

## Social Network Analysis and Research with Māori collectives

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**Abstract:** Social Network Analysis (SNA) involves the study of the structure and composition of networks that, in turn, is useful for understanding the implications of patterns and relationships among social entities. The focus of SNA is based on relationships within a network rather than the influence and characteristics of individuals within a network. Four key features of SNA are the structure of the social ties, systematic data, graphic representation, and mathematical or computational models. Examples of network structures and graphic representations are provided. This article provides an overview of SNA; it looks at some studies of SNA with indigenous and minority groups; it explores the use of social networks within a Kaupapa Māori analysis; and gives preliminary consideration as to whether SNA may be useful as a method for analysing social networks with Māori collectives. The article also raises considerations for future research using SNA such as who benefits from the knowledge that analysing Māori social networks brings about; what is the use of internet among Māori and to what extent do Māori use internet-based social networking tools; and will SNA enhance our ability to anticipate, understand and explain the relationship between social networks and whānau ora (wellbeing).

**Keywords:** ethnography; Kaupapa Māori analysis; Māori collectives; social network analysis, social networks

### Introduction

This paper presents an introductory overview of Social Network Analysis (SNA) and provides examples of studies with indigenous and minority groups as to how SNA has been applied. Following this, social networks by Māori are explored within a Kaupapa Māori analysis. Consideration is then given to SNA as an appropriate tool to analyse about social networks and to consider questions for future research of SNA with Māori collectives.

There are several definitions of SNA. Scott (2005) describes SNA as:

...a set of methods for the analysis of social structures, methods which are specifically geared towards an investigation of the relational aspects of these structures. The use of these methods, therefore, depends on the availability of relational rather than attribute data. (p. 38)

Scott (2005) reiterates the notion that SNA relates to relationships within the network rather than on the attributes and influence of individuals within the network. For example, if analysing the success of a network, success relates to the ability of the structure to create success rather than the ability of an individual to influence or determine success. To further illustrate that the focus of SNA is on relationships within a network rather than individuals, Hanneman and Riddle (2005) conducted a study of friendship ties in which John (a fictional character) is selected to be in a sample, and he identifies seven friends. Each of John's seven friends is spoken with, and they are asked about their friendship ties. The friends are included in the sample because John is included, and vice versa; hence the sample elements are no longer independent.

Durland and Fredericks' (2005) definition reinforces a similar notion to that of Scott (2005) regarding the relational use of data, while at the same time distinguishing the theory of social networks from other methodological theories:

SNA is the study of relationships within the context of social situations. It contains the set of measures and analysis tools that are used to describe and understand relational data. Relational data indicate whether a relationship between two components or actors exists and the value of that relationship. Social network theory stands apart from other methodological theories as it focuses on the social context and behaviour of relationships among actors rather than on the rational choices individual actors make. This is the basic assumption that differentiates SNA from other evaluation models (p. 9).

SNA has four key features (Freeman, 2004, p. 15):

- Structural intuition (a fundamental correlation between mathematics and physics) based on ties linking social actors (relationships between individuals),
- Systematic empirical data (the systematic collection of facts and figures based on observation or experience rather than theory),
- Graphic imagery (imagery in the form of a graph - lines connecting points), and
- Mathematical and/or computational models.

Instead of focusing on individual behaviours, attitudes and beliefs, SNA involves making models or frameworks of relationships. These models depict the structure of the group as well as the influence of that structure on group and individual functioning. Within SNA the following assumptions can be made about actors, relations and structure (Wasserman & Faust, 1994, pp. 4-9):

- Actors and their actions are viewed as interdependent rather than independent, autonomous units.
- Linkages between actors are channels for the flow of resources.
- Network models that focus on individuals view the network structural environment as providing opportunities for or constraints on individual action.
- Network models conceptualise structure (e.g., economical, political, social structure) as lasting patterns of relations among actors.

There are three primary lines of scrutiny in SNA (Durland & Fredericks, 2005, p. 18):

- Total structure,
- Subsets formed within the total group structure, and
- Nodes or individuals or groups of people who comprise the network.

Durland and Fredericks (2005, p. 18) note other important concepts of network methods, including:

- Dyads (two actors and their ties), triads (three actors and their ties), or larger systems (subgroups of individuals, or entire networks).
- Clique – a subset of actors who have ties with all other actors within that subset.
- Density – the proportion of the total available ties connecting actors.
- Centralisation – the fraction of main actors within a network.
- Connectedness – the ability of actors to reach one another correspondingly.
- Asymmetry – the ratio of mutual relationships to total relationships within a network.
- Balance – the extent to which ties in the network are direct and reciprocated.

Freeman (2004) contends that network analysis is used by people of many disciplines and varying backgrounds, including sociologists, anthropologists, mathematicians, economists, political scientists, psychologists, communication scientists, statisticians, ethnologists, epidemiologists, computer scientists, both organisational behaviour and market specialists from business schools and, recently, physicists. There are many applications in the network field that one may research. Freeman (2004) notes many applications, but by no means is the list definitive:

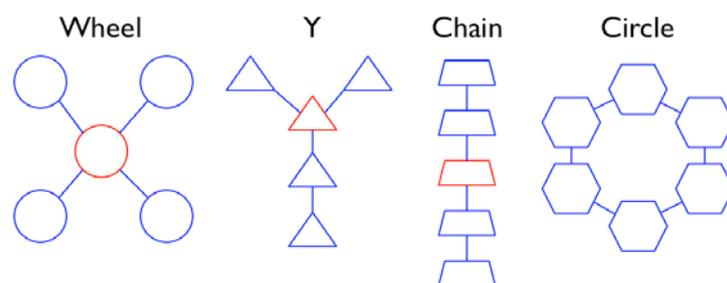
...the study of occupational mobility, the impact of urbanization on individuals, the world political and economic system, community decision-making, social support, community group problem-solving, diffusion, corporate interlocking, belief systems, social cognition, markets, sociology of science, exchange and power, consensus and social influence, and coalition formation...primate studies, computer-mediated communication, intra- and inter-organizational studies, and marketing...health and illness, particularly AIDS. (p. 16)

### **History of social network analysis**

Social networks have been in use for well over a century, and have been useful to researchers for providing answers to questions from a broad range of disciplines. The work of German sociologists Tonnies, Weber and especially Simmel at the turn of the 20th century pointed to interaction in branches of loosely-knit networks of individuals (Scott, 1988). Then, in the early 1930s, Moreno successfully depicted sociometry, the study of social interaction within small groups of people, while Warner and Mayo explored inter-personal relations (Borgatti, Mehra, Brass & Labianca, 2009; Freeman, 2004; Scott, 1988; Wasserman & Faust, 1994).

