		1	0
13	WK013	1	1	1	1	0	1	1	0	1	1	1	0		1
14	WS014	1	0	0	0	0	0	0	1	0	0	0	0	0	1

Recoded data saved as dataset Recode

Running time: 00:00:01
 Output generated: 02 Dec 99 16:41:50
 Copyright (c) 1999 Analytic Technologies

FREEMAN'S DEGREE CENTRALITY MEASURES:

Diagonal valid? NO
 Model: SYMMETRIC
 Input dataset: C:\Program Files\Ucinet 5\DataFiles Org 1 - NZ Post - Computer Ser
 vices Dept\Recode

	1	2
	Degree	NrmDegree
1 AW001	8.00	61.54
2 BA002	7.00	53.85
3 DH003	9.00	69.23
4 DLD004	9.00	69.23
5 GD005	6.00	46.15
6 JR006	10.00	76.92
7 KF007	7.00	53.85
8 ML008	7.00	53.85
9 SR009	5.00	38.46
10 TS010	5.00	38.46
11 TB011	8.00	61.54
12 TB012	9.00	69.23
13 WK013	13.00	100.00
14 WS014	3.00	23.08

DESCRIPTIVE STATISTICS

	1	2
	Degree	NrmDegree
1 Mean	7.57	58.24
2 Std Dev	2.38	18.32
3 Sum	106.00	815.38
4 Variance	5.67	335.71
5 SSQ	882.00	52189.35
6 MCSSQ	79.43	4699.92
7 Euc Norm	29.70	228.45
8 Minimum	3.00	23.08
9 Maximum	13.00	100.00

Network Centralization = 48.72%

NOTE: For valued data, both the normalized centrality and the centralization index may be larger than 100%.

ector-by-centrality matrix saved as dataset FreemanDegree

CLOSENESS CENTRALITY MEASURES

Input dataset: C:\Program Files\Ucinet 5\DataFiles Org 1 - NZ Post - Computer Services Dept\Recode

WARNING: Data matrix symmetrized by taking the larger of X_{ij} and X_{ji} .

Closeness Centrality Measures

		1	2
		Farness	Closeness
1	AW001	18.00	72.22
2	BA002	19.00	68.42
3	DH003	17.00	76.47
4	DLD004	17.00	76.47
5	GD005	20.00	65.00
6	JR006	16.00	81.25
7	KF007	19.00	68.42
8	ML008	19.00	68.42
9	SR009	21.00	61.90
10	TS010	21.00	61.90
11	TB011	18.00	72.22
12	TB012	17.00	76.47
13	WK013	13.00	100.00
14	WS014	23.00	56.52

Statistics

		1	2
		Farness	Closeness
1	Mean	18.43	71.84
2	Std Dev	2.38	10.21
3	Sum	258.00	1005.70
4	Variance	5.67	104.29
5	SSQ	4834.00	73705.34
6	MCSSQ	79.43	1460.07
7	Euc Norm	69.53	271.49
8	Minimum	13.00	56.52
9	Maximum	23.00	100.00

Network Centralization = 63.19%

Output actor-by-centrality measure matrix saved as dataset C:\Program Files\Ucinet 5\DataFiles Org 1 - NZ Post - Computer Services Dept\FreemanCloseness

Running time: 00:00:01

Output generated: 02 Dec 99 16:56:39

Copyright (c) 1999 Analytic Technologies

FREEMAN BETWEENNESS CENTRALITY

input dataset: C:\Program Files\Ucinet 5\DataFiles Org 1 - NZ Post - Computer Services Dept\Recode

ARNING: Data matrix is NOT symmetric.
 (Nor will this procedure symmetrize them.)

	1	2
	Between	nBetween
1 AW001	5.93	3.80
2 BA002	6.59	4.23
3 DH003	9.00	5.77
4 DLD004	8.94	5.73
5 GD005	3.33	2.13
6 JR006	10.83	6.94
7 KF007	4.49	2.88
8 ML008	8.29	5.31
9 SR009	1.75	1.12
10 TS010	1.83	1.18
11 TB011	2.96	1.90
12 TB012	12.33	7.90
13 WK013	34.54	22.14
14 WS014	0.20	0.13

DESCRIPTIVE STATISTICS FOR EACH MEASURE

	1	2
	Between	nBetween
1 Mean	7.93	5.08
2 Std Dev	8.18	5.24
3 Sum	111.00	71.15
4 Variance	66.90	27.49
5 SSQ	1816.72	746.52
6 MCSSQ	936.65	384.88
7 Euc Norm	42.62	27.32
8 Minimum	0.20	0.13
9 Maximum	34.54	22.14

Network Centralization Index = 18.37%

output actor-by-centrality measure matrix saved as dataset FreemanBetweenness

running time: 00:00:01
 output generated: 02 Dec 99 17:00:19
 Copyright (c) 1999 Analytic Technologies

FREEMAN'S DEGREE CENTRALITY MEASURES:

agonal valid? NO
 Model: SYMMETRIC
 Input dataset: C:\Program Files\Ucinet 5\DataFiles Org 1 - NZ Post - Computer Ser
 ices Dept\Recode

	1	2
	Degree	NrmDegree
1 AW001	4.00	30.77
2 BA002	4.00	30.77
3 DH003	12.00	92.31
4 DLD004	8.00	61.54
5 GD005	6.00	46.15
6 JR006	7.00	53.85
7 JF007	5.00	38.46
8 ML008	7.00	53.85
9 SR009	4.00	30.77
10 TS010	8.00	61.54
11 TB011	4.00	30.77
12 TB012	7.00	53.85
13 WK013	7.00	53.85
14 WS014	3.00	23.08

DESCRIPTIVE STATISTICS

	1	2
	Degree	NrmDegree
1 Mean	6.14	47.25
2 Std Dev	2.29	17.65
3 Sum	86.00	661.54
4 Variance	5.27	311.56
5 SSQ	602.00	35621.30
6 MCSSQ	73.71	4361.79
7 Euc Norm	24.54	188.74
8 Minimum	3.00	23.08
9 Maximum	12.00	92.31

Network Centralization = 52.56%

NOTE: For valued data, both the normalized centrality and the centralization index may be larger than 100%.

actor-by-centrality matrix saved as dataset FreemanDegree

CLOSENESS CENTRALITY MEASURES

Input dataset: C:\Program Files\Ucinet 5\DataFiles Org 1 - NZ Post - Computer Services Dept\Recode

WARNING: Data matrix symmetrized by taking the larger of Xij and Xji.

Closeness Centrality Measures

		1 Farness	2 Closeness
		-----	-----
1	AW001	23.00	56.52
2	BA002	22.00	59.09
3	DH003	14.00	92.86
4	DLD004	18.00	72.22
5	GD005	20.00	65.00
5	JR006	19.00	68.42
7	JF007	21.00	61.90
8	ML008	19.00	68.42
9	SR009	22.00	59.09
0	TS010	18.00	72.22
1	TB011	23.00	56.52
2	TB012	19.00	68.42
3	WK013	19.00	68.42
4	WS014	23.00	56.52

Statistics

		1 Farness	2 Closeness
		-----	-----
1	Mean	20.00	66.12
2	Std Dev	2.45	9.28
3	Sum	280.00	925.64
4	Variance	6.00	86.05
5	SSQ	5684.00	62405.10
6	MCSSQ	84.00	1204.75
7	Euc Norm	75.39	249.81
8	Minimum	14.00	56.52
9	Maximum	23.00	92.86

Network Centralization = 59.99%

Output actor-by-centrality measure matrix saved as dataset C:\Program Files\Ucinet 5\DataFiles Org 1 - NZ Post - Computer Services Dept\FreemanCloseness

Running time: 00:00:01
 Output generated: 02 Dec 99 17:11:51
 Copyright (c) 1999 Analytic Technologies

RECODE

Input dataset: C:\Program Files\Ucinet 5\DataFiles Org 1 - NZ Post - Computer Services Dept\Innovation Conversation Abbrev
Rows to recode: ALL
Columns to recode: ALL
Variables to recode: ALL
Output dataset: C:\Program Files\Ucinet 5\DataFiles Org 1 - NZ Post - Computer Services Dept\Recode

Recoding Schedule:

Values 1 to 2 recoded to 0
Values 3 to 5 recoded to 1

WONE>

		1	2	3	4	5	6	7	8	9	0	1	2	3	4
	A	B	D	D	G	J	K	M	S	T	T	T	W	W	
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	AW001		0	0	1	0	1	0	1	0	0	0	0	0	1
2	BA002	0		1	0	0	0	0	0	1	0	0	0	1	0
3	DH003	0	0		0	1	1	1	1	1	1	1	0	0	0
4	DLD004	0	0	1		1	1	1	0	0	1	0	0	1	0
5	GD005	0	0	1	1		1	0	1	0	1	0	1	0	0
6	JR006	0	0	1	0	0		1	0	1	0	0	1	0	0
7	JF007	0	0	1	1	0	1		0	0	1	0	1	0	0
8	ML008	0	1	1	0	0	0	0		0	1	0	0	1	1
9	SR009	0	1	1	0	0	0	0	0		0	0	0	0	0
10	TS010	0	0	1	1	0	0	0	0	0		1	0	0	0
11	TB011	0	0	1	0	0	0	0	0	0	1		0	1	0
12	TB012	0	0	1	1	1	1	1	0	0	1	1		0	0
13	WK013	0	1	1	1	0	0	0	0	1	1	1	0		0
14	WS014	0	0	1	0	0	0	0	1	0	0	0	0	0	0

recoded data saved as dataset Recode

Running time: 00:00:01
Output generated: 02 Dec 99 17:04:15
Copyright (c) 1999 Analytic Technologies

FREEMAN BETWEENNESS CENTRALITY

Input dataset: C:\Program Files\Ucinet 5\DataFiles Org 1 - NZ Post - Computer Services Dept\Recode

WARNING: Data matrix is NOT symmetric.
 (Nor will this procedure symmetrize them.)

	1	2
	Between	nBetween
1 AW001	0.00	0.00
2 BA002	1.75	1.12
3 DH003	55.88	35.82
4 DLD004	11.17	7.16
5 GD005	5.95	3.81
6 JR006	8.47	5.43
7 JF007	4.78	3.07
8 ML008	19.98	12.81
9 SR009	2.75	1.76
10 TS010	3.54	2.27
11 TB011	2.25	1.44
12 TB012	3.53	2.26
13 WK013	8.59	5.51
14 WS014	0.36	0.23

DESCRIPTIVE STATISTICS FOR EACH MEASURE

	1	2
	Between	nBetween
1 Mean	9.21	5.91
2 Std Dev	13.89	8.91
3 Sum	129.00	82.69
4 Variance	193.02	79.32
5 SSQ	3890.97	1598.85
6 MCSSQ	2702.33	1110.42
7 Euc Norm	62.38	39.99
8 Minimum	0.00	0.00
9 Maximum	55.88	35.82

Network Centralization Index = 32.21%

Output actor-by-centrality measure matrix saved as dataset FreemanBetweenness

Running time: 00:00:01
 Output generated: 02 Dec 99 17:15:06
 Copyright (c) 1999 Analytic Technologies

RECODE

Input dataset: C:\Program Files\Ucinet 5\DataFiles Org 1 - NZ Post - Computer Services Dept\Social Activity Conversation Abbrev

Pows to recode: ALL

Columns to recode: ALL

Matrices to recode: ALL

Output dataset: C:\Program Files\Ucinet 5\DataFiles Org 1 - NZ Post - Computer Services Dept\Recode

Recoding Schedule:

values 1 to 2 recoded to 0
 values 3 to 5 recoded to 1

NONE>

		1	2	3	4	5	6	7	8	9	0	1	2	3	4
	A	B	D	D	G	J	K	M	S	T	T	T	W	W	
1	AW001		1	1	0	0	1	0	0	1	1	1	0	0	1
2	BA002	0		1	0	0	0	0	0	0	0	0	0	0	0
3	DH003	0	0		1	1	1	1	0	1	1	0	0	0	0
4	DLD004	0	0	1		0	1	1	0	0	0	0	0	0	0
5	GD005	0	0	1	1		1	1	0	0	1	0	1	0	0
6	JR006	0	0	1	0	0		1	0	1	1	0	1	0	0
7	KF007	0	0	1	0	0	1		0	0	1	0	1	0	0
8	ML008	0	1	1	0	0	0	1		1	1	0	0	0	0
9	SR009	0	1	0	0	0	0	0	0		0	0	0	0	0
10	TS010	0	0	0	1	0	0	1	0	0		0	0	0	0
11	TB011	0	1	0	0	0	0	0	0	0	0		0	0	0
12	TB012	0	0	1	0	1	1	1	0	0	1	1		0	0
13	WK013	0	1	0	0	0	0	0	0	1	0	0	0		0
14	WS014	1	0	1	0	0	0	1	0	0	0	0	0	0	0

recoded data saved as dataset Recode

Running time: 00:00:01
 Output generated: 02 Dec 99 17:19:08
 Copyright (c) 1999 Analytic Technologies

FREEMAN'S DEGREE CENTRALITY MEASURES:

 diagonal valid? NO
 Model: SYMMETRIC
 Input dataset: C:\Program Files\Ucinet 5\DataFiles Org 1 - NZ Post - Computer Ser
 ices Dept\Recode

		1	2
		Degree	NrmDegree
		-----	-----
1	AW001	7.00	53.85
2	BA002	6.00	46.15
3	DH003	11.00	84.62
4	DL004	5.00	38.46
5	GD005	6.00	46.15
6	JR006	8.00	61.54
7	KF007	8.00	61.54
8	ML008	5.00	38.46
9	SR009	6.00	46.15
10	TS010	8.00	61.54
11	TB011	3.00	23.08
12	TB012	6.00	46.15
13	WK013	2.00	15.38
14	WS014	3.00	23.08

DESCRIPTIVE STATISTICS

		1	2
		Degree	NrmDegree
		-----	-----
1	Mean	6.00	46.15
2	Std Dev	2.30	17.69
3	Sum	84.00	646.15
4	Variance	5.29	312.76
5	SSQ	578.00	34201.18
6	MCSSQ	74.00	4378.70
7	Euc Norm	24.04	184.94
8	Minimum	2.00	15.38
9	Maximum	11.00	84.62

Network Centralization = 44.87%

OTE: For valued data, both the normalized centrality and the centralization index may be larger than 100%.

centrality-by-centrality matrix saved as dataset FreemanDegree

CLOSENESS CENTRALITY MEASURES

Input dataset: C:\Program Files\Ucinet 5\DataFiles Org 1 - NZ Post - Computer Services Dept\Recode

WARNING: Data matrix symmetrized by taking the larger of Xij and Xji.

