Sociometry and Social Network Analysis:
Applications and Implications

Diana Jones

Diana Jones is a sociometrist and TEP based in Wellington, New Zealand. She is an organisation development practitioner working extensively in organisations in team and leadership development and as an executive coach.

Organisation developments are directly related to shifts in interactions amongst team members: new conversations, new approaches to interactions, new behaviours, new patterns of relationships, and new attitudes all contribute to producing and implementing change. When people collaborate in new ways, these fresh patterns of interactions are reflected deeper within the organisation. Using group processes and identifying significant informal networks within and between groups stimulates new patterns of interaction, with maps and sociograms as potential tools. Social network analysts use maps to display relationships between entities and are contributing to the body of knowledge on relationships. Much of their work is 'at a distance' from those they are analysing. This paper aims to make a bridge between the two distinct yet related worlds of sociometry and social network analyses.

Sociometry - Where The Conversations Really Matter

At the time of exploring relationships within a longstanding leadership team, the CEO wanted business groups to work collaboratively to fund and implement a number of cross agency initiatives. While the leaders indicated all budgets were entirely committed to business unit activities, I had discovered there were funds available. However the attitude '*I won't show*

you mine, til you show me yours' meant no one was willing to declare their financial flexibility within the team. Leaders let me know they were anxious their colleagues' development decisions would compete negatively with their own business unit.

In one of our meetings, we asked, "who in the group do I choose to analyse my budget and let me analyse theirs with a view to releasing funds". Group members stood beside the person they chose and then mutual pairs worked together. Within 45 minutes, $15 million dollars had been released for organisation wide projects. By mid morning, $33 million was available and a strategic plan was created including an integrated information system, company-wide project management training, and a project approach to company development. A shared agenda had emerged. Groups members appeared to thrive on these discussions and really enjoyed their interactions with the peer of their choice, as they weighed up the merits or otherwise of their individual business plans and budgets.

Over subsequent months, in planning to implement the significant business developments identified earlier, the CEO assessed the ongoing dilemma facing the group, that group members don't trust one

another. I suggested we discover if this was true. The criterion we decided to explore was, "whom in the group do I trust to make business decisions to progress the overall business". The exploration was within a leadership development programme where the group met for one day each month during the year. Naturally this criterion is a risk to any group. Most people don't want to reveal this information, nor hear they are not trusted. The CEO reminded everyone he wanted a collaborative working group and observed that people were behaving as if they didn't trust one another. Here was a chance to find out the truth amongst colleagues who had worked together for some years. Tentatively, everyone completed their choices on paper; of yes, no or neutral and noted reasons for their choice. Everyone then shared their choice and reason with each of the others. Two things were quickly apparent: the pairs were having lively discussions of their choices and responses, and that two business unit managers, Ben and Dan, had chosen each other negatively. Sitting together in the middle of the room, Ben and Dan shared their reasons with one another. Everyone, including me was alert to this discussion, although few heard the content.

The map of the informal network including all choices was drawn on the whiteboard. This map displayed the previously invisible network of relationships that would progress the work of the entire group. New relationships formed as group members reflected on their experience, and the choices they had made with one another. Many of us there on that day have since made observations of developments. The two business unit managers who negatively chose one another and courageously shared their reasons are now collaborative colleagues. The strategic plan from that day has been implemented. With the exception of two members of the original eleven, this leadership team remained intact for a further five years and is still known within their industry as a high performing team.

I have learned that with sociometric explorations, the maps are not important to group members at the time. Discovering who has chosen you, and hearing their reasons, sharing your own choices and reasons, then responding to one another authentically, is much more important. As Dr Moreno envisioned, the purpose of a sociometric exploration is spontaneity and the development of group members' capacities to respond to their everyday dilemmas with vitality, creativity, novelty, flexibility and adequacy (Moreno 1953).

Social Network Analysis (SNA) - Where the Maps Really Matter

Having explored and mapped social networks for over twenty years as a sociometrist, imagine my surprise in 2005 to discover the world of Social Network Analysts - a group of academics, researchers and practitioners using software to map and display 'social networks' and analysing human relations visually and mathematically, "to understand how these relationships might influence individual and group behaviour." (Valente et al, 2004)

There are university courses, discussion forums, international conferences, articles and journals, and an increasing number of books on this subject. While SNA researchers and practitioners study within a wide range of disciplines (behavioural science, sociology, mathematics, organisation behaviour) few appear to include group work training. In April 2006, I immersed myself in the International Network of Social Network Analysts conference. There I entered a world of academic and mathematical analysis of relationships, vastly different from working with people and their authentic responses to one another. Since then, I have been stimulated to explore some of the distinctions between Morenian sociometry and Social Network Analysis, and the potential collaboration between the two.