In the 1940s and 1950s the advancements to social networks included the use of matrix algebra and graph theory for work with groups and social circles (Borgatti et al., 2009). Graph theory utilises lines to reflect the flow of a relationship or influence that, in turn, enable analysis of individuals concurrently within group structures (Durland & Fredericks, 2005). Another advancement noted during this period was that of Warner and Lunt, who studied a small urban community found to contain many intimate circles among the inhabitants from whence the term 'clique' became known in sociology and network theory (Durland & Fredericks, 2005). Durland and Fredericks (2005) also mention the influence of Bavelas in the use and understanding of mathematical models of group structures.

The Massachusetts Institute of Technology (MIT) has conducted laboratory experimentation on networks and studied the effects of different structures in communication networks, and the effect of the speed and accuracy with which a network could solve problems. Researchers found that even though a circle structure mathematically had the shortest minimum solution time, the structure with a central node and the shortest distance of all the nodes to the integrator was the fastest performing network (Borgatti et al., 2009). Figure 1 depicts various structures and, of the four models displayed, the Wheel structure was able to most quickly receive and disseminate information to and from the central node. Further experimentation revealed that this result is contingent on other factors (Borgatti et al., 2009).



**Figure 1. Example of four network structures**

Each node represents a person; each line represents a communication channel.

By the 1960s Borgatti et al. (2009) asserts there were three main lines of inquiry thriving in the field of anthropology, influenced by the work of Radcliffe-Brown (1952). These included:

- Societies as systems of relationships rather than monolithic entities (Nadel, 1957);
- Kinships as being algebraically related (such as ‘son of’ and ‘married to’) (Levi-Strauss, 1969); and
- Network-based explanations accounting for a range of outcomes such as the ethnographic study of social relations in urban families (Bott, 1957).

Other purposes for conducting SNA during this time included the study of group dynamics, which made up the backbone of American social psychology in the 1950s and 60s, and the study of family and community (Bott, 1957; Scott, 1988).

In the 1970s network research gravitated to the field of sociology, which viewed a social structure as a network of roles. Harrison White’s graduate sociology students at Harvard University were responsible for an upsurge of interest in the mathematics of network analysis (Scott, 1988). By the 1980s, SNA was an established field within the social sciences, and had been picked up by other disciplines (e.g., physics, biology, anthropology, economics) and applied fields such as management consultancy, public health, crime fighting and national security (Borgatti et al., 2009; Scott, 1988). As advancement of computer-based technology analysis techniques improved, the interest in and development of network analysis continued to grow.

Barry Wellman developed INSNA (International Organisation for Social Network Analysis), an international networking organisation for researchers, in 1978 (<http://www.insna.org>). Their website states INSNA is also involved with three professional journals – *Social Networks*, *Connections*, and the electronic *Journal of Social Structure* (INSNA, 2008). Other information from the website notes that standard texts on SNA have been produced and printed in various languages; there are a large number of computer software programs that assist with analysis and the display of networks; and many network training and research centres exist worldwide.

### ***Social network theory***

Social network methods, including SNA, have developed over the last fifty years due to advances in social theory, empirical research and formal mathematics and statistics (Wasserman & Faust, 1994). According to Wasserman and Faust (1994), social network theory requires concepts, definitions and processes in which various relations link social units to one another, and these relationships are the key difference between social network activities and non-network activities. Furthermore they contend that SNA sets out to understand how properties of the social structural environment influence noted characteristics and how those traits are relational. Wasserman and Faust (1994) go on to explain that in SNA the noted attributes of social actors (for example, the race, ethnicity or gender of people, or the size or productivity of collectives such as corporations or government agencies) are made sense of in terms of patterns or structures of ties among the units. The relational ties between units may be any type of relationship such as kinship, support and/or resources, membership or behavioural ties; and the relationship between a pair of units, as mentioned earlier, is characteristic of the unit, not of individuals within the unit. Some of the most important examples of theoretical concepts that motivated the development of SNA methods are:

Social group, isolate, popularity, liaison, prestige, balance, clique, subgroup, social cohesion, social position, social role, reciprocity, mutuality, transivity [i.e. the notion that a

friend of a friend is a friend], exchange, influence, dominance, and conformity (Wasserman & Faust, 1994, p. 14).

According to Wasserman and Faust (1994), mathematical models quickly became useful to researchers in the early days of the theoretical development of SNA. Three methods with mathematical foundations became useful – graph theory, statistical and probability theory, and algebraic models. Graph theory provides suitable representation of social networks and related concepts. Statistical theory was useful for the study of reciprocity, mutuality, transitivity and balance. Statistical models for analysing a range of social network data utilise Holland and Leinhardt’s probability model. Algebraic models are useful for studying combinations of relations such as ‘is a friend of’, ‘goes to for advice’, and have been used to study kinship systems, and network role structures (Wasserman & Faust, 1994).

Social network theory can get complicated because of the mathematical nature of the theory, and more so when comparing physical sciences to the social sciences, as social and physical scientists tend to have different goals (Scott, 2005). In terms of network ties, Borgatti et al. (2009) explain that in the physical sciences a network and a mathematical graph are synonymous, and similar methods are used for analysis. In contrast the social sciences compare how different kinds of ties affect each other analytically and theoretically. In terms of the mechanics of theory, Borgatti et al. (2009) allege that there must be some direct form of transmission from one node (intersection in the network) to another. Positioning of a node in a network determines the opportunities and obstructions that it encounters, which relates to the notion that connections in a network can assist in gaining the advantage.