Closeness Centrality Measures

		1 Farness	2 Closeness
1	AW001	19.00	68.42
2	BA002	20.00	65.00
3	DH003	15.00	86.67
4	DLD004	23.00	56.52
5	GD005	21.00	61.90
6	JR006	18.00	72.22
7	KF007	19.00	68.42
8	ML008	21.00	61.90
9	SR009	20.00	65.00
10	TS010	19.00	68.42
11	TB011	24.00	54.17
12	TB012	21.00	61.90
13	WK013	30.00	43.33
14	WS014	24.00	54.17

Statistics

		1 Farness	2 Closeness
1	Mean	21.00	63.43
2	Std Dev	3.40	9.74
3	Sum	294.00	888.05
4	Variance	11.57	94.79
5	SSQ	6336.00	57658.62
6	MCSSQ	162.00	1327.10
7	Euc Norm	79.60	240.12
8	Minimum	15.00	43.33
9	Maximum	30.00	86.67

Network Centralization = 52.13%

Output actor-by-centrality measure matrix saved as dataset C:\Program Files\Ucinet 5\DataFiles Org 1 - NZ Post - Computer Services Dept\FreemanCloseness

Running time: 00:00:01
 Output generated: 02 Dec 99 17:24:58
 Copyright (c) 1999 Analytic Technologies

FREEMAN BETWEENNESS CENTRALITY

Input dataset: C:\Program Files\Ucinet 5\DataFiles Org 1 - NZ Post - Computer Services Dept\Recode

WARNING: Data matrix is NOT symmetric.
 (Nor will this procedure symmetrize them.)

	1	2
	Between	nBetween
1 AW001	3.17	2.03
2 BA002	24.00	15.38
3 DH003	44.32	28.41
4 DLD004	2.23	1.43
5 GD005	3.33	2.14
6 JR006	9.65	6.19
7 KF007	13.27	8.50
8 ML008	0.00	0.00
9 SR009	5.13	3.29
10 TS010	2.58	1.66
11 TB011	1.87	1.20
12 TB012	12.20	7.82
13 WK013	0.00	0.00
14 WS014	0.25	0.16

DESCRIPTIVE STATISTICS FOR EACH MEASURE

	1	2
	Between	nBetween
1 Mean	8.71	5.59
2 Std Dev	11.82	7.58
3 Sum	122.00	78.21
4 Variance	139.82	57.45
5 SSQ	3020.63	1241.22
6 MCSSQ	1957.49	804.36
7 Euc Norm	54.96	35.23
8 Minimum	0.00	0.00
9 Maximum	44.32	28.41

Network Centralization Index = 24.58%

Output actor-by-centrality measure matrix saved as dataset FreemanBetweenness

Running time: 00:00:01
 Output generated: 02 Dec 99 17:27:59
 Copyright (c) 1999 Analytic Technologies

APPENDIX G

Organisation 1

Production Conversation

Most Central

13 tertiary			
6 tertiary			
3 some tertiary	4 tertiary	12 tertiary	
1 tertiary	11 some tertiary		
2 post-graduate	7 tertiary	8 some tertiary	
5 some tertiary			
9 tertiary	10 tertiary		
14 some tertiary			

Least Central

Innovation Conversation

Most Central

3 some tertiary			
8 some tertiary	10 tertiary		
6 tertiary	8 some tertiary	12 tertiary	13 tertiary
5 some tertiary			
7 tertiary			
1 tertiary	2 post-graduate	9 tertiary	11 some tertiary
14 some tertiary			

Least Central

Social Activity Conversation

Most Central

3 some tertiary			
6 tertiary	7 tertiary	10 tertiary	
1 tertiary			
2 post-graduate	5 some tertiary	9 tertiary	12 tertiary
4 tertiary	8 some tertiary		
11 some tertiary	14 some tertiary		
13 tertiary			

Least Central

Males =	12
Females =	2
n =	14
Mean age =	30

APPENDIX H

Degree Centrality

Organisation 1

Production Conversation

Most Central

<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>	<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>	<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>			
13	M	38	mngr	tert	15+	6 to 10	0																
6	M	23	n/spvr	tert	1 to 5	1 to 5	0																
3	M	28	n/spvr	s/tert	1 to 5	1 to 5	2	4	M	33	spvr	tert	1 to 5	1 to 5	1	12	F	25	n/spvr	tert	1 to 5	1 to 5	2
1	M	36	spvr	tert	15+	1 to 5	0	11	M	47	spvr	s/tert	15+	15+	0								
2	M	35	mngr	p-g	15+	1 to 5	0	7	M	22	n/spvr	tert	1 to 5	1 to 5	0	8	M	36	n/spvr	s/tert	1 to 5	1 to 5	2
5	M	21	n/spvr	s/tert	up to 1	1 to 5	1																
9	M	36	spvr	tert	1 to 5	1 to 5	0	10	M	27	n/spvr	tert	1 to 5	1 to 5	1								
14	F	21	n/spvr	s/tert	1 to 5	1 to 5	2																

Least Central

Innovation Conversation

Most Central

<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>	<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>	<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>			
3	M	28	n/spvr	s/tert	1 to 5	1 to 5	2																
4	M	33	spvr	tert	1 to 5	1 to 5	1	10	M	27	n/spvr	tert	1 to 5	1 to 5	1								
6	M	23	n/spvr	tert	1 to 5	1 to 5	0	8	M	36	n/spvr	s/tert	1 to 5	1 to 5	2	12	F	25	n/spvr	tert	1 to 5	1 to 5	2
5	M	21	n/spvr	s/tert	up to 1	1 to 5	1																
7	M	22	n/spvr	tert	1 to 5	1 to 5	0																
1	M	36	spvr	tert	15+	1 to 5	0	2	M	35	mngr	p-g	15+	1 to 5	0	9	M	36	spvr	tert	1 to 5	1 to 5	0
14	F	21	n/spvr	s/tert	1 to 5	1 to 5	2																

Least Central

Degree Centrality

Social Activity Conversation

Most Central

<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>	<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>	<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>	<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>				
3	M	28	n/spvr	s/tert	1 to 5	1 to 5	2																								
6	M	23	n/spvr	tert	1 to 5	1 to 5	0	7	M	23	n/spvr	tert	1 to 5	1 to 5	0	10	M	27	n/spvr	tert	1 to 5	1 to 5	1								
1	M	36	spvr	tert	15+	1 to 5	0																								
2	M	35	mngr	p-g	15+	1 to 5	0	5	M	21	n/spvr	s/tert	up to 1	1 to 5	1	9	M	36	spvr	tert	1 to 5	1 to 5	0	12	F	25	n/spvr	tert	1 to 5	1 to 5	2
4	M	33	spvr	tert	1 to 5	1 to 5	1	8	M	36	n/suprv	s/tert	1 to 5	1 to 5	2																
11	M	47	spvr	s/tert	15+	15+	0	14	F	21	n/suprv	s/tert	1 to 5	1 to 5	2																
13	M	38	mngr	tert	15+	6 to 10	0																								

Least Central

Males = 12
 Females = 2
 n = 14
 mean age = 30

Organisation 1

Production Conversation

Most Central

	<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>		<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>		<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>
13	M	38	mngr	tert	15+	6 to 10	0																
6	M	23	n/spvr	tert	1 to 5	1 to 5	0																
3	M	28	n/spvr	s/tert	1 to 5	1 to 5	2	4	M	33	spvr	tert	1 to 5	1 to 5	1	12	F	25	n/spvr	tert	1 to 5	1 to 5	2
1	M	36	spvr	tert	15+	1 to 5	0	11	M	47	spvr	s/tert	15+	15+	0								
2	M	35	mngr	p-g	15+	1 to 5	0	7	M	22	n/spvr	tert	1 to 5	1 to 5	0	8	M	36	n/spvr	s/tert	1 to 5	1 to 5	2
5	M	21	n/spvr	s/tert	up to 1	1 to 5	1																
9	M	36	spvr	tert	1 to 5	1 to 5	0	10	M	27	n/spvr	tert	1 to 5	1 to 5	1								
14	F	21	n/spvr	s/tert	1 to 5	1 to 5	2																

Least Central

Innovation Conversation

Most Central

	<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>		<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>		<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>
3	M	36	n/spvr	s/tert	1 to 5	1 to 5	2																
4	M	33	spvr	tert	1 to 5	1 to 5	1	10	M	27	n/spvr	tert	1 to 5	1 to 5	1								
6	M	23	n/spvr	tert	1 to 5	1 to 5	0	8	M	36	n/spvr	s/tert	1 to 5	1 to 5	2	12	F	25	n/spvr	tert	1 to 5	1 to 5	2
5	M	21	n/spvr	s/tert	up to 1	1 to 5	1																
7	M	22	n/spvr	tert	1 to 5	1 to 5	0																
2	M	35	mngr	p-g	15+	1 to 5	0	9	M	36	spvr	tert	1 to 5	1 to 5	0								
1	M	36	spvr	tert	15+	1 to 5	0	11	M	47	spvr	s/tert	15+	15+	0	14	F	21	n/spvr	s/tert	1 to 5	1 to 5	2

Least Central

13 M 38 mngr tert 15+ 6 to 10 0

Closeness Centrality

Social Activity Conversation

Most Central

<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>		<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>		<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>	
3	M	28	n/spvr	s/tert	1 to 5	1 to 5	0																
6	M	23	n/spvr	tert	1 to 5	1 to 5	0																
1	M	36	spvr	tert	15+	1 to 5	0	7	M	22	n/spvr	tert	1 to 5	1 to 5	0	10	M	27	n/spvr	tert	1 to 5	1 to 5	1
2	M	35	mngr	p-g	15+	1 to 5	1	9	M	36	spvr	tert	1 to 5	1 to 5	0								
5	M	21	n/spvr	s/tert	up to 1	1 to 5	1	8	M	36	n/spvr	s/tert	1 to 5	1 to 5	2	12	F	25	n/spvr	tert	1 to 5	1 to 5	2
4	M	33	spvr	tert	1 to 5	15+	0																
11	M	47	spvr	s/tert	15+	6 to 10	0	14	F	21	n/spvr	s/tert	1 to 5	1 to 5	2								
13	M	38	mngr	tert	15+																		

Least Central

Males = 12
 Females = 2
 n = 14
 Mean age = 30

Organisation 1

Production Conversation

Most Central

	<u>Sex</u>	<u>Age</u>	<u>Position</u>	<u>Education</u>	<u>Tenure</u>	<u>Current</u>	<u>Previous</u>
					<u>(yrs)</u>	<u>Job</u>	<u>Job</u>
13	M	38	manager	tertiary	15+	6 to 10	0
12	F	25	non-supervisor	tertiary	1 to 5	1 to 5	2
6	M	23	non-supervisor	tertiary	1 to 5	1 to 5	0
3	M	25	non-supervisor	some tertiary	1 to 5	1 to 5	2
4	M	33	supervisor	tertiary	1 to 5	1 to 5	1
8	M	36	non-supervisor	some tertiary	1 to 5	1 to 5	2
2	M	35	manager	post-graduate	15+	1 to 5	0
1	M	36	supervisor	tertiary	15+	1 to 5	0
7	M	22	non-supervisor	tertiary	1 to 5	1 to 5	0
5	M	21	non-supervisor	some tertiary	up to 1	1 to 5	1
11	M	47	supervisor	some tertiary	15+	15+	0
10	M	27	non-supervisor	tertiary	1 to 5	1 to 5	1
9	M	36	supervisor	tertiary	1 to 5	1 to 5	0
14	F	21	non-supervisor	some tertiary	1 to 5	1 to 5	2

Least Central

Betweenness Centrality

Innovation Conversation

Most Central

	<u>Sex</u>	<u>Age</u>	<u>Position</u>	<u>Education</u>	<u>Tenure</u> (yrs)	<u>Current</u> <u>Job</u>	<u>Previous</u> <u>Job</u>
3	M	28	non-supervisor	some tertiary	1 to 5	1 to 5	2
8	M	36	non-supervisor	some tertiary	1 to 5	1 to 5	2
4	M	33	supervisor	tertiary	1 to 5	1 to 5	1
13	M	38	manager	tertiary	15+	6 to 10	0
6	M	23	non-supervisor	tertiary	1 to 5	1 to 5	0
5	M	21	non-supervisor	some tertiary	up to 1	1 to 5	1
7	M	22	non-supervisor	tertiary	1 to 5	1 to 5	0
10	M	27	non-supervisor	tertiary	1 to 5	1 to 5	1
12	F	25	non-supervisor	tertiary	1 to 5	1 to 5	2
9	M	36	supervisor	tertiary	1 to 5	1 to 5	0
11	M	47	supervisor	some tertiary	15+	15+	0
2	M	35	manager	post-graduate	15+	1 to 5	0
14	F	21	non-supervisor	some tertiary	1 to 5	1 to 5	2
1	M	36	supervisor	tertiary	15+	1 to 5	0

Least Central

Betweenness Centrality

Social Activity Conversation

Most Central

<u>Sex</u>	<u>Age</u>	<u>Position</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Current</u> Job	<u>Previous</u> Job	<u>Sex</u>	<u>Age</u>	<u>Position</u>	<u>Education</u>	<u>Tenure</u> (yrs)	<u>Current</u> Job	<u>Previous</u> Job		
3	M	28	non-supervisor	s/tert	1 to 5	1 to 5	2	8	M	36	non-supervisor	some tertiary	1 to 5	1 to 5	2
2	M	35	manager	p-g	15+	1 to 5	0								
7	M	22	non-supervisor	tert	1 to 5	1 to 5	0								
12	F	25	non-supervisor	tert	1 to 5	1 to 5	2								
6	M	23	non-supervisor	tert	1 to 5	1 to 5	0								
9	M	36	supervisor	tert	1 to 5	1 to 5	0								
5	M	21	non-supervisor	s/tert	up to 1	1 to 5	1								
1	M	36	supervisor	tert	15+	1 to 5	0								
10	M	27	non-supervisor	tert	1 to 5	1 to 5	1								
4	M	33	supervisor	tert	1 to 5	1 to 5	1								
11	M	47	supervisor	s/tert	15+	15+	0								
14	F	21	non-supervisor	s/tert	1 to 5	1 to 5	2								
13	M	38	manager	tert	15+	6 to 10	0								