Participant Involvement

The first significant difference between sociometrists and SNA practitioners is

the question of how data is gathered from participants, and whether it is done *in situ.* Many SNA researchers appear to make their analyses without participants knowing they are considered as a group, or that their relationships are being assessed in any way. Data mining, email mining and internet surveys are frequently used to gather data. Data gathering of choices where the participants are not actively participating with one another is termed "near sociometric" (Moreno 1953:74). In the rush to display maps of relationships, groups may be unaware these maps are being made, and are frequently neither consulted nor advised that their relationships are under scrutiny. Nor are they aware that the assessment of their relationships is available for others to see.

A basic principle of sociometric group research is that participants in such social network explorations have access to the maps and data being generated about them. In organisations, sociograms and social network maps should be the property of the participants, and not the managers' or the organisation's. A three (or more)-way agreement of who has access to the maps needs to be worked out with the investigator (whether sociometrist or SNA), the participants, and the organisation prior to the exploration being undertaken. The researchers' mandate must clarify the purpose of any exploration. Participants need to know the process they are participating in, what data and sociograms they can expect to see, and who else has access to these. Without these safeguards, the value of both the exploration and the sociograms will be lost to the participants.

Sociometrists gather data in as transparent a way as possible. Sociometrists know that asking group members to choose whom to include, or not to include on specific and real criteria, is a challenging process. This challenge is particularly apparent when the people are in the room with one another at the time. Group work training and experience is important when working with individual and group concerns.

Data vs Encounter
The second significant difference between sociometrists and social network analysts is that social network analysts value collecting and analysing data and displaying relationships using sophisticated computer programmes to present data in maps and graphs. In contrast, sociometrists value initiating interactions amongst participants based on the choices people have made to stimulate interpersonal authenticity and group development.

> When the group members realize that the investigation is meant to improve their relationships and interaction with others and find their choices respected and acted upon, the level of the group's morale is greatly enhanced, co-operation insured and cohesion improved. (Moreno, 2000:234)

Group Development vs Research Project
A third significant difference is in the selection of criteria. Each question or criterion that researchers use, displays a different network configuration of that group at that snapshot in time. Networks amongst the same players vary according to the criteria or questions being explored. This factor is the power of the social network methodologies. It is also the reason why we need to work effectively with social network maps with both network participants and the information they are sharing. Sociometrists know that any question or criteria needs to be based on common interactions relevant to participating group members. Sociometrists choose criteria relevant to the group and its development, where SNA researchers use criteria relevant to their research project or client briefing, and may not have a close link with the purpose or desires of the group being researched. For example in SNA research, such criteria include:

- Who are you in regular contact with?
- Who do you typically give work-related information to?
- Who do you turn to for input prior to making an important decision?

- Who are you likely to turn to in order to discuss a new or innovative idea?
- Who are you friends with?
- Who are the opinion leaders you consult with on ....?

However what is neither asked for, nor used, is a process for individuals or groups to share their choices with one another. This means a rich source of relational data and interaction is omitted.