### **Social network structure**

The structure of networks is relevant in terms of analysis of social networks as the structure determines the ways in which networks act or react. For example a chain network has a long chain of nodes (with each node representing an individual). Figure 2 illustrates the exclusion mechanism where one node forms a relationship with a second node, but excludes a third node. A node only has power with those it comes into contact with thereby making pair-wise deals with those they are directly in contact with, but excluding others they are not in direct contact with. Those nodes on the end of the chain do not have as much bargaining power or influence as the more central nodes as they are lacking full contact. However, nodes B and D are in a stronger position of power than node C as they are connected to nodes A and E that are in weak positions where there are no alternative partners.

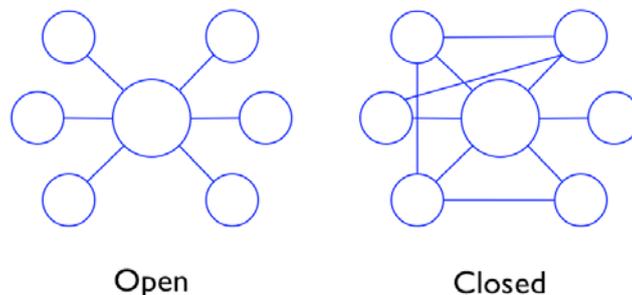


**Figure 2. Chain network – five-person exchange – the exclusion mechanism**

Each node represents a person; each line represents a potential channel for interpersonal communication.

The binding mechanism of Figure 3 relates to the concept that social ties can bind nodes together in such a way as to construct a new entity whose properties can be totally different to those that it was derived from, so this concept is similar to that of chemical bonding. A network with open nodes, that is the nodes are not connected, has lots of structural holes and therefore has competitive advantages in that they can be better performers in some situations (i.e., they can act or make decisions quicker as they do not have any other immediate ties). However, this can be a limiting factor in that their actions or decisions are not based on the collective wisdom of a group. When the network’s nodes are bounded together creating a lack of structural holes (i.e., a closed network), networks are better able to communicate and act as

one. Conversely, obtaining consensus from those in the network may be a limiting factor if for example time is of the essence. Examples of these networks in action are political alliances and workers' unions. (See the section on Social Support Networks for more information about the ego and ego networks.)



**Figure 3. Ego (personal) networks**

Each line represents a potential channel for interpersonal communication; each node represents a person.

Wasserman and Faust (1994) claim that there are three distinct theoretical constructs that provide the tools that assist in fully understanding networks and network analysis: graphs, matrices, and sociograms. These tools enable us to understand the information being depicted or that has been analysed. Examples are provided below to depict the use of these three tool, alluding to the possible extent of their use.

### Graphs

Figures 1, 2 and 3 above are examples of graphic representations of various types of network. Graphs are a set of objects connected by links, and are the first component of network analysis. SNA graphs illustrate the characteristics of the relationship between two or more actors. More complex relationships can be graphed showing the dynamics of position, direction and positive and negative values of relationships. Graphs, according, are the building blocks for understanding sociograms (Durland & Fredericks, 2005).

Information on the Orgnet website (Orgnet, 2008) depicts an on-line community (OLC), in which every node represents a person, and a link between two nodes depicts a relationship or connection in the community, thus, the social network. Orgnet posits that most on-line communities have three social rings – a densely connected core in the centre; loosely connected fragments in the second ring; and an outer ring of disconnected nodes (isolates), commonly known as lurkers. The lurkers have been attracted to the network, but they have not connected as yet. They are a group who are most likely to leave the OLC, or to remain passive members and not contribute to the community. The second ring consists of people with a few connections, who are usually small groups of acquaintances, who do not need a particular OLC to survive. People in this group are likely to leave in unison or become passive. The inner core is comprised of people who are very involved in the network; they are committed and will work at making the network a success. They see a win-win situation for themselves and for the group, knowing that better connectivity will benefit the individual and the group simultaneously.

### Matrices

Matrices provide graphic information of social networks in a format that can be summarised and analysed with matrix algebra and computer tools; they are the basics for most data collection and data sets. Matrices are collections of elements (ties) into rows and columns,

thereby presenting data in the form of tables. Matrices are often used in network analysis to note the presence of pairwise ties.

	Bob	Carol	Ted	Alice
Bob	---	1	0	0
Carol	1	---	1	0
Ted	1	1	---	1
Alice	0	0	1	---

**Figure 4. Adjacency matrix**

Reproduced, with permission, from Hanneman & Riddle (2005, p. 27)

	Bob	Ted	Carol	Alice
Bob	---	1	1	0
Ted	1	---	1	1
Carol	0	1	---	0
Alice	0	1	0	---

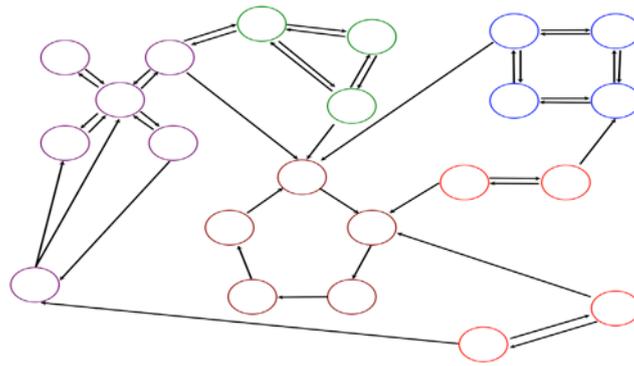
**Figure 5. Partitioned (block) matrix**

Reproduced with permission from Hanneman & Riddle (2005, p. 29)

The plain (Adjacency) matrix in Figure 4 displays information as to who likes whom, given that 0 represents no relationship or tie is present, and 1 represents one relationship or tie. The coloured (Partitioned block) matrix at Figure 5 goes further than just displaying information in a matrix; it partitions data into sections of male and female responses that are represented by coloured blocks, reporting who likes whom. The point of grouping cells in social network matrices is to identify and test ideas about how actors are imbedded in social roles or other contexts; for example, the groupings in the Partitioned Matrix of Figure 5 indicate that all the males choose each other as friends, and no females choose each other as friends; and that the males are more likely to choose females as friends than the females are likely to choose males. These social elements are not immediately apparent by looking at the grouping of data in the plain Adjacency Matrix of Figure 4. Mathematical operations such as blocking or partitioning are helpful for highlighting certain aspects of patterns of ties in social networks (Hanneman & Riddle, 2005).