Least Central

Males = 12
 Females = 2
 n = 14
 Mean age = 30

APPENDIX I

Organisation 1

Production Conversation

Most Central

	<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>		<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>
13	M	38	mngr	tert	15+	6 to 10	0								
6	M	23	n/spvr	tert	1 to 5	1 to 5	0								
9	M	36	spvr	tert	1 to 5	1 to 5	0	10	M	27	n/spvr	tert	1 to 5	1 to 5	1
14	F	21	n/spvr	s/tert	1 to 5	1 to 5	2								

Least Central

Innovation Conversation

Most Central

	<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>		<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>		<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>								
12	M	28	n/spvr	s/tert	1 to 5	1 to 5	2																								
4	M	33	spvr	tert	1 to 5	1 to 5	1	10	M	27	n/spvr	tert	1 to 5	1 to 5	1																
1	M	36	spvr	tert	15+	1 to 5	0	2	M	35	mngr	pg	15+	1 to 5	0	9	M	36	spvr	tert	1 to 5	1 to 5	2	11	M	47	spvr	s/tert	15+	15+	0
14	F	21	n/spvr	s/tert	1 to 5	1 to 5	0																								

Least Central

Degree Centrality

Social Activity Conversation

Most Central

<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>		<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>		<u>Sex</u>	<u>Age</u>	<u>Posn</u>	<u>Edn</u>	<u>Tenure</u> (yrs)	<u>Curr</u> <u>Job</u>	<u>Prev</u> <u>Jobs</u>	
3	M	28	n/spvr	s/tert	1 to 5	1 to 5	2																
6	M	23	n/spvr	tert	1 to 5	1 to 5	0	7	M	23	n/spvr	tert	1 to 5	1 to 5	0	10	M	27	n/spvr	tert	1 to 5	1 to 5	1
11	M	47	spvr	s/tert	15+	15+	0	14	F	21	n/spvr	s/tert	1 to 5	1 to 5	0								
13	M	38	mngr	tert	15+	6 to 10	0																

Least Central

Organisation 1

Production Conversation

Most Central

	<u>Sex</u>	<u>Age</u>	<u>Job</u>	<u>Education</u>	<u>Tenure (yrs)</u>	<u>Current Job</u>	<u>Prev Jobs</u>		<u>Sex</u>	<u>Age</u>	<u>Job</u>	<u>Education</u>	<u>Tenure (yrs)</u>	<u>Current Job</u>	<u>Prev Jobs</u>
13	M	38	mngr	tertiary	15+	6 to 10	0								
6	M	23	n/spvr	tertiary	1 to 5	1 to 5	0								
9	M	36	spvr	tertiary	1 to 5	1 to 5	2	10	M	27	n/spvr	tertiary	1 to 5	1 to 5	1
14	F	21	n/spvr	some tertiary	1 to 5	1 to 5	0								

Least Central

Innovation Conversation

Most Central

	<u>Sex</u>	<u>Age</u>	<u>Job</u>	<u>Education</u>	<u>Tenure (yrs)</u>	<u>Current Job</u>	<u>Prev Jobs</u>		<u>Sex</u>	<u>Age</u>	<u>Job</u>	<u>Education</u>	<u>Tenure (yrs)</u>	<u>Current Job</u>	<u>Prev Jobs</u>		<u>Sex</u>	<u>Age</u>	<u>Job</u>	<u>Education</u>	<u>Tenure (yrs)</u>	<u>Current Job</u>	<u>Prev Jobs</u>
3	M	36	n/spvr	some tertiary	1 to 5	1 to 5	2																
4	M	33	spvr	tertiary	1 to 5	1 to 5	1	10	M	27	n/spvr	tertiary	1 to 5	1 to 5	0								
2	M	35	mngr	post-graduate	15+	1 to 5	0	9	M	36	spvr	tertiary	1 to 5	1 to 5	2								
1	M	36	spvr	tertiary	15+	1 to 5	0	11	M	47	spvr	some tertiary	15+	15+	0	14	F	21	worker	some tertiary	1 to 5	1 to 5	0

Least Central

Closeness Centrality

Social Activity Conversation

Most Central

	<u>Sex</u>	<u>Age</u>	<u>Job</u>	<u>Education</u>	<u>Tenure</u>			<u>Sex</u>	<u>Age</u>	<u>Job</u>	<u>Education</u>	<u>Tenure</u>	<u>Current</u>	<u>Prev</u>
					(yrs)	(yrs)						(yrs)	<u>Job</u>	<u>Jobs</u>
3	M	28	n/spvr	some tertiary	1 to 5	1 to 5	2							
6	M	28	n/spvr	some tertiary	1 to 5	1 to 5	0							

11	M	47	spvr	some tertiary	15+	15+	0	14	F	21	n/spvr	some tertiary	1 to 5	1 to 5	0
13	M	38	mngr	tertiary	15+	6 to 10	0								

Least Central

Organisation 1

Production Conversation

Most Central

	<u>Sex</u>	<u>Age</u>	<u>Job</u>	<u>Education</u>	<u>Tenure</u>	<u>Current</u>	<u>Previous</u>
					<u>(yrs)</u>	<u>Job</u>	<u>Jobs</u>
13	M	38	manager	tertiary	15+	6 to 10	0
12	F	25	non-supervisor	tertiary	1 to 5	1 to 5	1

9	M	36	supervisor	tertiary	1 to 5	1 to 5	2
14	F	21	non-supervisor	some tertiary	1 to 5	1 to 5	0

Least Central

Innovation Conversation

Most Central

	<u>Sex</u>	<u>Age</u>	<u>Job</u>	<u>Education</u>	<u>Tenure</u>	<u>Current</u>	<u>Previous</u>
					<u>(yrs)</u>	<u>Job</u>	<u>Jobs</u>
3	M	28	non-supervisor	some tertiary	1 to 5	1 to 5	2
8	M	36	non-supervisor	some tertiary	1 to 5	1 to 5	2

14	F	21	non-supervisor	some tertiary	1 to 5	1 to 5	0
1	M	36	supervisor	tertiary	15+	1 to 5	0

Least Central

Betweenness Centrality

Social Activity Conversation

Most Central

<u>Sex</u>	<u>Age</u>	<u>Job</u>	<u>Education</u>	<u>Tenure</u> <u>(yrs)</u>	<u>Current</u> <u>Job</u>	<u>Previous</u> <u>Jobs</u>	<u>Sex</u>	<u>Age</u>	<u>Job</u>	<u>Education</u>	<u>Tenure</u> <u>(yrs)</u>	<u>Current</u> <u>Job</u>	<u>Previous</u> <u>Jobs</u>		
3	M	28	non-supervisor	some tertiary	1 to 5	1 to 5	2	8	M	36	non-supervisor	some tertiary	1 to 5	1 to 5	2
2	M	35	manager	post-graduate	15+	1 to 5	0								
14	F	21	non-supervisor	some tertiary	1 to 5	1 to 5	0								
13	M	38	manager	tertiary	15+	6 to 10	0								

Least Central

APPENDIX J

Organisation 1

Production Conversation

Degree

The most central actor is a member of management who has a tertiary qualification. The two staff members who are the next most central have strikingly similar demographic details with respect to length of service with the organisation and amount of time they have been in their respective jobs being equal. However, of most importance is the fact that they both hold a tertiary qualification but are of different gender.

The two third most central actors are both males, both of the actors are supervisors one of which has a tertiary qualification and the other has completed some study towards a university qualification. Both of these actors have been with the organisation for more than 15 years.

The least central actor is a female who has had some study towards a technical or university qualification which in terms of this organisation is the least amount of education. The next least central actors are both male, both have got a tertiary qualification and have been in the organisation for approximately the same amount of time performing the same job over this period. One of the second least central actors is in a non-supervisory role, whereas, the other is a supervisor.

The third least central actor is one of the youngest in this organisation and the one actor who has been with the organisation for the shortest period of time, less than one year. The three fourth least central actors are once again male. One of which has a post-graduate qualification and is a member of middle management. The other two actors have non-supervisory rank and file roles and have both been with the organisation for between 1 and 5 years. One of these actors has a tertiary qualification and one has completed some study towards a tertiary qualification.

Closeness

Exactly the same actors showing up as being most and least central in terms of degree centrality were the most and least central in terms of closeness.

Betweenness

In terms of betweenness the same actor in the organisation was revealed as being the most central. The second most central is a female non-supervisor with a tertiary qualification. The third most central actor is a male non-supervisor who has completed some study towards a tertiary qualification. The fourth most central actor is a male supervisor who has completed a tertiary qualification. The fifth most central actor is a non-supervisor who has also completed some study towards a tertiary qualification.

The least central actor also remains the same as for the previous measures. The second least central actor is the male supervisor with a tertiary qualification who is also second least central in the other measures. The third least central actor is a male non-supervisor who has completed a tertiary qualification. The fourth least central actor is a male supervisor who has completed some study towards a tertiary qualification. This actor has been with the organisation for more than 15 years having worked for no other organisations. The fifth least central actor is one of the youngest members of the sample from this organisation. This male actor has completed some study towards a tertiary qualification and has been with the organisation for the least amount of time.

There are three other members of the sample whose scores are below the mean. The sixth least central actor is a male non-supervisor who has obtained a tertiary qualification. The seventh least central actor is a male supervisor with a tertiary qualification. The eighth least central actor is a male member of middle management who has a post-graduate qualification. These last two actors are aged 36 and 35 respectively and have been with the organisation for more than 15 years.

Innovation Conversation

Degree

When it comes to conversations regarding new ideas the most central actor is a male in a non-supervisory role who has undertaken some technical or university study. This individual has been with the organisation for the same amount of time as a majority of the staff, between 1 and 5 years. The second most central actors are male, of similar age to the most central actor, and have been with the organisation for approximately the same amount of time. Both of these actors have also completed a tertiary qualification. There are four actors that scored as being the third most central. Three of these actors have non-supervisory roles in the organisation, two of which are male the other a female. One of the males and the female have completed a tertiary qualification, whereas, the other male non-supervisor has completed some study towards a tertiary qualification. The other third most central actor is a male member of management who has obtained a tertiary qualification.

The least central actor is the same actor as for production conversation who is one of the least qualified and also one of the youngest in the organisation. There are four actors who are second most central all of which are male. Three occupy supervisory positions, two have tertiary qualifications, the other one has completed some study. The other actor is a member of management who has a post-graduate qualification. A majority of these actors have been with the organisation for 15+ years. However, one supervisor has only been with the organisation between 1 and 5 years. The third least central actor is a male non-supervisor who has obtained a tertiary qualification. The fourth least central actor is another male non-supervisor who has completed some study towards a tertiary qualification. This actor is one of the youngest in the organisation and has been with the organisation for the least amount of time.

Closeness

In terms of closeness the three most central actors are, once again, the same as for degree except all actors have the same score and are equally central. Two actors score as being the fourth most central. One of these is a male member of management who has a post-graduate qualification. The other fourth most central actor is

a male supervisor who has obtained a tertiary qualification. The fifth most central actor is a male non-supervisor with a tertiary qualification.

The least central actor is also the same as for degree. Two actors occupy the position of being the second least central. Both men have a tertiary qualification but one is a supervisor and the other is a non-supervisor. Four actors scored as being the third least central. These are the four same actors that scored as being the third most central for degree.

There is one actor who has a score the same as the mean. This is the male non-supervisor who has completed some study towards a tertiary qualification and who is one of the youngest in the organisations' sample. This actor could either be classed the sixth most central or the fourth least central.

Betweenness

The most central actor once again remains the same as for the other two measures of centrality when innovative conversations are taken into account. The second most central actor changes with the introduction of a new actor. This individual, like the most central actor, is male who has a non-supervisory role and has completed some of a technical or university qualification. The third most central actor is a supervisor who has a tertiary qualification.

The least central actor changes to a male supervisor who has completed a technical or university qualification. This actor has a zero score which indicates that the actor does not lie between any other actors. The previously least central actor, a female non-supervisor with some tertiary study, is the second least central. The third least central actor is a male member of management who has a post-graduate qualification. A male supervisor who has completed some study towards a tertiary qualification is the fourth least central actor. The fifth least central actor is a male supervisor who has a tertiary qualification. The sixth least central actor is a female non-supervisor who has a tertiary qualification. This actor's score is followed very closely by the seventh least central actor who is a male non-supervisor who also has a tertiary qualification. The only difference between these last two actors is gender and the fact that the sixth least central actor is two years younger than the seventh.

The eighth least central actor is also a male non-supervisor who has a tertiary qualification and the ninth least central actor is the male non-supervisor who has completed some study towards a tertiary qualification. This actor is one of the youngest and has been with the organisation for the least amount of time. The tenth least central actor is a male manager who has a tertiary qualification.

Social Activity Conversation

Degree

The most central actor is the same as for the degree centrality measure of innovation conversation, a male non-supervisor with a tertiary qualification. There are three actors occupying the position of second most central. All are male, have a tertiary qualification, perform a non-supervisory role and are of similar age and very similar tenure. The fourth most central actor is a male supervisor who also has a tertiary qualification.

In terms of the least central a new actor takes this position. This male is a member of management who has a tertiary qualification. Two actors occupy the position of second least central. Both have completed some tertiary education but their age and length of service is markedly different. The two third least central actors are both male and have a tertiary qualification. One is a supervisor and the other is a non-supervisor. Both have been with the organisation for between 1 and 5 years.

There are four actors who have the same score as the mean. They can either be scored as being the fifth most central or the fourth least central. Two of these actors have non-supervisory roles. One is a female who has a tertiary qualification and the other is the male who has been with the organisation for the least amount of time and who has completed some study towards a tertiary qualification. One of the other actors is a male supervisor who has a tertiary qualification and the other is a male member of management who has a post-graduate qualification.

Closeness

Once again the most central actor for closeness is the same as for degree, a male non-supervisor who has completed some study towards a tertiary qualification. The second most central actor is a male non-supervisor who has a tertiary qualification. Three actors occupy the position of third most central. They have similar demographic characteristics in that they are of the same gender, have the same level of education, but have different roles and have been in their present job for different amounts of time. Two actors take the position of being the fourth most central. They are of similar age but one has a supervisory role and a post-graduate qualification and the other a supervisory role and a tertiary qualification.

The least and second least central actors are the same as for degree with a tertiary qualified manager occupying the position of being the least central and two semi-qualified actors being the second least central actors. One of these actors is female and has a non-supervisory role, whereas, the other is a male supervisor. The third least central actor is a male supervisor who has a tertiary qualification.