Historic Foundations

It is interesting to see the origins of SNA. These are interdisciplinary, and rely on key players from a range of fields: Mayo from Harvard and the Hawthorne experiments in the 1920's and early 1930's; Moreno, sociometry and group psychotherapy; Lazarfeld and Harary from mathematics; Barnes and Botts from anthropology in the 1940's; Kohler and Lewin from psychology; Granovetter and White from sociology in the 1970's; and currently, Wellman, Burt, Borgatti, Cross and Freeman. Computer technology coupled with dynamic software, designed with interdisciplinary interests in mind, the mapping of previously invisible networks of relationships is now easy. SNA software enables relationships amongst groups of tens to hundreds (UCINET), to hundreds of thousands (PAJEK) of people (nodes) to be mapped. Programmes automatically toss up the number of possible relationships amongst group members, the number of mutual relationships, the sociometric stars, and participants' 'betweenness scores' (the number of relationships they are from those stars).
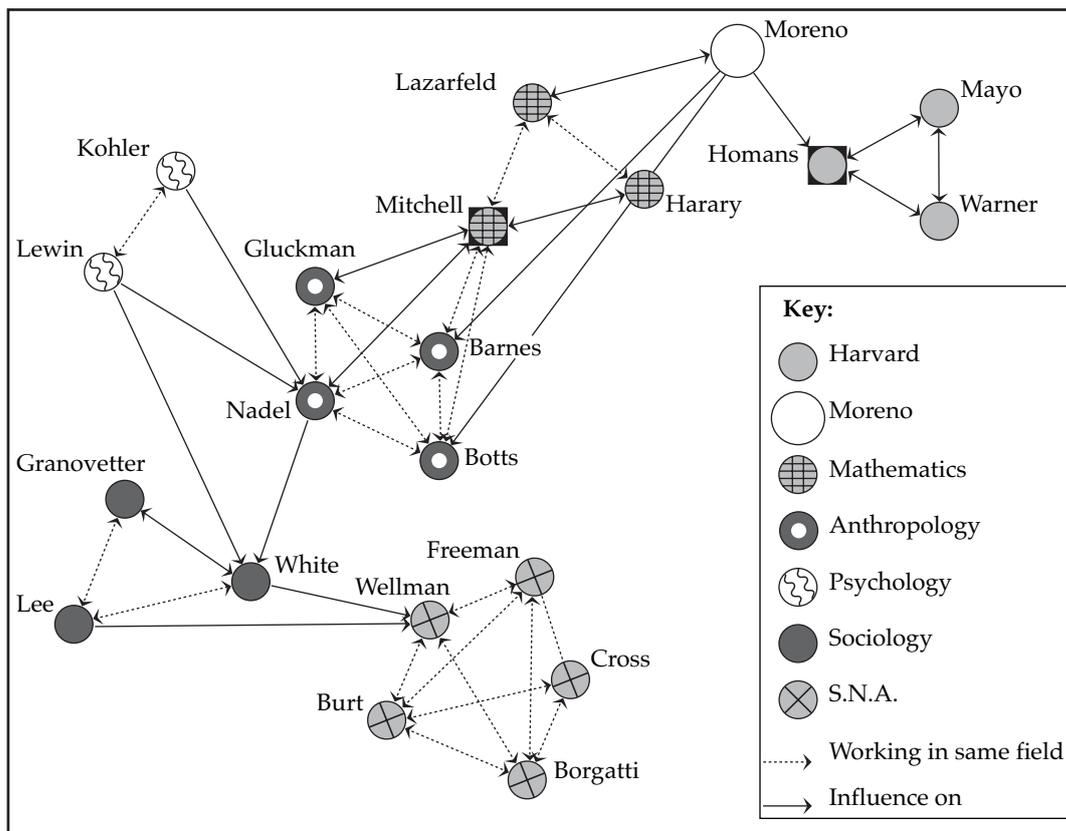

Diagram 1: Origins of and influencers in social network analysis

Social Network Software: Uses and Abuses

Software enables researchers to have sophisticated mathematical and technological approaches to identifying interpersonal and group relationships. Using the technology, researchers can move participants to better display stars, cliques and inter-connections amongst individuals and sub groups. A myriad of algorithms, mathematical and hypothetical solutions can be generated as to the nature of positions of individuals within the sociogram. Researchers delight in reflective studies such as, 'who kicked the ball to who in the final of the world cup', 'who emailed who in Enron' or 'which directors re-occur within a series of international companies and their boards (interlocking directorates)'. Here is a further difference. Much of SNA appears to be driven by a love of technology, mathematical algorithms, and the sheer pleasure of visual displays of previously hidden informal networks of relationships. In contrast, sociometrists' delight in experiencing the authentic interactions amongst participants, and in fresh new responses within the group.

Disappointingly, few SNA academics have knowledge of or give value to Moreno's original vision of spontaneity, individual and group development. There is low capacity amongst SNA researchers to work with the complex emotional responses evoked when a researcher wants to explore and display the previously invisible networks of interpersonal relationships in work groups. "Experience suggests that this technique serves as a powerful catalyst for change. It is dangerous, however, because of the powerful emotions it engenders in a group setting and this can put the researcher in the position of practising therapy without a licence." (Borgatti and Molena, 2005:109).