**Sociograms**

Sociograms are a graphic representation of social links created from data that depict the structure and patterns of group interaction. They consist of points or nodes to represent actors, and lines (or edges) to represent ties or relations. Traditionally sociograms have been used to depict network relationships resulting from graphs and the product of matrix manipulations (Durland & Fredericks, 2005).



**Figure 6. Sociogram of relationships in an organisation**

Adapted from Anderson (1999)

The sociogram in Figure 6 shows several direct pairings. A partial explanation of this sociogram is that there is a two-way flow of positive energy, as depicted by the double solid lines, which suggests that the people feel comfortable working together.

## **Application of Social Network Analysis**

Scott (2005) acknowledges that, by and large, texts and sources on SNA techniques have been produced by highly numerate specialists with a mathematical background. He also comments that the potential growth in use of new techniques of SNA was seen as unachievable by many researchers “who have found it difficult to come to grips with the highly technical and mathematical language in which much discussion of these techniques has been cast” (p. 1).

### ***Social network connections***

Hanneman and Riddle (2005) note that there are multiple levels of analysis when looking at social networks. They discuss the variance of connectivity of people within their networks; that is, the more people are connected, the more exposed they are to a diversity of information. Hanneman and Riddle (2005) also contend that those individuals who are highly connected are more likely to be influential people, and may be likely to be influenced by others. In terms of health, the applicability of SNA to the Māori population or to whānau is demonstrated by how well populations are connected and the consequences, such as the likelihood of disease or rumours spreading quickly. By the same token well-connected populations or whānau may also be well-placed to problem-solve or quickly gather their resources. Some populations may be similar to the extent that they are all similarly well connected as a network; other populations may contain a small group of centrally located and well-connected people with the larger mass of people having fewer connections. One perspective is to analyse the composition of networks by looking at the stratification order or social layers of social groups.

Another perspective that Hanneman & Riddle (2005) discuss is the distance or connectedness of actors to one another, which serves to inform the ease with which actors can reach other members of their networks to the degree that ‘everyone knows’. Some actors may pass a message to their connections but if some of those connections may not be well connected to others the message may not be relayed too far. Other considerations in connectedness is whether a network has limited connections and whether it is limited in scope and activity (constrained), or whether the network consists of actors with difference, in which case connectedness relates not so much to the number of connections in a network, but to the extent of the outreach in terms of opportunity.

Some social networks may be small and others can be large. In regard to smaller personal networks (also known as egocentric networks) the sorts of information an analyst would be seeking includes (according to Wellman, 2007, p. 349):

- The types of people contained in the network, that is, whether they are composed mostly of friends or family, etc.
- The quality of relationships, that is, whether they are strong or weak ties; and the frequency of contact – whether they are in contact often or infrequently.
- What kinds of resources flow through the different networks, to find out for example whether kin provide more emotional support than friends?

However, in regard to whole networks (otherwise known as complete networks), the information sought by analysts tends to be about the structure and composition of the whole network, such as who is in the network and the relational ties, and they typically seek to study specified ties of a defined population (Wellman & Berkowitz, 1988).

### ***Social support networks***

Personal (ego-centred) networks are made up of individuals who have contact with others; they are composed of alters (other people) with whom the ego (individual) has a relationship (Agneessens, Waeye & Lievens, 2006). Alters provide social support to the ego; such support correlates to stress, psychological (mental and emotional) and physical wellbeing, health and longevity, personality characteristics, and attitudes towards life and society. Different types of support may be provided by different alters (e.g., a spouse, relative (immediate and extended), colleague, friend, neighbour). As Agneessens et al. (2006) point out different alters may provide different resources (e.g., emotional support, instrumental support, companionship). Although an individual may have various social support networks, they may not necessarily be of equal importance. SNA is useful to capture qualitative aspects of support networks available to people, which include patterns of behaviour (Agneessens et al., 2006).

In health research many older studies on social networks were integrated with social support. More recent studies have paid particular attention to the support from networks in order to gain further understanding of how social relationships influence health. By examining the socio-cultural context in which networks are analysed Kana'iaupuni, Donato, Thompson-Colon and Stainback (2005) argue they are better able to understand which ties and network attributes are support resources with a particular focus on [Mexican] child health. Research shows that social support networks are especially meaningful for economically marginalised households in that the greater the support networks, the more chances of good/excellent [child] health status (Kana'iaupuni et al., 2005).

### ***Ethnographic studies***

Ethnography is the study of the customs of people and their culture. SNA is important within ethnography as a tool to explore kinships groups and support networks within and across cultures. A Spanish proverb that translates as 'Tell me who you walk with, and I will tell you who you are' provides clues as to the value of social network analysis and the judgements people make according to whom people are involved with (Schensul, LeCompte, Trotter II, Cromley, & Singer, 1999, p. 1). The advantages of ethnographic network approaches are (Schensul et al., 1999, p. 42):

- Identifying and assessing hidden populations.
- Recruiting, retaining and following up on intervention populations.
- Understanding personal social influences on the lives, decisions, and behaviours of individuals.

- Enhancing the efficacy of behavioural interventions by working with groups that have maximum impact on the lives of the individuals who are members.
- Understanding and intervening to change barriers and facilitators to information flow in order to reach individuals and groups more effectively.