Three actors have the same score as the mean. Two of these actors are the same as for degree, the partially qualified male non-supervisor who has been with the organisation for the least amount of time and the female non-supervisor who has a tertiary qualification. The other actor who has the same score is a male non-supervisor who has completed some study towards a tertiary qualification.

Betweenness

When it came to a measure of betweenness the most central actor is the same as for degree and closeness for social activity conversations and for innovation conversations. This actor occupies a non-supervisory position and has completed some study towards a tertiary qualification. The second most central actor is an organisational member who up until now has tended to indicate being in the mainstream of the organisation. That is, not occupying a position that is either central or non-central. The second to most central actor is a male member of management who holds a post-graduate qualification and is the most highly qualified person in the organisation. The third most central actor is the same as the third to most central for degree, a male non-

supervisor who has a tertiary qualification. The fourth most central actor is another non-supervisor who has a tertiary qualification, except this actor is female. The fifth most central actor is a male, tertiary qualified non-supervisor.

The two least central actors have a zero score. One is a male member of management with a tertiary qualification and the other is a male non-supervisor who has completed some study towards a tertiary qualification. The second least central actor is a female non-supervisor who has completed some study towards a tertiary qualification. This actor has predominantly been the least central or second to least central in all measures which is significant as this actor is one of the only two females in the organisation. The third least central actor is a male supervisor who has completed some study towards a tertiary qualification. The fourth least central actor is a male supervisor with a tertiary qualification and the fifth least central is a non-supervisor with a tertiary qualification. The sixth least central actor is a male supervisor with a tertiary qualification and the seventh least central actor is the male partially qualified non-supervisor who has been with the organisation for the least amount of time. The eighth least central actor is a male supervisor who has a tertiary qualification.

Across all measures it can be observed that:-

- The most central actor was **3** 66.66% of the time 100% time for innovation and social activity conversations.
- **13** was the most central actor 33.33% of the time 100% for production conversations and the least central actor 33.33% of the time 100% for social activity conversation.
- The second most central position was occupied by **6** 44.44% of the time for production conversation degree and closeness and social activity conversation degree and closeness.
- **10** was also the second most central actor 33.33% of the time for innovation degree and closeness and social activity degree.
- **4** was the second most central actor 22.22% of the time for innovation conversation degree and closeness.
- **12** was the second most central actor 11.11% of the time for production conversation betweenness.

- **8** was the second most central actor 11.11% of the time for innovation conversation betweenness.
- **2** was the second most central actor 11.11% of the time for social activity conversation betweenness.
- The least central actor was **14** 55.55% of the time 100% for production conversation and degree and closeness for innovation conversation. When it comes to being the second most central actor **14** was 33.33% of the time for innovation conversation betweenness and social activity conversation degree and closeness.
- **1** was the least central actor 11.11% of the time for innovation conversation betweenness and the second least central actor 22.22% of the time for innovation conversation degree and closeness.
- **9** was the second least central actor 44.44% of the time 100% for production conversation and for innovation conversation degree.
- **11** was the second least central actor 44.44% of the time for degree and closeness of innovation conversation and degree and closeness of social activity conversation.
- **10** was the second least central actor 22.22% of the time for degree and closeness of production conversations.
- **8** was the second least central actor 11.11% of the time for betweenness of social activity conversations.
- **2** was the second least central actor 11.11% of the time for innovation conversation degree.

There are only two actors that did not feature as being either the two most or two least central in all of the measures. They are both male and make up part of the 12 male members out of the 14 members of the organisation. They are 21 and 22 years of age, whereas, the mean age is 30. The 21 year old actor has been with the organisation for less than one year having previously completed some tertiary study. The 22 year old has been with the organisation between 1 and 5 years and has completed a tertiary qualification. They both hold non-supervisory jobs with this being the only organisation they have worked for.

Organisation 2

Production Conversation

Degree

Two actors occupy the position of being the most central, both are male members of management, one has a post-graduate qualification and the other has a tertiary qualification. The second most central actors are a male member of middle management with a post-graduate qualification and a female non-supervisor who has university entrance. The actors that occupy management roles have been with the organisation for numerous years, whereas, the female non-supervisor has only been with the organisation for less than one year.

The least central actors are a female non-supervisor who has a tertiary qualification and a male supervisor who also has a tertiary qualification. The female non-supervisor is one of the youngest in the organisation and has been with the organisation less than one year. The male second least central actor is a supervisor with a post-graduate qualification who has also been with the organisation for less than one year.

Closeness

Exactly the same actors that showed up as being the most and least central in terms of degree centrality were the most and least central in terms of closeness.

Betweenness

The most central actor is one of the actors that was the most central for degree and closeness. This male member of management has a tertiary qualification. The second most central is also one of the actors that was the most central for degree and closeness. This male actor is a manager who has a post graduate qualification. These men are both in their 30's and above the mean age of 28.2.

The least central actor is also the same as for degree and closeness, a female non-supervisor with a tertiary qualification, who has been with the organisation for less than one year. The

second most central actor is a male supervisor with a post-graduate qualification who has been with the organisation between 1 and 5 years.

Innovation Conversation

Degree

When it comes to conversations regarding new ideas there are two most central actors, a male supervisor who has a post-graduate qualification and the male manager who also has a post-graduate qualification. The two second most central actors are also male and occupy management positions. They are of similar age, both have a tertiary qualification, although, one has a post-graduate degree.

The least central actor is the same as for all measures of centrality for production conversations. Once again, this woman has a tertiary qualification but has been with the organisation for less than 12 months. The second least central actor has appeared before in production conversation measures. This actor is a male supervisor who has a post-graduate tertiary qualification.

Closeness

The most central actor is the same as for degree, a supervisor with a post-graduate qualification. The second most central actors are the same as for degree, both being male members of management with a post-graduate or graduate qualification.

The least central actor is the same as for degree and for the measures for production conversation, a young female non-supervisor. The second least central actor has also appeared in the measures up until now, a male supervisor with tertiary qualification.

Betweenness

The position of most central actor is held by the manager who has a post-graduate qualification. This actor has predominantly taken the role of second to most central. The second most central actor is a male manager with a tertiary qualification.

One of the two least central actors is once again the same as for all of the other measures. Several reasons could exist for this result which include, the fact that this is her first job, she is one of the youngest in the organisation and she has only been with the organisation for less than one year. The other least central actor has not scored significantly in the measures up until now. She has a tertiary qualification and has been with the organisation between 1 and 5 years and has a non-supervisory role. The second least central actor has a supervisory role and a post-graduate tertiary qualification and has been in their current job for less than one year.

Social Activity Conversation

Degree

The most central actor is the same as for innovation conversation degree centrality. This actor is a male supervisor who has a post-graduate qualification. One of the second most central actors has a tertiary qualification and holds a position as supervisor. The other, second equal, least central actor is a female secretary with school certificate as her highest qualification.

The least central actor is the same as for all other measures. The second least central actor is a male supervisor who has a post-graduate tertiary qualification.

Closeness

The most central actor is the same as for innovation conversation degree and closeness of and social activity conversation degree. This actor is a male supervisor who has a post-graduate qualification. The second most central actors comprise a male supervisor with a tertiary qualification and a female non-supervisor, secretary, who has school certificate as her highest qualification.

The least central actor is the same as for all other measures. The second least central actor is the same as for degree, a male supervisor who has a tertiary qualification. The third least central actor is also a male supervisor who has a tertiary qualification. These three actors are the same as for innovation conversation closeness.

Betweenness

The most central actor is a male member of middle management with a tertiary qualification who has traditionally taken the role of being the second most central actor. The second most central actor is a male supervisor who has a post-graduate tertiary qualification.

Three actors occupy the position of being the least central actor. The female non-supervisor who features in all of the other measures, and two male supervisors with tertiary qualifications, one with a post-graduate qualification.

Across all measures it can be observed that:-

- The most central actor was **11** 44.44% of the time for innovation conversation degree and closeness and social activity conversation degree and closeness. **11** was also the second most central character 11.11% of the time for social activity conversation betweenness.
- **2** was the most central actor 33.33% of the time 100% for production conversations.
- **1** was the most central actor 44.44% of the time for production conversation degree and closeness and innovation conversation degree and betweenness. **1** was the second most central actor for work conversation betweenness.
- **4** was the most central actor 11.11% of the time for social activity conversation betweenness and the second most central actor 33.33% of the time for 100% for innovation conversation.
- When it comes to being the second most central actor **3** was 44.44% of the time for production conversation and innovation conversation degree and closeness.
- **12** was the second most central actor 22.22% of the time for innovation conversation degree and closeness.
- **16** was the second most central actor 22.22% of the time for production conversation degree and closeness.

- **5** was the second most central actor 22.22% of the time for social activity conversation degree and closeness.
- The least central actor was **15** for every single measure.
- **10** was the least central actor 33.33% of the time for production conversation degree and closeness and social activity betweenness.
- **7** was the least central actor 11.11% of the time for innovation conversation betweenness and the second least central actor 11.11% of the time for social activity betweenness.
- **14** was the least central actor 11.11% of the time for social activity conversation betweenness and the second least central actor 66.66% of the time for production conversation betweenness, 100% for innovation conversation and for social activity conversation degree and closeness.
- **9** was the second most central actor 11.11% of the time for production conversation degree and closeness.
- **13** was the second most central actor 11.11% of the time for production conversations closeness.

Once again, there are only two actors that did not feature as being either the two most or the two least central in all of the measures. They are both female and make up part of the 6 female members out of the 16 members of the organisation. They are 25 and 28 years of age, whereas, the mean age is 28. The 25 year old actor has been with the organisation for less than one year having previously completed a tertiary qualification. The 28 year old has been with the organisation between 1 and 5 years and has school certificate as her highest qualification. They both hold non-supervisory, secretarial, jobs and have worked for more than two other organisations

Organisation 3

Production Conversation

Degree

The most central actor is a female member of management who has a tertiary qualification. The second most central actor is another female whose highest qualification is school certificate and who occupies a non-supervisory role. Both of these women are of similar age and have been with the organisation for between 1 to 5 years.

The least central actor is a female non-supervisor who has been with the organisation for between 1 and 5 years and has school certificate as her highest qualification. The second least central actors vary in age, qualifications and tenure. Two of the women, aged 16 and 22, have school certificate as their highest qualification with the other, aged 33, has completed some tertiary study. They vary in the amount of time they have been with the organisation between less than one year and between 6 to 10 years for the women who have attained school certificate and 1 to 5 years for the supervisor.

Closeness

The most central actor is the same as the most central actor for degree, a male supervisor with a tertiary qualification. The second most central actor is also the same as the second most central actor for degree, a female supervisor who has university entrance as her highest qualification.

The least central actor is the same as for degree, a female non-supervisor who has school certificate as her highest qualification. The three actors who are the second most central in terms of degree are the same three actors who are the second least central for closeness.

Betweenness

The most central actor is the female member of management who has a tertiary qualification and is the most central for degree and closeness. The second most central actor is a supervisor who has university entrance as her highest qualification.

The least central actor is the male manager who has a tertiary qualification. The second least central actor is a female supervisor who has university entrance as her highest qualification.

Innovation Conversation

Degree

The most central actor is the same as for degree and betweenness for production conversations, a female member of management who holds a tertiary qualification. There are two second most central actors. One is the female supervisor who was also the second most central for closeness and betweenness for production conversations. This actor is a female supervisor who has university entrance as her highest qualification. The other is a female who holds a non-supervisory role and has school certificate as her highest qualification.

The least central actor is the same as for degree and closeness for production conversation, a female that has school certificate as her highest qualification and who holds a non-supervisory role. Once again, there are three second least central actors. They are all women who vary in age and education. One actor has school certificate, one university entrance and the other one has completed some study towards a tertiary qualification. All women have been with the organisation for between 1 and 5 years.

Closeness

The actors identified as being most and least central for degree are exactly the same for closeness. A female graduate takes the position of the most central and the least central is taken up by a female non-supervisor who has school certificate as her highest qualification.

Betweenness

Once again, the most central actor is the same as for production conversation and degree and closeness for innovation conversation. This actor is a female member of middle management who has a university qualification. The second most central actor is a female supervisor who has done some study towards a university qualification.

Three actors are least central all of which have a score of zero. They vary in age, are non-supervisors and have school certificate or university entrance as their highest qualification. The second least central actor is also a female non-supervisor who has school certificate as her highest qualification.

Social Activity Conversation

Degree

The most central actor is the same as for all previous measures the female member of management who has a tertiary qualification. The second most central actor is also a women who holds a non-supervisory job and has school certificate as her highest qualification.

The least central actor is the male who occupies the management position. This actor has a tertiary qualification and is also one of three males in the organisation. The second least central is a women who holds a non-supervisory jobs and who has school certificate as her highest qualification.

Closeness

The most and least central actors are exactly the same as for degree with members of management occupying the positions of being the most and least central. The second most and least central positions are taken up by non-supervisors who have school certificate as their highest qualification.

Betweenness

As with the other measures for social activity conversation the most and least central actors are the same. The second most and least central positions are made up of non-supervisors who have school certificate as their maximum educational qualification.

Across all measures it can be observed that:-

- The most central actor was **32** 100% of the time for production conversation, innovation conversation and social activity conversation.

- When it comes to being the second most central actor **45** was 55.55% of the time for production conversation degree and closeness and 100% for social activity conversation.
- **34** was the second most central actor 33.33% of the time for production conversation betweenness and for innovation conversation degree and closeness.
- **41** was the second most central actor 22.22% of the time for innovation conversation degree and closeness.
- **36** was the second most central actor 11.11% of the time for innovation conversation betweenness and the second least central actor 22.22% of the time for production conversation degree and closeness.
- The least central actor was **44** 44.44% of the time for production conversation degree and closeness and innovation conversation degree and closeness and the second least central actor 22.22% of the time for production conversation betweenness and innovation conversation betweenness.
- **31** was the least central actor 44.44% of the time for production conversation betweenness and 10% of the time social activity conversation degree.
- **38** was the least central actor 11.11% of the time for betweenness of innovation conversation.
- **39** was the least central actor 11.11% of the time for betweenness of innovation conversation and the second least central actor 22.22% of the time for production conversation degree and closeness.
- **42** was the least central actor 11.11% of the time for innovation conversation betweenness and the second least central actor 22.22% of the time for innovation conversation degree and closeness.
- The most prominent second least central actor was **40** 55.55% of the time for production conversation degree and closeness and 100% for the measures for social activity conversation.