Schensul et al. (1999) note that the approach to social networking is more sophisticated these days as not only have ethnographers noticed how group structures differ within and between cultures, but they are also interested in how these differences affect what people think and do, and what influences their behaviour and actions. Ethnographers use network analysis to identify various kinds of networks (e.g., drug user networks) to explore patterns of behaviour within networks, the flow of information, and predicting knowledge and behaviour within the group. This information can be used to develop interventions to encourage group change. A key point is that:

Network methods are especially effective for interventions because naturally existing network connections encourage participation and provide peer pressures that can reduce barriers to prevention and education and enhance retention. (Schensul et al., 1999, p. 43)

The analysis of data collected on reciprocal relationships is useful to help understand complex conditions in everyday lives. Useful information includes connectedness within networks; power and influence of actors; and roles and their impact. There are two different approaches to understanding cultural networks that are important in ethnographic research; namely, the systematic exploration of kinship groups, and the ethnographic exploration of social networks (Schensul et al., 1999). Extensive work by anthropologists has expanded the knowledge of kinship and non-kinship networks. For the purposes of research with Māori as collectives, both whakapapa networks and kaupapa networks play a significant role in Māori networks.

Network analysis is viewed as a highly desirable and productive tool for a wide variety of ethnographic research projects (Schensul et al., 1999). Social scientists have realised that not all network members are supportive and therefore network analysis enables analysts to distinguish the different types of support people receive and the different types of support that different people provide, as network members may provide various types of support, but not all types of support (Wellman & Wortley, 1989). Multi-level analysis is used to determine the effect and quality of resources that flow through networks, for example, to determine whether individual immediate kin are more supportive when they have networks dominated by immediate kin. Other uses of analyses are to trace changes within networks over time in terms of life experience and relationships; and discerning community practice – who knows whom, who knows what, and who knows who knows what and therefore the implications those relationships pose within social networks (Wellman, 2007).

Hidden populations are “groups that reside outside of institutional and clinical settings” (Schensul et al., 1999, p. 125), and whose “activities are clandestine and therefore concealed from the view of mainstream society and agencies of social control” (Watters & Biernacki, 1989, p. 417). Examples of hidden populations are runaway youth, illicit drug users, sex workers, unwed pregnant teens, abused children, women who suffer domestic violence and school dropouts. Within those groups may be hidden subgroups that it may be important to learn about due to significant rates of health, mental health, and nutritional, social or other needs. Hidden populations are highly likely to be disadvantaged and disenfranchised, therefore they are mentioned here as SNA may assist in providing knowledge to ensure these groups are provided for in terms of intervention strategies and targeted services.

Research undertaken in terms of kinship and community studies using SNA applications are investigations of social mobility, social class structure, perceptions of class, corporate power, international trade exchanges, contact within deviant groups, welfare support, science citations, migration patterns, reactions to disasters and the transmission of disease through

sexual contact (Scott, 1988). Scott (1998) also mentions studies that have been undertaken of urbanisation to understand its effect on communities and the traditional conceptions as well as transformations of communities.

### ***Use of the internet to maintain networks***

Much has been written about the effect of the internet on networks and communities as a modern form of social communication (e.g., Hampton & Wellman, 2003; Mok, Wellman, & Carrasco, 2009; Boase, Horrigan, Wellman & Rainie, 2006; Wellman, 2001a,b, 2007). Interestingly it was generally perceived that when modern forms of communication were introduced (e.g., telegraph, telephone, cell phone, email), each invention would bring about the death of distance in that connectivity had little regard for spatial distance, and people would no longer feel the need to travel to socialise (Mok et al., 2009). Research considered the effect the internet would have on connectivity as to whether it would accelerate the disintegration of social relationships and community thereby increasing social isolation (Mok et al., 2009). Even before the advent of the internet, telephones and transport such as planes and vehicles saw people forming networks with those other than their neighbours; hence technology aided long distance connectivity and people did not restrict themselves to neighbourly contact (Larson, Urry & Axhausen, 2008).

Recent research has confirmed that the closer people are in proximity, the more they interact (Mok et al., 2009), and that rather than being bound solely to one community, networks have become more geographically dispersed allowing people to seek out a variety of appropriate people and resources (Boase et al., 2006). Communities have become what Wellman (2001a) has coined as “glocalised” – simultaneously globally connected and locally involved. Findings show that the internet works synergistically with face-to-face contact to consolidate social networking and that the internet together with the phone and face-to-face are major mediums of communication (Boase et al., 2006; Wellman, 2001a). Wellman (2001b) states that although modern communication technology assists in the fragmentation of organisations, community, work groups and households, people remain connected as individuals, utilising their networks to obtain information, support, and meet sociability needs. Furthermore Mok et al. (2009) contend that the relationship is what is considered most important; not the method of communication.

The internet, although not a SNA tool, is mentioned here as it is effective as a tool for connecting whānau with, and maintaining, social networks. Mok et al. (2009) conducted a study on the effect of distance on the frequency of contact in personal networks through the use of email, phone, face-to-face contact and overall contact, pre and post the internet. In an American study, the analysis confirmed that email contact is generally insensitive to distance, and tends to increase for transoceanic relationships of great distance. Interestingly, Mok et al. (2009) advise email has only somewhat altered the way people maintain contact; the frequency of face-to-face contact among friends and relatives has hardly changed between the 1970s and the 2000s, although the frequency of phone contact has increased. The study also showed that the sensitivity of relationships to distance has remained similar despite the affordability of telephone and internet communication.

Communities are described by Hampton and Wellman (2003) as consisting of various ties (kinship, workplace, friendship, interest and neighbourhood) that link together as networks to provide sociability, support, assistance and social control. Hampton and Wellman (2003) note that communities are social networks that are sparsely, rather than densely, knit and they are loosely bound. Therefore opportunities exist to locate resources within a number of social circles rather than from within one group of people. Analysis of ethnographic data and a survey of a suburb in Toronto by Hampton and Wellman (2003) found that the internet did not weaken interpersonal community contact; disengagement from the community; or the decline of gatherings, involvement and commitment to community. ‘Wired’ residents, who had access to high speed internet allowed people within this suburb to transform and enhance

their neighbouring through easy access and online discussion groups. The internet supported increased access with weaker ties, and more neighbours were known and chatted with despite being geographically dispersed. The internet has also created a whole new form of community – the ‘virtual community’ – which does not contain people within geographical boundaries nor social characteristics such as race, ethnicity, gender and socio-economic status (Hampton & Wellman, 2003).