- **37** was the second least central actor for innovation conversation degree and closeness.

There are only three actors out of the sample of 15 that did not feature as being either the two most or two least central in all of the measures. Two of these actors are male and make up part of the 3 male members of the organisation. They are 22 and 25 years of age whereas, the mean age is 27. The 22 year old actor has been with the organisation for less than one year having previously worked for one other organisation. They have both completed a tertiary qualification. The 25 year old has been with the organisation between 1 and 5 years and has also been in their current job for less than one year. This actor is a member of management and has completed some study towards a tertiary qualification.

The other actor that did not feature as being either the two most or two least central in all of the measures is one of the 12 females in the organisation. This actor is 23 and has been with the organisation for between 1 and 5 years. She has worked for one other organisation to date and has completed some study towards a tertiary qualification.

Organisation 4

Production Conversation

Degree

The two most central actors are supervisors in the organisation who have completed some study towards a tertiary qualification. Both of these women have been with the organisation for between 11 and 15 years. The second most central actor has completed a tertiary qualification and has a non-supervisory role which in this organisation denotes being a tutor.

The least central actor is in a non-supervisory role, has a tertiary qualification and has been with the organisation for between 6 and 10 years. The second least central actor also has a non-supervisory role, has a tertiary qualification, is a very similar age to the least central actor and has also been with the organisation and in their job for between 6 and 10 years.

Closeness

The most and least central actors for closeness are exactly the same as those exhibited for degree.

Betweenness

The most central actor is one of the most central for degree and closeness, a supervisor with some study towards a tertiary qualification. This actor has a significantly higher result than the next actor, being nearly three times their score. The second most central actor is the other most central actor to date. This actor is also a female supervisor who has completed some study towards a tertiary qualification.

The least central actors are exactly the same as for degree and closeness, a female non-supervisor with a tertiary qualification. The second least central actor is also a female non-supervisor with a tertiary qualification.

Innovation Conversation

Degree

The most central actor is a female who has a non-supervisory role in the organisation and has completed some study towards a tertiary qualification. This actor is one of the oldest in the organisation. The second most central actor is also a female who has a supervisory role and who has completed some study towards a tertiary qualification. Both actors have been with the organisation for between 11 and 15 years but in their respective jobs for varying amounts of time.

The least central actor is a female who has a non-supervisory role within the organisation. This actor has completed a tertiary qualification. The second least central actors are of very similar age to the least central actor and to each other. They have all been with the organisation for approximately the same amount of time, between 6 and 10 years. They also occupy non-supervisory roles with one having a tertiary qualification and one having completed some study towards a tertiary qualification.

Closeness

The actors that took on the roles of being the most and least central for degree are the same for closeness.

Betweenness

The most central actor for degree and closeness is the same for betweenness. This actor is a female non-supervisor who has completed some study towards a tertiary qualification. The second most central actor is a female non-supervisor who has a tertiary qualification.

The least central actor and the two least central actors for degree and closeness are the same for betweenness.

Social Activity Conversation

Degree

The most central actor is a female supervisor who has completed some study towards a tertiary qualification. The second most

central actor also has a supervisory role and has also completed some study towards a tertiary qualification. Both of these women have been with the organisation for approximately the same amount of time.

The least central actor is the female who is the only member of management. This actor has been with the organisation for 15+ years and has school certificate as her highest qualification. The second least actor is also a woman who has figured prominently in all least central measures, she is a non-supervisor who has a tertiary qualification.

Closeness

The actor that measured the most central is the same as for degree, a female supervisor who has completed some study towards a tertiary qualification. The second most central actor is a female who has a non-supervisory role and has also completed some study towards a tertiary qualification.

The actors that indicated the least centrality are exactly the same as for degree.

Betweenness

The most central actor is the same as for degree and closeness. The second most central actor is a non-supervisor who has completed some study towards a tertiary qualification. The third most central actor is a supervisor who has also completed some study towards a tertiary qualification.

The two actors that indicated the least centrality are exactly the same as for degree and closeness except these actors are equally the least central, they both have a zero score. These actors are both female and occupy positions that are non-supervisory and managerial. The manager has school certificate as her highest qualification and the non-supervisor (tutor) has a tertiary qualification. The second least central actor is a female non-supervisor who has completed a tertiary qualification.

Across all measures it can be observed that:-

- The most central actor was **49** 55.55% of the time for production conversation degree and closeness and 100% for social activity conversation. **49** was also the second most

central actor 11.11% of the time for production conversation betweenness.

- **59** was the most central actor 33.33% of the time 100% for innovation conversation and the second most central actor 33.33% of the time for social activity conversation.
- **47** was the most central actor 33.33% of the time 100% for production conversation and second most central 44.44% of the time for innovation conversation degree and closeness and for social activity conversation degree and closeness.
- **54** was the second most central actor 22.22% of the time for production conversation degree and closeness.
- **53** was the second most central actor 11.11% of the time for innovation conversation betweenness.
- The least central actor was **52** 44.44% of the time 100% for production conversation and for social activity conversation betweenness. **52** was also the second least central actor 44.44% of the time for innovation conversation degree and closeness and social activity conversation degree and closeness.
- **51** was the least central actor 33.33% of the time 100% for innovation conversation and also the second least central actor 33.33% of the time 100% for production conversation.
- **46** was the least central actor 33.33% of the time 100% for social activity conversation.
- **57** was the second least central actor 33.33% of the time 100% for innovation conversation.
- **60** was the second least central actor 11.11% of the time for social activity betweenness.

Out of the sample of 16 there are 5 actors who did not feature as being either the two most or two least central in all of the measures. As there are no males in this sample all of the actors that did not appear on the extreme measures are female. Five of these actors are either equivalent to or over the mean age which is 43 years. One actor's age is below the mean.

Five of these actors are tutors within the organisation occupying non-supervisory roles. Two of which have a tertiary qualification and three having completed some study towards a tertiary qualification. The other actor is a supervisor who has university entrance as her highest qualification. When length of service with the organisation is taken into account and length of time in their current job there is very little similarity amongst the group. Time varies from less than one year to 15+ years indicating no apparent significance.

Organisation 5

Production Conversation

Degree

The most central actor is a male supervisor who has university entrance as his highest qualification. The second most central actors both have an equal score and are both females who have non-supervisory roles and school certificate as their highest qualification. All of these actors have been with the organisation and in their present jobs for approximately the same amount of time and are a similar age.

The three least central actors all have the same score and are all females with non-supervisory roles. These women are all aged between 19 and 23 and hold university entrance as their highest qualification. There are two second least central actors. Both are female, one has a supervisory role and has university entrance as her highest qualification. Whereas, the other has a non-supervisory role and has school certificate as her highest qualification.

Closeness

The two most and two least central actors identified for degree are exactly the same for closeness and the three least central actors once again have the same score.

Betweenness

The most central actor is a female supervisor who has university entrance as her highest qualification. The second most central actor has a non-supervisory role and school certificate as her highest qualification. This actor has also featured as being second most central for degree and closeness.

Innovation Conversation

Degree

The most central actor is a male supervisor who has university entrance as his highest qualification. The second most central

actor is also a male who has a non-supervisory role in the organisation and has school certificate as his highest qualification.

The least central actors are the same actors that scored most central and least central for production conversation betweenness. Both are female one is a non-supervisor, who has school certificate as her highest qualification, and the other is a supervisor with university entrance as her highest qualification. The second least central actor is a female non-supervisor who also has university entrance as her highest qualification. All of these actors are aged between 19 and 24 years.

Closeness

The most central actors are exactly the same as for degree. The least central actor is one of the same as for degree, a female supervisor whose highest qualification is university entrance. The second most central actors are both female non-supervisors. One has school certificate as her highest qualification and one has university entrance as her highest qualification.

Betweenness

The most central actor is the same as for production conversation degree and closeness and for innovation conversation degree and closeness, a male supervisor with university entrance. The second most central actor is a female supervisor also with university entrance.

Five least central actors all have a zero score. They are all female, three of them have non-supervisory roles, two have school certificate as their highest qualification and one has university entrance. The other two are a male and a female supervisor with university entrance as their highest qualification. These actors range between 20 and 24 in age. The second least central actor is a female non-supervisor who has university entrance as her highest qualification.

Social Activity Conversation

Degree

The most central actor is the same female supervisor as for innovation conversation betweenness. This actor has a non-

supervisory role and has school certificate as her highest qualification. The next five most central actors all have the same score. The group is comprised of four female non-supervisors four of which have school certificate and one has university entrance. All of which are either 20 or 21 years of age. The other actor is a male supervisor with university entrance as his highest qualification.

The three least central actors all have the same score. Two are female supervisors who have university entrance and have been with the organisation and in their present job for approximately the same amount of time. The other is a male non-supervisor who has school certificate as his highest qualification. The second least central actor is a male supervisor who has university entrance as his highest qualification and is in the same age group as the other least central actors.

Closeness

The scores for closeness are exactly the same as for degree.

Betweenness

The most central actor is a female who has a non-supervisory role in the organisation and school certificate as her highest qualification. The second most central actor is also a female non-supervisor who has school certificate as her highest qualification.

The least central actor has a zero score. This actor is a male non-supervisor who has school certificate as his highest qualification. The second least central is a female who has university entrance as her highest qualification.

Across all measures it can be observed that:-

- The most central actor was **64** 55.55% of the time for production conversation degree and closeness, 100% for of the time for social activity conversation and the second most central actor 22.22% of the time for social activity conversation degree and closeness. **64** also featured as being the second least central actor 22.22% of the time for social activity conversation degree and closeness.

- **69** was the most central actor 33.33% of the time 100% for social activity conversation and the second most central actor 22.22% of the time for production conversation degree and closeness. **69** was also featured as the least central actor 11.11% of the time for innovation conversation betweenness.
- **63** was the most central actor 11.11% of the time for production conversation betweenness and the least central actor 55.55% of the time 100% for innovation conversation and social activity conversation degree and closeness.
- **73** was the second least central actor 55.55% of the time for production conversation degree and closeness and 100% for of the time for social activity conversation.
- **70** was the second most central actor 33.33% of the time for production conversation betweenness and social activity conversation degree and closeness. **70** was also the second least central actor 22.22% of the time for production conversation degree and closeness.
- **67** was the second most central actor 22.22% of the time for innovation conversation degree and closeness and 33.33% of the time 100% for social activity conversation.
- **65** was the second most central actor 22.22% of the time for social activity conversation betweenness and the least central actor 11.11% of the time for innovation conversation betweenness.
- **66** was the second most central actor 22.22% of the time for social activity conversation degree and closeness and 11.11% of the time for innovation conversation betweenness..
- **68** was the second most central actor 22.22% of the time for social activity conversation degree and closeness. **68** was also the least central 55.55% of the time 100% for production conversation and for innovation conversation degree and closeness. **68** was the second least central 11.11% of the time for innovation conversation closeness.

- **62** was the second most central actor 22.22% of the time for innovation conversation betweenness and the least central actor 22.22% of the time for social activity degree and closeness. **62** was the second least central actor 22.22% of the time for production conversation degree and closeness.
- **71** was the least central actor 22.22% of the time for production conversation degree and closeness, the second least central actor 55.55% of the time for production conversation degree and 100% of the time for innovation conversation and for social activity betweenness.
- **72** was the least central actor 22.22% of the time for production conversation degree and closeness.

Unlike all previous organisations every member of this organisation appeared as being either the two most or two least central members. Surprisingly enough, some members were measured as being one of the two most central and one of the two least central in numerous measures. The demographic data related to this organisation illustrates that there is very little difference in age between the 12 sampled. The age ranged between 19 and 26 years of age with the mean being 22 years. There is not a lot of difference between the most highly qualified and the least qualified as only two levels of education were apparent. Five members of the organisation have school certificate as their highest qualification and seven have university entrance. When the age and education of these respondents is taken into account it is not surprising that half of the sample have never worked for any other organisation.

Organisation 6

Production Conversation

Degree

There are two most central actors one of which is the only male member in this organisation's sample. This actor is a member of management who has school certificate as his highest qualification. The other most central actor is a female supervisor who has school certificate as her highest qualification. There are also two actors who are second most central. Both are females, one is a member of management who has completed some study towards a tertiary qualification and the other occupies a non-supervisory role and has also completed some study towards a tertiary qualification.

The least central actor is a female non-supervisor who has completed some study towards a tertiary qualification. The two second least central actors are both female and have school certificate as their highest qualification. One actor has a management position and the other has a non-supervisory position. The manager is 46, whereas the non-supervisor is 25 years of age.

Closeness

The results obtained for degree are exactly the same for closeness.

Betweenness

The most central actor is a female member of management who has completed some study towards a tertiary qualification. Up until now this actor has been one of the second most central actors. The two second most central actors are the male manager and the female supervisor who have both got school certificate as their highest qualification. These two actors were previously the two most central for degree and closeness.

The three least central actors all have a zero score and are all female. Two of these actors are non-supervisors and the other one is a manager. The manager and one of the non-supervisors both have school certificate as their highest qualification, whereas, the

other non-supervisor has completed some study towards a tertiary qualification.

Innovation Conversation

Degree

The most central actor is once again the male member of management who has school certificate as his highest qualification and who is the only male in this sample. The two second most central actors are both female. Both also have school certificate as their highest qualification but one has a managerial role and the other actor is a supervisor.

The two least central actors are both female non-supervisors. One of these actors has completed some study towards a tertiary qualification and the other has school certificate as her highest qualification. The two second least central actors are also female one is a member of management and the other is a non-supervisor but both have completed some study towards a tertiary qualification.

Closeness

The actors that were the most and least central for degree are also the same for closeness.

Betweenness

The actor who is the most central is the male manager who has school certificate as his highest qualification. The second most central actor is a female non-supervisor who has completed some study towards a tertiary qualification.

The three least central actors all have zero scores. Two of these female actors are non-supervisors and one is a member of management. One non-supervisor has school certificate as her highest qualification and the other two actors have completed some study towards a tertiary qualification. The two non-supervisors were also the least central for production conversation betweenness.

Social Activity Conversation

Degree

There are three most central actors for degree. Two of these actors are members of management one is, once again, the male member of management who has school certificate as his highest qualification and the other is a female who has completed some study towards a tertiary qualification. The other two actors are exactly the same age with one having a supervisory role and school certificate as her highest qualification and the other a non-supervisory role and having completed some study towards a tertiary qualification.