### **Social Network Analysis software**

There are many SNA software applications that are used to represent, analyse and visualise various types of data. Scott (2005) explains that analysing small data sets, such as information for a four- or five-person group can easily be crafted by hand; but for networks much larger, analysis can become more difficult. Scott suggests that when dealing with data sets that have more than ten cases and five affiliations, processing of the information by computer saves considerable time, and analysis can be performed which may not be possible manually. Software is useful for simulating nodes, that is, agents or organisations that form the network, and relationships. The Wikipedia Social Network Analysis Software webpage (Wikipedia, 2010) notes that visual representations of social networks are not only important to understand data and the result of analysis; they are also important as an additional or stand alone analysis method.

The Wikipedia SNA software webpage lists numerous social network tools, such as ‘UCInet’, and Pajek. These tools were two of the four software applications Scott wrote a chapter about (2005, p. 175); the other two tools were GRADAP, and Structure. Wikipedia also lists other SNA applications in a chart, which includes notes as to the tools’ functionality; the input and output formats; the type of platform, for example, Mac OSX, Windows, etc.; purchase cost or whether it is free (for non-commercial use); and notes as to applicability and use in certain contexts.

The software has not been reviewed to determine which package might be best for analysing Māori social networks and why. However, critique of the software would be a good idea for future work on SNA.

## **Social Network Analysis and Indigenous people**

SNA has been conducted with Indigenous peoples and minority groups in a variety of research settings. The following are some examples of such studies.

### **SNA and ethnic minority groups in organisations**

A study of the social identity and social networks of ethnic minority groups in ethnically diverse organisations sought to test the (Distinctiveness) theory that members of a smaller ethnic group will (a) tend to identify and form friendships within their own ethnic group; and (b) will have less access to well connected individuals in their network of friendship relations compared with larger ethnic minority groups (Leonard, Mehra & Katerberg, 2008). In contrast to previous research, their study found that members of the smaller ethnic group were just as well connected to the centre of their networks as were the members of the larger ethnic group. Desired future lines of enquiry would be to review social identity and social networks of those that are considered different from rather than similar to the study group.

The study also noted implications for practice in terms of the insights Distinctiveness theory would offer policy makers and managers such as whether the increasing ethnic diversity in schools and educational institutions enhances the learning experience for all or whether it contributes to a decline in cross-cultural relations and a reduction in the perceived quality of education (Leonard et al., 2008). Another organisation’s mission was to increase the number

of management professors of colour. A matter for further consideration is the ability of these people to remain well connected with people in their ethnic groups, as well as to build bridges between members of the smaller ethnic groups to well connected members of the larger groups. The researchers thought policy makers could use the Distinctiveness theory to “anticipate, understand, and explain to majority group members why members of under-represented groups seem so often to retreat into self-imposed isolation” (Leonard et al., 2008, p. 586). SNA would be an effective tool for studying these matters in consideration of Māori and other ethnic groups.

#### **Social networks and the effect on child wellbeing**

A study of Mexican families considered the relationship between social networks of mothers with young children and the effect on child well-being (Kana'iaupuni et al., 2005). Several dimensions of social networks were considered – network size, kinship and non-kinship roles, interaction (whether support lives in close proximity – either as a co-resident or nearby; and whether support is in close and regular contact) and the provision of emotional and financial support. The findings of this study suggested that greater support resources existed for those networks with greater extended kin rather than immediate kin, and those networks where support came from those living in the same residence. Furthermore the study confirmed the importance to the wellbeing of Mexican families of social networks founded on the principles of reciprocity, *confianza* (a system of reciprocal exchange), and *compadrazgo* (institute of godparenting that names persons as protectors of newborns through various important life events). The researchers thought the study into the relationship between child wellbeing and social networks may provide insights into the function of social networks and social support systems for immigrant families, as well as providing insights into contributing factors for deteriorating health due to the breakdown of immigrant ties (Kana'iaupuni et al., 2005).

#### **Social Network Analysis in the context of Andean local groups**

Rural Andean societies feature extensive socio-cultural and economic networks developed by building on traditional knowledge and economic and power relations that link different communities locally, nationally and internationally through real and fictitious kinship (the construction of social and economic relations) (Teves & Fischer, 2008). SNA provides insights into various levels of the local Andean lifestyles by mapping their social and economic ties; investigating their rationale for decision-making processes; and the direct and indirect, and reciprocal and unequal exchange of raw materials, goods and manpower. For example, an informant with a personal network of only six people is shown to be known by a majority of people within individual networks, highlighting that people can be viewed differently in the context of relations of a network.

The study also captured the movements and relationships within a geographical setting for those whose daily work routine required them to travel within the region, showing the extent of their networks, mapping the paths to the locations, showing distances between locations, and the importance of each of the locations within the network for the economic sustainability to the network as a whole (Teves & Fischer, 2008). Similarly SNA could be used to depict Māori collectives in urban and rural areas and the value and connectedness of their networks or not in terms of support, reciprocity or exchange of goods or services; opportunities for workforce development regionally in rural areas; identification of key people within communities to utilise and broaden networks; the transient nature of some whānau due to economic and social circumstances; potential gaps for lack of connectedness to support services, and so on.

#### **Kaupapa Māori analysis**

Kaupapa Māori enables Māori to legitimise their knowledge, experiences and ways of being, with Te Ao Māori as the focal element (Cram, 2004). Graham Smith positions Kaupapa

Māori theory locally as being valid and legitimate; that the language and culture are imperative to its survival; and that autonomy of their culture and wellbeing is imperative for Māori survival. SNA is a method that aligns with Kaupapa Māori principles and practices in that the method is conducive to understanding and gaining further knowledge about Māori as collectives; and to working with information to gain improved understandings, practice, and social, economical and spiritual wellness for Māori. SNA is compatible with Kaupapa Māori principles as it seeks to validate the collective nature of whānau rather than the individualistic nature of Western ways of being. Kaupapa Māori research is by Māori, for Māori, with Māori (Smith, G. cited in L. Smith, 1999); an approach that ensures that Māori are involved in all aspects of the research; SNA relates to the analysis of the research, but of course Māori may have full involvement in the other aspects of the research process pre and post analysis, such as the research design, information gathering, write up and dissemination of the findings. SNA is a method that will allow Māori to explore areas of interest to Māori whilst utilising Kaupapa Māori approaches such as (Bishop, 1996; Cram, 2001; Powick, 2003; Walker, Eketone & Gibbs, 2006):

- Giving full recognition to Māori cultural values and systems.
- Challenging Western (dominant) constructions of research.
- Determining the assumptions, values, key ideas and priorities of the research.
- Ensuring that Māori maintain conceptual, methodological and interpretive control over the research.
- Being guided by Māori philosophical beliefs, traditions, and values.