The least central actor is a female non-supervisor who has completed some study towards a tertiary qualification. The two second least central actors are also female. Both have school certificate as their highest qualification but one has a management role and the other a non-supervisory role.

Closeness

The measures for closeness are exactly the same as for degree.

Betweenness

The most central actor is a female supervisor who has school certificate as her highest qualification. The second most central actor is a female non-supervisor who has completed some study towards a tertiary qualification.

The least central actor has a zero score and is a female non-supervisor who has completed some study towards a tertiary qualification. The second least central actor is also a female non-supervisor who has completed some study towards a tertiary qualification.

Across all measures it can be observed that:-

- The most central actor was **74** 77.77% of the time for production conversation degree and closeness, 100% for innovation conversation and degree and social activity conversation closeness. **74** was also the second most central actor 11.11% of the time for production conversation betweenness.

- **76** was the most central actor 55.55% of the time for production conversation degree and closeness and 100% for social activity conversation and the second most central actor 33.33% of the time for production conversation betweenness and innovation conversation degree and closeness. **76** was the second least central actor 11.11% of the time for innovation conversation betweenness.
- **77** was the most central actor 33.33% of the time for production conversation betweenness and social activity conversation degree and closeness and the second least central actor 22.22% of the time for production conversation degree and closeness. **77** was also the least central actor 11.11% of the time for innovation conversation betweenness and the second least central actor 22.22% of the time for innovation conversation degree and closeness.
- **80** was the most central actor 22.22% of the time for social activity conversation degree and closeness and the second most central actor 33.33% of the time for production conversation degree and closeness and innovation conversation degree. **80** was also the least central actor 22.22% of the time for innovation conversation degree and closeness and the second least central actor 22.22% of the time for production conversation degree and social activity conversation betweenness.
- **78** was the second most central actor 22.22% of the time for innovation conversation degree and closeness. **78** also featured as being the least central actor 11.11% of the time for production conversation betweenness and the second least central actor 55.55% of the time for production conversation degree and closeness, innovation conversation betweenness and social activity conversation degree and closeness.
- **81** was the second most central actor 11.11% of the time for social activity conversation betweenness. **81** was also the least central actor 44.44% of the time for production conversation betweenness, 100% of the time for innovation conversation and the second least central actor 44.44% of the time for production conversation degree and closeness and social activity conversation degree and closeness.

- **79** was the least central actor 77.77% of the time 100% for production conversation, innovation conversation betweenness and 100% for social activity conversation. **79** also featured as being the second least central actor 22.22% of the time for innovation conversation degree and closeness.

Every member of the sample for this organisation fell into either the category of the most central or the least central. Not surprising considering that there are only 7 respondents in this organisation's sample. It is interesting to note that a majority of the respondents (4) have only got school certificate as their highest qualification. The other three respondents have all completed some study towards a tertiary qualification. All of the respondents who have school certificate as their highest qualification have not worked for any other organisation. These respondents have been with this organisation for a minimum of 6 years. The most striking feature is the fact that a majority of the sample, 6 members, are female. The only male member of the sample is often the most central actor as opposed to being the least central actor.

Organisation 7

Production Conversation

Degree

The two most central actors are both male, of similar age and hold school certificate as their highest qualification. One of these actors is a manager and the other is a supervisor. Both have been in their present job for between 1 and 5 years. The second most central actor is a female non-supervisor of similar age who has completed some study towards a tertiary qualification and who has been in her present job for approximately 1 to 5 years. Five actors are in the third most central position. Three of these actors are supervisors who have either school certificate, university entrance, or some tertiary study as their highest level of education.

There are two least central actors both of different gender and of similar age. The male actor has a tertiary qualification, whereas, the female actor has university entrance as her highest qualification. Both of these actors have been in their present jobs for up to one year. There are three actors who are second least central. Two of these actors have either school certificate, university entrance, or some tertiary study as their highest level of education. Two of these actors have non-supervisory positions and have only been with the organisation for up to one year. The other actor is a supervisor who has completed some study towards a tertiary qualification. This male actor has been with the organisation for between 6 and 10 years. There are three third least central female actors who all occupy non-supervisory positions. Two of these actors have university entrance as their highest qualification and one actor has a post-graduate qualification and is the most highly qualified actor in the organisation. All are aged below the mean of 27 and have been with the organisation for varying amounts of time.

Closeness

The results for closeness are exactly the same as for degree.

Betweenness

The most central actor is a female non-supervisor who has completed some study towards a tertiary qualification. The second and third most central actors are both male and are of similar age

to the most central actor. Both of these actors have school certificate as their highest qualification. The fourth most central actor is a male who also has school certificate as his highest qualification. The fifth and sixth most central actors are both male supervisors who have been with the organisation for between 1 and 5 years.

The least central is one of the most qualified in this organisation's sample. This actor has a tertiary qualification but has only been with the organisation for up to one year. The second least central actor has university entrance as their highest qualification and has also only been with the organisation for up to one year. The third least central actor is a male supervisor who is the oldest in this organisation's sample, this actor has completed some study towards a tertiary qualification. The fourth and fifth least central actors are both non-supervisors and are the youngest two in this organisation's sample. These actors both have university entrance as their highest qualification and have only been with the organisation for up to one year. The sixth least central actor is also a female non-supervisor except this actor is the highest qualified in this organisation's sample.

There are four actors, three females and one male, who are neither central is non-central. These actor are all of similar age. Two of which have tertiary qualifications, the other two have university entrance as their highest qualification. Three of these actors have been with the organisation for between 6 and 10 years.

Innovation Conversation

Degree

One of the most central actors for production is the most central actor for innovation conversation. This actor is a male supervisor who has school certificate as his highest educational qualification. The second most central actor is the same as for production, a female non-supervisor who has carried out some study towards a tertiary qualification. There are five actors who are third most central one of which is the only manager in the organisational sample. This actor is male and has school certificate as his highest qualification. One other actor in the same position also has school certificate as their highest qualification. This actor is a male supervisor. One female actor has university entrance as her highest qualification, they occupy a non-supervisory position.

Another female actor also occupying a non-supervisory position has a tertiary qualification and is aged a couple of years below the mean. The other actor occupying the position of third most central is a male supervisor who has completed some study towards a tertiary qualification. Neither one of these actors has been with the organisation for less than one to five years.

It can be observed that three actors are essentially in the middle of the sample. In other words, neither most centrally nor least centrally located. All of these actors occupy non-supervisory positions. Two of these actors are female one of which has university entrance as her highest qualification and the other has a post-graduate qualification. The other actor is a male actor who has school certificate as his highest qualification.

The least central actor is a female non-supervisor who has university entrance as her highest qualification. This actor is the youngest in the organisation and has been with the organisation for up to one year. The second least central actor is a male supervisor who has completed a tertiary qualification. Three actors fulfil the position of being third least central. Two of these actors are male one of which is in a non-supervisory position and who has a tertiary qualification. This actor has been with the organisation for up to one year. The other male actor is a supervisor who has completed some tertiary study. The other actor is a female non-supervisor who has university entrance as her highest qualification. This actor has also been with the organisation for up to one year. The fourth least central actor is a female supervisor who has university entrance as her highest qualification. This actor has been with the organisation for between 6 and 10 years but has been in their present job for up to one year.

Closeness

All of the results for closeness are exactly the same as for degree.

Betweenness

The most central, second most central and third and fourth most central actors all have school certificate as their highest qualification. Two of these actors are supervisors, one is a non-supervisor and the other a manager. Two actors scored as being the fifth most central. Both of these actors are female non-supervisors, with one holding a tertiary qualification and the other

having has completed some study towards a tertiary qualification. The sixth most central actor is also a female who has university entrance as her highest qualification.

The least central and second least central actors are both male and of similar age, just over the mean. Both of these actors have a tertiary qualification. One is a supervisor and the other a non-supervisor. The third least central actor is the oldest actor in this organisation's sample. This actor is a male supervisor who has completed some tertiary study. The fourth and fifth least central actors are the same as for work conversation non-supervisors who are the youngest two in this organisation's sample. These actors both have university entrance as their highest qualification and have only been with the organisation for up to one year. The sixth least central actor is also in the same position as for work conversation. This actor is a female non-supervisor who has a post-graduate tertiary qualification.

The four actors who are neither central nor non-central comprise one male and three females. The three females all have university entrance as their highest qualification, one of which is a supervisor, and the male is a supervisor who has completed some study towards a tertiary qualification.

Social Activity Conversation

Degree

There are two most central actors who are both supervisors, both are of different gender. The male supervisor has completed some study towards a tertiary qualification, whereas, the female supervisor has university entrance as her highest qualification. There are three actors who are second most central. Two of these actors are male supervisors who both have school certificate as their highest qualification. The other actor is a female non-supervisor who has completed some study towards a tertiary qualification. Three actors also scored as being third most central. Two of these actors are male, one is a supervisor who has completed some tertiary study and the other is a non-supervisor who has a tertiary qualification. The other actor is a female non-supervisor who has university entrance as her highest qualification.

The least central actor is a male supervisor who has a tertiary qualification. The two second least central actors are both non-supervisors. One is a female non-supervisor who has university entrance as her highest qualification and who has only been with the organisation for up to one year. The other actor is a male non-supervisor who has school certificate as his highest qualification. The two third least central actors are the male manager who has school certificate and the female non-supervisor with university entrance who has been with the organisation for up to one year and who is the youngest member in this organisation's sample.

The position of either fourth most central or fourth least central, in other words, the actors who showed neither tendency are all female non-supervisors. Two of which are just below the mean in age and have tertiary qualifications, one being post-graduate. Both of these actors have been with the organisation for between 1 and 5 years. The other actor is the second to youngest in this organisation's sample, has university entrance as her highest qualification and has been with the organisation for up to one year.

Closeness

All of the results for closeness are exactly the same as for degree.

Betweenness

The two most central actors are both supervisors who are of similar age. One is a male who has school certificate as his highest qualification and the other is a female who has university entrance as her highest qualification, both have been with the organisation for up to one year. The third most central actor is a female who has completed some study towards a tertiary qualification. The third, fourth, fifth and sixth most central actors have all been in their positions for between 1 and 5 years. The third most central actor is a female non-supervisor who has carried out some study towards a tertiary qualification. The fourth most central actor is a male supervisor who has school certificate as his highest qualification. The fifth most central actor is a female non-supervisor who has university entrance as her highest qualification. The sixth most central actor is a male supervisor who has completed some study towards a tertiary qualification.

The least central actor is one of the few actors in this organisation's sample who has a tertiary qualification. This actor is a male supervisor. The second third and fourth and fourth least

central actors are all females, two of which are the youngest in the organisation's sample. All of these women have been with the organisation up to one year. All four least central actors have been in their jobs for up to one year. The fifth and sixth least central actors are both male and have school certificate as their highest qualification. One of the men is the only manager while the other has a non-supervisory role.

The four actors that are neither central nor non-central comprise some of the most qualified actors in this organisation's sample. Three of these actors, two females and a male have tertiary qualifications one of which is post-graduate, all of these women have non-supervisory roles and are of similar age. The other actor is a male supervisor who has completed some study towards a tertiary qualification.

Across all measures it can be observed that:-

- The most central actor was **92** 55.55% of the time for production conversation degree and closeness and 100% for innovation conversation. **92** was also the second most central actor 33.33% of the time 100% for social activity conversation.
- **91** was the most central actor 22.22% of the time for production conversation degree and closeness and the second most central actor 11.11% of the time for innovation conversation betweenness.
- **95** was the most central actor 22.22% of the time for social activity conversation degree and closeness.
- **97** was the most central actor 22.22% of the time for social activity conversation degree and closeness and the second most central actor 11.11% of the time for production conversation betweenness.
- **96** was the most central actor 11.11% of the time production conversation betweenness and the second most central actor 22.22% of the time for social activity conversation degree and closeness.
- **102** was the most central actor 11.11% of the time for social activity conversation betweenness and the second most central actor 55.55% of the time for production conversation, innovation conversation and social activity conversation degree,

and innovation conversation and social activity conversation closeness.

- **93** was the most central actor 11.11% of the time for production conversation closeness and the least central actor 55.55% of the time for production conversation degree and closeness and 100% for social activity conversation. **93** was the second least central actor 33.33% of the time 100% for innovation conversation.
- **105** was the least central actor 22.22% of the time for production conversation degree and closeness and the second least central actor 33.33% of the time for production conversation betweenness and social activity conversation degree and closeness.
- **98** was the least central actor 22.22% of the time for production conversation and innovation conversation betweenness and the second least central actor 22.22% of the time for production conversation degree and closeness.
- **106** was the least central actor 22.22% of the time for innovation conversation degree and closeness and the second least central actor 33.33% of the time for production conversation degree and closeness and social activity conversation betweenness.
- **94** was the second least central actor 22.22% of the time for production conversation degree and closeness.
- **100** was the second least central actor 22.22% of the time for social activity conversation degree and closeness.

Every member of the sample except for four fell into either extreme of the measures. The four that did not feature as being either centrally located or not centrally located are all female non-supervisors and are aged below the mean of 27. Several of these women featured in all three measures as being in the mid range. These women have been with the organisation for a varied amount of time with the youngest of them, a 19 year old, only being with the organisation for up to one year. Two of the women have university entrance as their highest qualification. The other two hold tertiary qualifications with one holding a post-graduate qualification which is the highest qualified in this organisation's sample. The other women who holds a tertiary qualification is one of the four actors that are tertiary qualified.

Organisation 8

Production Conversation

Degree

The two most central actors both have the same level of education, having completed some tertiary study and are of very similar age, being the two of the oldest in this organisation's sample. One of these actors is a male manager and the other is a female non-supervisor. There are four actors who are second most central three are female and one is male. The male actor is the senior manager who has school certificate as his highest qualification. Two of the women are of similar age and are non-supervisors, although, one has school certificate as her highest qualification and the other has completed some tertiary study. The third woman is also a non-supervisor who has completed some tertiary study and is the oldest member of this organisation's sample. The third most central actor is a female non-supervisor who has completed some study towards a tertiary qualification.

The least central actor is a female non-supervisor who has completed some study towards a tertiary qualification. Two actors are second least central, both are female and both have a tertiary qualification. One of these women has only been with the organisation for up to one year. Two actors are also third least central. One of these actors is a male manager who has a post-graduate qualification and is the highest qualified actor in this organisation's sample. The other actor is a female non-supervisor who has school certificate as her highest qualification. Both of these actors have been with the organisation and in their respective jobs for approximately the same amount of time, between 1 and 5 years, and have worked for 3 other organisations.

Closeness

The results for closeness are exactly the same as for degree.

Betweenness

The most central actor is the senior manager who has school certificate as his highest qualification. The second most central actor is a female non-supervisor who also has school certificate as her highest qualification. The third fourth and fifth most central actors are also female non-supervisors who have completed some

study towards a tertiary qualification. These women have been with the organisation for varying amounts of time but have all previously worked for two other organisations. The sixth most central actor, who is within the mid range, is a male manager who has been with the organisation for 15+ years and has completed some study towards a tertiary qualification.

The least central and the second, third, fourth and fifth least central actors are all female non-supervisors who have been with the organisation for varying amounts of time. Two of these women have tertiary qualifications (the only two in this organisation's sample) and two have completed some study towards a tertiary qualification, and the other one has school certificate as her highest qualification. The sixth least central actor, who is also in mid range is a male manager who has a post-graduate qualification and is the only male in this organisation's sample who has a tertiary qualification.

Innovation Conversation

Degree

The most central actor is the most senior manager who has school certificate as his highest qualification. There are two second most central actors, one is a male manager who has completed some study towards a tertiary qualification and the other is a female non-supervisor who has school certificate as her highest qualification. Three actors are third most central, one is another male manager who has a post-graduate qualification and the other two are female non-supervisors who have been with the organisation for approximately the same amount of time. One of these women has completed some study towards a tertiary qualification and the other has school certificate as her highest qualification.

The least central and second least central actors are both female non-supervisor who have completed some study towards a tertiary qualification. Both have been in their respective jobs for up to one year except the least central actor is twice the age of the second least central actor. Four actors are third least central, all of whom are female non-supervisors. All of these actors have been with the organisation for varying amounts of time. Two of these women have a tertiary qualification while the other two have completed some study towards a tertiary qualification.

Closeness

The results for the most central actors are exactly the same as for degree.

The least central and second least central actors are also the same. The third least central actor is a female non-supervisor who has a tertiary qualification. These actors have all been in their respective jobs for up to one year.

There are three actors who are mid range. Two of these actors were the third least central for degree. The actors mid range comprise three female non-supervisors who are above the mean of 39 in age. Two of these actors have completed some study towards a tertiary qualification and one has a tertiary qualification.

Betweenness

The most central actor is the same as for degree, the male senior manager who has school certificate as his highest qualification. The second and third most central actors are both male managers. The second most central manager has completed some study towards a tertiary qualification and the third most central actor has a post graduate qualification. All of these managers are of varying ages and have been with the organisation varying amounts of time. The fourth, fifth and sixth most central actors are all female non-supervisors. The fourth most central actor has school certificate as her highest qualification and the fifth and sixth most central actors are the only two women in this organisation's sample who have tertiary qualifications.

The least central, second, third, fourth and fifth least central actors are all female non-supervisors who have completed some study towards a tertiary qualification. They have all been with the organisation for varying amounts of time. The sixth least central actor is also a female non-supervisor except this actor has school certificate as her highest qualification.

Social Activity Conversation

Degree

There are three most central actors who are three of the oldest members of this organisation's sample. All actors have completed

some tertiary study, one actor is a male manager and the other two are female non-supervisors. There are also three second most central actors, one is another male manager who has a post-graduate qualification and the other two are female non-supervisors who are both of the same age. One of the women has a tertiary qualification and the other has school certificate as her highest qualification.

There are two least central actors who are both female non-supervisors of a similar age. One holds a tertiary qualification and the other has completed some study towards a tertiary qualification. The second least central actor is the male senior manager who has school certificate as his highest qualification.

Three actors either fall into the category of third most central or third least central. These three actors are all female non-supervisors, two have completed some study towards a tertiary qualification and the other one has school certificate as her highest qualification.

Closeness

The results for closeness are exactly the same as for degree.

Betweenness

The most central actor is the oldest actor in this organisation's sample. This actor is a female non-supervisor who has completed some study towards a tertiary qualification. The second most central actor is another female non-supervisor except this actor has a tertiary qualification and they have been with the organisation for less than one year. The third most central actor is a male manager who has been with the organisation the longest and has completed some study towards a tertiary qualification. The fourth most central actor is a female non-supervisor who has also completed some study towards a tertiary qualification. The fifth most central actor is a male manager who has a post-graduate qualification and who is the youngest out of all three managers. The sixth most central actor is a female non-supervisor who has completed some study towards a tertiary qualification.

The least central and the second least central actor are both female non-supervisors who have both completed some study towards a tertiary qualification. The third least central actor is also a female non-supervisor who has completed a tertiary qualification. The

fourth least central actor is the male most senior manager who has school certificate as his highest qualification. The fifth and sixth least central actors are both female non-supervisors who also have school certificate as their highest educational qualification. The actors occupying the position of third least central to sixth least central have all been with the organisation and in their respective jobs for between 1 and 5 years.

Across all measures it can be observed that:-

- One of the most central actors was **108** 44.44% of the time for production conversation degree and closeness and social activity conversation degree and closeness. **108** was also the second most central actor 33.33% of the time 100% for innovation conversation.
- **117** was the other most central actor 44.44% of the time for production conversation degree and closeness and social activity conversation degree and closeness.
- **116** was the most central actor 33.33% of the time for innovation conversation degree and closeness and the second most central actor 22.22% of the time for production conversation degree and closeness.
- **107** was the most central actor 44.44% of the time 100% for innovation conversation and production conversation betweenness and the second most central actor 22.22% of the time for production conversation degree and closeness. **107** was the second least central actor 22.22% of the time for social activity degree and closeness.
- **115** was the second most central actor 77.77% of the time 100% for production conversation and innovation conversation and social activity conversation degree and closeness.
- **114** was the second most central actor 33.33% of the time 100% for social activity conversation and the second least central actor 22.22% of the time for production conversation degree and closeness.
- **110** was the second most central actor 22.22% of the time for production conversation degree and closeness and the second least central actor 44.44% of the time 100% for innovation conversation and for social activity conversation betweenness.

- **109** was the second most central actor 22.22% of the time for social activity degree and closeness.
- **113** was the least central actor 88.88% of the time 100% for production conversation and social activity conversation and for innovation conversation closeness and betweenness.
- **111** was the least central actor 22.22% of the time for social activity degree and closeness and the second least central actor 22.22% of the time for production conversation degree and closeness.
- **103** was the second least central actor 11.11% of the time for social activity degree and closeness.
- **118** was the second least central actor 11.11% of the time for production conversation betweenness.

Every member of the sample except for one fell into either extreme of the measures. The one that did not feature as being either centrally located or not centrally located is a female non-supervisor who has completed some study towards a tertiary qualification. This woman has been with the organisation and in her respective job for between 6 and 10 years and only has worked for one other organisation. Age was not divulged.

Organisation 9

Production Conversation

Degree

The most central actor is a female supervisor who has school certificate as her highest level of education. There are three actors who make up the second most central two of which are female and one male. The male actor is a non-supervisor who has school certificate as his highest qualification. One of the female actors who is second most central has a managerial position and school certificate as her highest qualification. The other female actor is a supervisor who has a tertiary qualification. All of these actors have been with the organisation for approximately the same amount of time, between 6 and 10 years. The third most central actor is a non-supervisor who has university entrance as his highest qualification. Two actors are in the position of being fourth most equal, one is a male manager who has school certificate as his highest qualification and the other is a female supervisor who has a tertiary qualification. Two actors are also in the position of fifth most central. Both of these actors are non-supervisors one is male the other female. The female has school certificate as her highest qualification while the male actor has university entrance as his highest qualification.

The least central and the second least central actors are both female non-supervisors who have a tertiary qualification. Both of these actors have been with the organisation for up to one year. There are three third least central actors. The two female third least central actors are both exactly the same age - 20 years old, have non-supervisory roles, university entrance as their highest qualification and have been with the organisation for between 1 and 5 years. The male third least central actor also has a non-supervisory role except he has completed some study towards a tertiary qualification. The fourth least central actor is a female supervisor who has a tertiary qualification. There are four actors who are fifth least central all of which are female. Three of the four female actors have non-supervisor roles and have university entrance as their highest qualification. The other fifth least central actor is a supervisor who has a tertiary qualification. All of these actors have been with the organisation for approximately between 1 and 5 years.

Closeness

The results for closeness are exactly the same as for degree.

Betweenness

The most central and second most central actors are both females who have school certificate as their highest qualification. The most central actor is a supervisor and the second most central actor is the female manager who is one of the oldest members of this organisation's sample. The third most central actor is another female supervisor who has a tertiary qualification. The fourth, fifth and sixth and seventh most central actors are all non-supervisors who are very similar in age, 20 to 24. Three of these actors are women who have either school certificate or university entrance as their highest qualification and the other actor is a male who has university entrance as his highest qualification.

The least central actor is a male non-supervisor who has completed some tertiary study. The second, third, fourth and fifth actors are all female non-supervisors. Two of these women have been with the organisation up to one year and have a tertiary qualification. The other two actors have been with the organisation for between 1 and 5 years and have university entrance as their highest qualification. The sixth and seventh least central actors are both female supervisors who have been with the organisation for between 1 and 5 years and who both have a tertiary qualification.

Five actors could be considered as being in the mid range. One of these actors is the male manager whose highest qualification is school certificate. One of these actors is a female supervisor with a tertiary qualification and three of these actors are non-supervisors whose highest qualification is either school certificate or university entrance.

Innovation Conversation

Degree

The most central actor is the male manager who has school certificate as his highest level of education and who is the oldest actor in this organisation's sample. There are three actors who are second most central. One of these actors is the only other

manager who is of similar age to the previous manager and who has reached the same level of education, except this actor is a woman. The other two second most central actors are female supervisors who have been with the organisation for approximately between 1 and 5 years. These women are both of similar age, one has a tertiary qualification and the other has school certificate as her highest qualification. Two actors are third most central, one is a female supervisor who has a tertiary qualification and the other is a male non-supervisor who has university entrance as his highest qualification.

Three actors were measured as being in the position of being least central, all of which are non-supervisors. There are two male actors who have been with the organisation for approximately between 6 and 10 years, one of which has school certificate and the other has completed some study towards a tertiary qualification. The other actor is a female who has been with the organisation for up to one year and has a tertiary qualification. Three actors are also second most central all are female and, once again, these actors have non-supervisory roles. Two of the women are of similar age, have been with the organisation for between 1 and 5 years and have university entrance as their highest qualification. The other woman has a tertiary qualification and has been with the organisation for up to 1 year. Five actors take the position of being third most central four women and one male. Two of these women and the male are non-supervisors and have university entrance as their highest qualification and the other two are supervisors who have a tertiary qualification. All of these women have been with the organisation for between 1 and 5 years.

There are two actors who fall into the mid range category both of these actors are women, both in their 20's. One of these women has university entrance as her highest qualification and the other one has school certificate as her highest qualification.

Closeness

The most central actor and the second most central actors are both of the managers in this organisation's sample who are of different gender but both have school certificate as their highest qualification. The third most central actor is a female supervisor who has a tertiary qualification. A female supervisor who has a tertiary qualification is one of the fourth most central actors the other is a male non-supervisor who has university entrance as his highest qualification. Two female actors are fifth most central, one

is a supervisor and the other is a non-supervisor, both have school certificate as their highest qualification.

Two actors are the least central, both are male non-supervisors who have been with the organisation and in their current jobs for between 6 and 10 years. One of these men has school certificate as his highest qualification, the other has completed some study towards a tertiary qualification.

The actor who is in the mid range position is a female non-supervisor who has university entrance as her highest qualification.

Betweenness

The female manager is again in the position of being most central with the male manager being the second most central, both of these actors have school certificate as their highest qualification. The third and fourth most central actors are two female supervisors who have a tertiary qualification.

Eleven actors are in the position of being the least central, all of which have 0.00 scores. Three of these actors are male non-supervisors, one has completed some study towards a tertiary qualification, one has university entrance and the other has school certificate as his highest qualification. There are eight female actors who are least central. Two of these actors are supervisors who have a tertiary qualification. Six of these actors are non-supervisor two of which have a tertiary qualification, two have university entrance as their highest qualification and the other actor has school certificate as her highest qualification. The second and third least central actors are both non-supervisor who have university entrance as their highest qualification and the fourth least central actor is a female supervisor who has school certificate as her highest qualification.

The mid range actor is a male non-supervisor who is the youngest in this organisation's sample and who has school certificate as his highest qualification.

Social Activity Conversation

Degree

The most central actor and the second most central actor are both non-supervisors who have school certificate as their highest qualification. They have been with the organisation for between 1 and 5 years and in their present job for up to one year. Although they are of different gender, they are only a year apart in age being 18 and 19 years old. The third most central actor is a female supervisor who has a tertiary qualification. The three most central actors have all been with the organisation for the same amount of time and have worked for no other organisations previous to this one. Three actors are fourth most central, two of these actors are of different gender but are both non-supervisors with university entrance as their highest qualification. The other actor is a female supervisor who has school certificate as her highest qualification.

There are two female actors who scored as being least central, both of which are non supervisors. One of these actors has school certificate as her highest qualification while the other has a tertiary qualification. Both of these actors have been in their present jobs for up to one year. The second least central actor is a supervisor who has a tertiary qualification. Two actors are third least central, one of these actors is a male manager who has school certificate as his highest qualification. (This actor is the oldest in this organisation's sample and has been with the organisation the longest, between 11 and 15 years). The other actor is a female non-supervisor who has a tertiary qualification. Two actors are also fourth most central both have been with the organisation for between 6 and 10 years. One of these actors is the female manager who has school certificate and the other is a male non-supervisor who has completed some tertiary study. Four actors are fifth least central. Two women are non-supervisors who have university entrance as their highest qualification, the male actor is also a non-supervisor, he has school certificate as his highest qualification. The other women is a supervisor who has a tertiary qualification.

Closeness

The results for closeness for the most central actors are exactly the same as for degree.

The two least central actors for degree become the least central and second least central for closeness. The least central is the female non-supervisor who was the least central for both production and innovation, a female non-supervisor who has a tertiary qualification but has only been with the organisation for up to one year. The second least central is a female non-supervisor who has school certificate as her highest qualification. The third least central is a female supervisor who has a tertiary qualification. The fourth least central is the male manager who has school certificate as his highest qualification. The fifth least central actor is a female non-supervisor who has a tertiary qualification.