SNA will be useful for research with Indigenous people, for whom statistics show are historically disenfranchised, over-represented in negative statistics in terms of health, crime, poverty and low socio-economic status, to name a few. SNA will assist to learn more about indigenous people's support mechanisms in relation to their networks, leading to outcomes such as Scott and Handcock (2005) note (e.g., enquiries into intergenerational mobility, or measuring the likelihood for economic advancement), thereby contributing to understanding about persistent inequalities.

SNA will appeal to Māori and to policy-makers in terms of the learnings and understandings that can be gained about the connectedness and relatedness of Māori within their social networks. In conducting SNA we can learn more about whānau connections: whānau's ability to connect with their networks easily or not; the composition of their networks, that is, the social layers that make up networks and the maintenance of their connectivity; the use and value of their networks as resources and support; as well as the negative influence of some networks. SNA will enable Māori to look at how whānau are working as collectives or not; how the networks are structured; how large or small their networks are; and how connected their networks are.

It can also possibly determine information as highlighted in Schensul et al.'s (1999) publication about who may be missing out in terms of information, resources, etc., owing to limited connectedness; whānau's ability to make decisions quickly depending on the type and structure of their networks; their ability to impart information to their wider whānau quickly and effectively; their points of influence – how susceptible to influence they are; whether decision-making is based on the influence of a few key people or whether decisions are made with general consensus of the wider whānau; and so on. This is by no means a comprehensive list of the benefits of SNA or the things that can be studied for working with whānau, but certainly SNA is amenable to working with Māori. The learnings from SNA will also benefit any organisations, including government, who are interested in understanding the reality of whānau that may lead to reducing inequities and ensuring better outcomes for all.

Ideas for further research are suggested in the previous section as suggested by the articles reviewed regarding SNA and Indigenous People. Some ideas for future research also surfaced from the article reviewed below on social networks and Māori mental health. Other questions that future research on the use of SNA could address are:

- Are Māori social networks different from Western social networks, and if so, do Western SNA tools still apply in a Māori context?
- Are Māori more likely to have a great number of hidden populations that could affect SNA?
- What is the benefit of SNA tools used with Māori compared to other possible analysis tools?

### ***Māori social networks***

In this section research on two types of Māori social network is explored to illustrate the potential sites where SNA might add value to the understanding of these networks.

#### **Social networks and mental health service utilisation by Māori**

A study was conducted on the role and usefulness of social networks to utilisation of mental health services for Māori, noting that despite having larger social and supposedly more supportive social networks than Pākehā, Māori are over-represented in the mental health utilisation statistics (Kumar & Oakley Browne, 2008). The study examined sources of stress on Māori social networks that were considered to adversely affect the network's ability to support Māori experiencing mental illness. With the shift of care to communities in the 1970s, it is possible that support systems are already stressed. Personal networks may already be strained due to the burden of care; conversely, new social contacts through mental health services may engender an extended social network. Discrimination and/or institutionalised racism could be reasons over-representation of Māori in the statistics (which have not improved in the past decade). The researchers note that no studies have reported on the impact of social networks on mental health utilisation. This is an area in which SNA could be a useful tool.

Kumar and Oakley Browne (2008) note five reasons why Māori social networks may not be able to care for its members with mental health illness and these are stated briefly as follows:

1. Modernisation (for example, urbanisation) may have created pressure to abandon traditional values, causing effects such as fragmentation of social networks among Māori. Modernisation and urbanisation has also led to the weakening of the authority a group once had over individuals, or even greater still, a loss of identity. Social alienation may also have occurred due to modernisation.
2. Sub-groups of Māori with smaller networks may be heavier users of mental health users as they are less likely to be able to reciprocate when others in their networks require support, causing their social supports or networks to shrink.
3. The discharge of institutionalise patients in to the community in the 1970s put further strain on families and may have worsened the alienation of the mentally ill from the community instead of integrating them.
4. Other factors such as socio-economic deprivation or inadequate access to primary health care may increase the vulnerability of Māori to mental illnesses of significant severity.
5. Māori may not identify or associate themselves with their social networks, and hence do not draw adequate support from them.

The study calls for the examination of social networks and the relationship with urbanisation and service utilisation. The article suggests social networks, supports and ties could be studied for a comparison and contrast between Māori in mental health services and Māori in the

general population to help understand the erosion of group authority over individuals, for example. The article declares the need for further investigation into these issues, and certainly SNA would be a valuable tool for analysis of the relationship of Māori social networks to service utilisation (Kumar & Oakley Browne, 2008).

### **Social networks and the internet**

Of interest is the notion of creating, building and maintaining kinship networks through the use of the internet. Although networking is not a tool of itself, its use by whānau is important as being worthy of analysis. The use of websites and online network sites such as Facebook are becoming increasingly popular tools to establish and maintain connections with whānau. As an example our whānau developed and launched a whānau website through completion of fairly basic templates. The website provided a central point of information for whānau about the impending whānau reunion at our marae for relatives descended from two particular tūpuna. Whānau were notified through the 'grapevine' about the website, which kept them informed about the many aspects of the reunion, including organisation and expectations of whānau's involvement. This material did not need to be duplicated or repeated as it was available on the website for all to see and refer to. Whānau were asked to direct whānau they were in touch with, to the website, hence whānau living all over New Zealand, in Australia, Europe and elsewhere in the world were able to access information from the website. During and after the hui, whānau posted comments, blogs, photos and videos on the website, which enabled all those who were not present to gain a sense of the proceedings; to see and also listen to whānau that they may not have seen or heard from for a long time; to observe the interaction with other whānau; and to see the familiar surroundings of the tiny East Coast settlement. Postings also revived memories for those who had been there. Although activity on the website has dwindled somewhat as the purpose for which it was first established – an information zone regarding a particular event – has since passed, more whānau are becoming aware of the site and are using it to connect with their kin, to introduce themselves, and to state their position within the wider whānau. The website is therefore meeting the purpose of connecting and reconnecting whānau. Again these connections are occurring from near and far, within New Zealand, as well as overseas.

It would be interesting to analyse the social capital of whānau connections; social capital is broadly referred to as "the resources accumulated through relationships among people" (Ellison, Steinfield & Lampe, 2007). Social capital is linked to positive social outcomes such as improved health, and lower crime rates; as well as negative purposes such as collusion on illegal activities (Ellison et al., 2007). If this is so, no matter the outcome – positive or negative, the analysis of social capital among whānau networks is worthy of further investigation.

Facebook has also been interesting in terms of a vehicle for facilitating and maintaining whānau connections; whānau are utilising Facebook to connect with and maintain contact with whānau they already know. From the author's observations and experience of connecting with whānau on Facebook, whānau's connections are also steadily increasing as users' networks facilitate connections to more and more whānau – people they already knew, but with whom they had little or no contact. Research into the use of Facebook as a facilitator of networks suggests that users search for people they have off-line connections with rather than complete strangers (Ellison et al., 2007). The connections may be quite weak in that the family ties may not be close; for example, our great grandparents had 14 children, whose children, and their children, have had children. So the common relationship, that of being kin, is sufficient to make and maintain a connection, and enables whānau to state their place within the whānau through the network forum.

Also of interest is the notion that Facebook facilitates social capital; Facebook enables people to access others outside of their networks, hence people benefit from an increase in access to resources due to an increase in their network ties. Various forms of social capital, such as

social ties, are related to positive outcomes such as wellbeing, self-esteem, and satisfaction with life (Ellison et al., 2007). Therefore, is Facebook serving whānau well in terms of gaining resources, information and maintaining contact? How are Māori using Facebook? Has SNA of Māori Facebook use been conducted? How do we get information/ statistics on Facebook, particularly if Facebook doesn't allow for people to state their ethnicity? The following are just some of the questions that future research on SNA can ask in terms of internet use and other forms of communication used by Māori collectives:

- What is the usage of internet among Māori?
- To what extent do Māori use internet-based social networking tools to connect with and maintain their social networks?
- How does this compare with other communication tools such as e-mail, mobile phones, landlines and letter writing?

Kaupapa Māori analysis includes an overview of the use of some Māori social networks to which we then ask, "Could we apply SNA to these situations?" The response is to the affirmative, but now the challenge is to go and seek answers to these questions and many more that will arise.

### ***Barriers to use***

Much of the material written about SNA uses highly technical language, mainly due to the mathematical nature of analysis; this could be a barrier to use for working with whānau. Ideally the SNA methods should be engaging and easy to understand and use; if they are too complicated those working with whānau may become resistant to, or even abandon use. Complex SNA methods may require time and effort for familiarisation in order to conduct analysis effectively.

Other matters that will be barriers to use of SNA relate to the ethics of researching with Māori such as ensuring the notion of Kaupapa Māori research with whānau. Other concerns relate to questions about who will use the information; who owns the information, how will it be used, hesitation about having whakapapa documented, ensuring the diversity of whānau collectives, and ensuring a strengths-based approach. These are ethical concerns that are not specifically barriers for research using SNA.

In terms of SNA, barriers are around obtaining consent. This may be problematic, not so much for the person who consents to provide information (respondent) for SNA, but more for the people whose names are put forward by respondents. Of concern is that those people may not even realise that they have become part of a survey, and therefore there may be issues in contacting those people, in obtaining consent and in maintaining anonymity and confidentiality (Kadushin, 2005, p. 149). Other concerns are that people may not want their networks to be documented. Kadushin also notes that SNA has been conducted using publicly available records. The risks to using that information are that the records may be used in a manner that was not originally intended, and that there may be issues about the reliability of the information source and the accuracy of the information (Kadushin, 2005, p. 142). Finally, Kadushin asks, "Who benefits from the research?" This is an all-important question for Māori and those conducting research with Māori. Guiding principles that emerged from a national and international stock-take of literature for working respectfully with Indigenous peoples (Kennedy & Wehipeihana, 2006) alleviate some of those barriers through being respectful of those they are conducting research with. They are:

- **Self-determination**, including the right to make decisions about all aspects of their lives;
- **Clear benefits** to those being researched;

- **Acknowledgement and awareness**, which refers to due recognition and appreciation for indigenous culture, values, customs, beliefs and rights, including an acceptance of a worldview that may not be consistent with Western ideologies;
- **Cultural integrity**, which relates to the validity of indigenous knowing and ways of being, and that cultural knowledge be protected from misuse and misappropriation, and must be preserved for future generations; and
- **Capacity building**, which enables Indigenous peoples to participate actively in the research, with the aim to ultimately drive their own research.

As stated by Linda Smith, a respect for people is required when involving them in research (L. Smith, 1999). This is further articulated by Kennedy and Cram in terms of research with Māori collectives, to allow whānau to set the agenda for the research, and ensure they tell their story and that they are part of the decision-making processes (Kennedy & Cram, 2010).

## Summary

SNA will be a useful tool for achieving learnings and understandings about the connectedness and relatedness of Māori within their social networks such as the composition of whānau networks – the size, the social layers and the geographical and demographical spread; how connectivity is maintained and the ease or difficulty in maintaining connectivity; the strengths and limitations of whānau resources and support; the ability for whānau to communicate quickly and effectively; points of influence such as their susceptibility to influence and whether decision-making is by consensus of the wider whānau or influenced by a few key people. The benefits of SNA are the learnings and understandings that may be captured that can be used by providers, agencies, researchers, individuals, communities and whānau to better support whānau to achieve their goals and aspirations. This paper provides an overview of SNA and we have seen that Māori are taking part in interesting activities to ensure they are communicating, and building and maintaining their social networks. Now we need to consider the questions we need to ask to ensure that SNA will benefit Māori from the knowledge that it brings about.

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