Betweenness

Once again, the most central actor is the female manager and the second most central actor is the male manager, both of which have school certificate as their highest qualification. The third most central actor is a female supervisor with a tertiary qualification. Two actors are fourth most central. One of these actors is another female supervisor with a tertiary qualification and the other is a male non-supervisor with university entrance as his highest qualification. Two female actors are fifth most central, these comprise of a supervisor and a non-supervisor both of which have school certificate as their highest qualification.

The least central and second least central actors are both non-supervisor who have been with the organisation for less than one year and who both have a tertiary qualification. Two actors are third least central both are male non-supervisors who have both been with the organisation for between 6 and 10 years. One of these actors has completed some study towards a tertiary qualification while the other has school certificate as their highest qualification. Three actors are fourth least central two of which are female supervisors who have a tertiary qualification. The other actor is a male non-supervisor who has university entrance as his highest qualification. All three of these actors have been in their jobs and with the organisation for between 1 and 5 years.

Four very similar actors fall into the mid range category. They are all female non-supervisors who have university entrance as their highest qualification. They are all aged below the mean of 33 and have been with the organisation for between 1 and 5 years.

Across all measures it can be observed that:-

- One of the most central actors was **125** 33.33% of the 100% for production conversation. **125** was also the second most central actor 11.11% of the time for innovation conversation degree.
- The other most central actor was **120** 33.33% of the time for innovation conversation closeness and betweenness and social activity betweenness. **120** was the second most central actor 44.44% of the time 100% for production conversation and for innovation conversation degree.
- **136** was the most central actor 22.22% of the time for innovation conversation degree and closeness. **136** was also the least central actor 11.11% of the time for innovation conversation betweenness and the second least central actor for innovation conversation degree.
- **119** was the most central actor 11.11% of the time for innovation conversation degree and the second least central actor 33.33% of the time for innovation conversation closeness and betweenness and social activity conversation betweenness.
- **121** was the second most central actor 22.22% of the time for production conversation degree and closeness.
- **127** was the second most central actor 22.22% of the time for production conversation degree and closeness and the least central actor 22.22% of the time for innovation conversation degree and betweenness.
- **128** was the second most central actor 22.22% of the time for social activity conversation degree and closeness.
- **122** was the second most central 11.11% of the time for social activity conversation degree and closeness.
- **137** was the least central actor 77.77% of the time for production conversation degree and closeness, 100% for innovation conversation and social activity conversation closeness and betweenness. **137** was the second least central actor 22.22% of the time for production conversation betweenness and social activity degree.

- **126** was the least central actor 33.33% of the time for production conversation betweenness and innovation conversation degree and betweenness.
- **131** was the least central actor 22.22% of the time for innovation conversation betweenness and social activity conversation degree and the second least central actor 11.11% of the time for social activity closeness.
- **123** was the least central actor 11.11% of the time for innovation conversation betweenness.
- **124** was the least central actor 11.11% of the time for innovation conversation betweenness.
- **133** was the least central actor 11.11% of the time for innovation conversation betweenness.
- **134** was the least central actor 11.11% of the time for innovation conversation betweenness.
- **135** was the least central actor 11.11% of the time for innovation conversation betweenness and the second least central actor 11.11% of the time for innovation conversation degree.
- **136** was the least central actor 11.11% of the time for innovation conversation betweenness and the second least central actor 11.11% of the time for innovation conversation degree.
- **138** was the least central actor 11.11% of the time for innovation conversation betweenness and the second least central actor 55.55% of the time for production conversation and innovation conversation degree and closeness and social activity betweenness.
- **130** was the second least central actor 11.11% of the time for innovation conversation betweenness.

There is only one member of this organisations' sample that did not appear in either extreme of the measures. This actor is a female non-supervisor who has university entrance as her highest qualification. This actor is aged below the mean and has been with the organisation between 1 and 5 years.

Organisation 10

Production Conversation

Degree

The most central actor is a male supervisor who has been with the organisation for over 15 years and who has a tertiary qualification. There are three actors who are second most central one of which is one of the two managers in this organisation's sample. This actor has a tertiary qualification and has also been with the organisation for more than 15 years. The other two second most central actors are female, one is a supervisor who has a tertiary qualification and the other is a non-supervisor who has school certificate as her highest qualification. Both of these women have been with the organisation for between 6 and 10 years. The third most central actor is a male supervisor who has a tertiary qualification. There are two actors who are fourth most central, both are male one has a supervisory position and one has a non-supervisory position. Both have a tertiary qualification and have been in their current jobs for less than 1 year. The fifth most central actor is a female non-supervisor who has a tertiary qualification and who has also been in her current job for less than one year.

There are two least central male actors, one is the other manager and the other is a non-supervisor, both have a tertiary qualification. The second and third least central actors are both non-supervisors who have been with the organisation and in their present jobs for less than one year. The second least central actor is a female who has completed some study towards a tertiary qualification and the third least central actor is a male who has a tertiary qualification, both are of very similar age. There are two female non-supervisors who are fourth least central, both have a tertiary qualification. There are four actors who are fifth least central, one of which is a male supervisor who has a tertiary qualification. The other three are female non-supervisors, one has university entrance, one has completed some tertiary study and the other has a tertiary qualification. All of these women have been with the organisation between 1 and 5 years.

Closeness

The results for closeness are exactly the same as for degree.

Betweenness

The most central actor is a male manager who has a tertiary qualification and who has been with the organisation for over 15 years. The second and third most central actors, a female and male respectively, are both supervisors who have tertiary qualifications. The fourth most central actor is a male non-supervisor who has a tertiary qualification and who has been with the organisation for less than one year. The fifth and sixth most central actors are both male supervisors who have tertiary qualifications. The seventh most central actor is a female non-supervisor who has school certificate as her highest qualification.

The least central actor is the male manager who is the second to oldest in this organisation's sample. This actor has a tertiary qualification and like the other actor has been with the organisation for over 15 years. The second least central actor is a female non-supervisor who has completed some study towards a tertiary qualification and who has been with the organisation for less than one year. The third least central actor is a male non-supervisor who has a tertiary qualification and has been with the organisation for between 11 and 15 years. The fourth, fifth, sixth and seventh least central actors are all female non-supervisors who are all in their mid twenties or below. The fourth, fifth and sixth least central actors all have tertiary qualifications, whereas, the seventh least central actor has completed some study towards a tertiary qualification.

The mid range category is comprised of the oldest actor in this organisation's sample, a male supervisor with a tertiary qualification and three non-supervisors. Two of the non-supervisors are females aged 22 one of which has a tertiary qualification and the other university entrance as her highest educational qualification. The other actor is a male who has a tertiary qualification.

Innovation Conversation

Degree

There are two most central actors, one of which is the same as for degree, a male supervisor with a tertiary qualification and the other is another male supervisor who also has a tertiary qualification. The most notable difference is the fact that one of

the supervisors has been with the organisation for between 11 to 15 years and the other has been with the organisation for between 1 and 5 years. The third most central actor is one of the male managers who has a tertiary qualification and the fourth most central actor is a male non-supervisor with a tertiary qualification.

The least central actor is a male non-supervisor with a tertiary qualification. Two female non-supervisors are second least central one has a tertiary qualification and the other has completed some study towards a tertiary qualification. Both of these women are of very similar age to the least central actor and like him have only been with the organisation and in their current jobs for less than one year. Three actors are third least central, they are all female non-supervisors, two have a tertiary qualification and one has school certificate as her highest educational qualification. Four female actors are fourth least central, three of which are non-supervisors and one is a supervisor. The supervisor and two of the non-supervisors have a tertiary qualification while the other non-supervisor has completed some study towards a tertiary qualification.

There is one actor that is in a mid range position. This actor is a male manager who has been with the organisation for over 15 years and has a tertiary qualification.

Closeness

The actors that fall into the category of being most central are the same as for degree except instead of both being most central the two supervisors are most central and second most central. Both have tertiary qualifications but the supervisor who has been with the organisation for over 15 years is the most central.

The least central actor and the second least central actor are both non-supervisors who have tertiary qualifications. Both are the youngest in this organisation's sample and have been with the organisation and in their present jobs for less than one year. There are three actors that are third least central, all are non-supervisors. One of these actors is a male with a tertiary qualification and the other are two females, one with a tertiary qualification and the other with school certificate as their highest qualification. Three actors are also fourth least central, two are female non-supervisors, one has a tertiary qualification and the other has completed some study towards a tertiary qualification. The other is a male supervisor who has a tertiary qualification.

The fifth least central actor is a female non-supervisor who has completed some study towards a tertiary qualification.

There are three actors that fall into the mid range category, one of which is a male manager with a tertiary qualification. The other two are female non-supervisors who are the second to youngest in this organisation's sample. One of these women has a tertiary qualification and the other has completed some study towards a tertiary qualification.

Betweenness

The most central, second, third and fourth most central actors are all male supervisors who are of minimum age 28 and who have tertiary qualifications. The fifth most central actor is a male non-supervisor who has a tertiary qualification and the sixth most central actor is a male manager who has a tertiary qualification and who has been with the organisation for over 15 years.

Three actors are least central, two of which are the youngest two in this organisation's sample, a male and a female non-supervisor who have tertiary qualifications but have only been with the organisation for less than one year. The other actor is a female non-supervisor who has school certificate as her highest qualification and who has been with the organisation for over 6 years. Two actors are second least central, one is a male supervisor who has a tertiary qualification and the other is a female non-supervisor who has completed some study towards a tertiary qualification. The third and fourth least central actors are both female non-supervisors who have been with the organisation for between 1 and 5 years. The third least central has a tertiary qualification and the fourth least central has completed some study towards a tertiary qualification. The fifth least central actor is the oldest male manager who has a tertiary qualification.

Four actors fall into the mid range, all of which are non-supervisors who have tertiary qualifications. Three of these actors are women who are of similar age and the other is a male who is at least ten years older than the females.

Social Activity Conversation

Degree

The most central actor is one of the managers who has been with the organisation for over 15 years and who has a tertiary qualification. The second most central actor is a male supervisor who has a tertiary qualification. There are four actors who are third most central, one of these actors is a male supervisor and the other two are non-supervisors of each gender, all have a tertiary qualification. The fourth most central actor is a male supervisor who has a tertiary qualification.

There are two least central actors, one is a male supervisor, who is tertiary qualified and is the oldest actor in this organisation's sample, and the other is a female non-supervisor who has school certificate as her highest qualification. Two actors are second least central, once again, one is a male supervisor with a tertiary qualification and the other is a female non-supervisor who has completed some study towards a tertiary qualification. Two actors are in the position of third least central as well, both are male and have tertiary qualifications. One is a manager, and the other is a non-supervisor, both have been with the organisation for at least 11 years. Four actors are fourth least central, all are female non-supervisors who are aged either 21 or 22 years old. Four of these women have tertiary qualifications and the other one has completed some study towards a tertiary qualification.

The mid range actor is a 24 year old female non-supervisor who has a tertiary qualification.

Closeness

the results for closeness are the same as for degree.

Betweenness

The most central actor is the same actor that was the most central for innovation conversation betweenness, a male supervisor who has a tertiary qualification. The second most central actor is the oldest male manager who has a tertiary qualification. The third most central actor is a female non-supervisor who has university entrance as her highest educational qualification. Three actors are fourth most central, all of which have tertiary qualifications. One actor is a female non-supervisor and the other two are male, one a supervisor and the other a non-supervisor. The fifth most central

actor is a male supervisor who has a tertiary qualification and the sixth most central actor is a female non-supervisor who has completed some study towards a tertiary qualification.

The least central actor is a female non-supervisor who has completed some study towards a tertiary qualification, but has been with the organisation for less than one year. The second least central actor is a male supervisor who has a tertiary qualification and is the oldest actor in this organisation's sample. The third and fourth least central actors are both female non-supervisors, one has school certificate as her highest qualification and the other has a tertiary qualification. The fifth least central actor is a male supervisor who has a tertiary qualification and who has been with the organisation for over 15 years. The sixth least central actor is a male manager who has a tertiary qualification and who has also been with the organisation for over 15 years.

The mid range actors are once again non-supervisors who have a tertiary qualification. Three of these actors are women aged 24 years and under and one is a male who is mid thirties.

Across all measures it can be observed that:-

- The most central actor was **141** 44.44% of the time for production conversation and innovation conversation degree and closeness and the second most central actor 11.11% of the time for innovation conversation betweenness. **141** was the second least central actor 22.22% of the time for social activity degree and closeness.
- **145** was the most central actor 22.22% of the time for innovation conversation and social activity conversation betweenness. **145** was the second most central actor 77.77% of the time 100% for production conversation and for innovation conversation and social activity conversation degree and closeness.
- **139** was the most central actor 22.22% of the time for social activity degree and closeness and the second most central actor 11.11% of the time for social activity betweenness. **139** was also the least central actor 33.33% of the time 100% for production conversation and the second least central actor 11.11% of the time for social activity conversation betweenness.
- **140** was the most central actor 11.11% of the time for production conversation betweenness and the second most

central actor 22.22% of the time for production conversation degree and closeness.

- **155** was the second most central actor 22.22% of the time for production conversation degree and closeness and the least central actor 33.33% of the time for innovation conversation betweenness and social activity conversation degree and closeness.
- **144** was the least central actor 22.22% of the time for production conversation degree and closeness.
- **149** was the least central actor 22.22% of the time for innovation conversation degree and betweenness and the second least central actor 11.11% of the time for innovation conversation closeness.
- **142** was the least central actor 22.22% of the time for social activity conversation degree and closeness and the second least central actor 11.11% of the time for innovation conversation betweenness.
- **150** was the least central actor 22.22% of the time for innovation conversation closeness and betweenness and the second least central actor 11.11% of the time for innovation conversation degree.
- **152** was the least central actor 11.11% of the time for social activity betweenness and the second least central actor 77.77% of the time 100% for production conversation, innovation conversation degree and betweenness and social activity conversation degree and closeness.

There are eight members of this organisation's sample that did not appear in either extreme of the measures. Three of these actors are male, two supervisors and one non-supervisor who all have tertiary qualification. All of these actors have been with the organisation for varying amounts of time and have worked for various other organisations. The other five actors are female non-supervisors who are all aged under 26 years. Three of these women have tertiary qualifications, one has completed some study towards a tertiary qualification and the other has university entrance as her highest qualification. All of these women have been with the organisation for between 1 and 5 years and all except one of these actors has been in their current job for between 1 and 5 years.