Sociometrists know it is not desirable to separate emotional responses from thinking and action - they are intimately connected. Exploring and displaying previously invisible relationships in groups will engender strong resistance from participants if:

- The criteria is not relevant to the group's purpose (e.g. asking work colleagues who they are friends with)
- Confidentiality agreements are not sought and established
- Access to the information is broader than within the actual participant group
- The purpose of gathering the data is not agreed to by participants

Any researcher is naïve to think that he or she can work with group information and not have to respond to the fears and anxieties of group members.

Increasingly SNA'ers encourage the use of network maps by managers in organisations. This approach cuts across the work of sociometrists and feeds intellectual decision making by managers, for example, rearranging formal reporting relationships as a solution to complex interpersonal and inter-group dilemmas. By ignoring the emotional component of behaviour within organisations, SNA's contribution to organisation development is incomplete. If managers continue the old approach of making decisions affecting others without involving them in the decision, SNA's potential contribution as a participation technology will be overlooked. Where sociometrists value spontaneity as the purpose and outcome of network exploration, SNA does not.

Moreno's Contribution to Social Networks

Jacob Moreno (1889 - 1974), experimenting in the 1930's, discovered a central force in personality. He discovered that people, like molecules, have responses to one another. People are:

- attracted to one another on specific bases, like hydrogen and oxygen, or
- repulsed, and move away from one another, similar to magnetic poles, or oil and water, or
- are neutral, that is, they don't have a sense of the other.

Moreno called this phenomena 'tele'. He described tele as the two-way flow of feeling from one person to another and having both an outgoing flow and an incoming flow. Tele is both a fact and a concept. Moreno defined tele "as the factor responsible for the increased rate of interaction between members of a group" and "for the increased mutuality of choices surpassing chance possibility" (Moreno JL 1953:311-312). Essentially tele, if we learn to respond to the attractions and repulsions, assists us find companions for the range of criteria we explore in living our life.

There are five types of tele relationships, which can be displayed.
i)   Positive symmetrical relationships: where there is mutual benefit to both players in the dyad
ii) One way: non mutual relationships frequently occur when several or many individuals go to one person for information, largely because of the function, a sociotelic criteria (Williams 1991), for example, help desk, finance manager, team leader
iii) Asymmetrical: where a positive choice is met with a negative or neutral choice.[1] Think of falling in love with someone who prefers you as a colleague (Moreno JL 1953, Moreno ZT 1987, 2000).
iv) Negative: meaning an actor consciously chooses not to be with a particular person on the criterion under exploration
v)   Neutral: the actors are currently unknown or not significant to the other.

Crucially, social network analysts tend to map only positive choices and focus on mutuality, density, and 'structural holes', where there is no apparent relationship. Indeed SNA sociograms and network graphs do contain and display significant personal information of participants. However, mapping and considering only positive connections, and/or assuming that where there is no relationship there is a 'structural hole', means that, from a sociometric perspective, social network researchers display only part of the actual network.

In addition, SNA researchers neither relate to tele, nor the psychosocial field of relationships. Researchers appear unaware of, or disregard the significance of the social and cultural atom. Although there is increasing interest in SNA in mapping 'ego networks', the main focus is to assist people expand their network of relationships rather than accept that sociograms reflect social atoms which are, in themselves, the source of relationship significance.

Exploring Negative Choices

From a sociometric point of view interpersonal networks form the emotional and psychological geography of a community. These networks greatly influence what occurs within and between people, groups, families, organisations and societies. Positive tele between people is responsible for cohesion in groups, and the enactment of negative tele is at the basis of disintegration in relationships. Being responsive to these dynamic and differentiated flows of feeling creates the possibility of new and innovative responses to old and familiar situations.

Negative choices do not reside easily within SNA. This means that few SNA applications will be relevant to authentic and sustainable group and organisation development, and because of the 'danger' perceived in working with powerful emotions, a rich source of relational data is ignored.

Obviously, there will be many occasions where group members do not want to explore or reveal choices to one another. It is natural to have anxieties when greater intimacy is being called for, especially in organisations. Revealing network maps, both positive and negative, calls for wise judgement by the investigator. For groups, either in trouble or wanting to increase their vitality and spontaneity, negative choices must be included, even if results are not disclosed. (Moreno ZT 2000).

Managing Negative Data

In one of my recent projects, group members

were asked their responses to, "who in the group do I trust to solve problems in a way that ensures consistency in our group". Positive, negative and neutral choices were invited. The data revealed (using INFLOW software) that 272 relationships were possible amongst the 17 people. There were 143 positive relationships. This gave a relationship density of 53%. This looked and sounded positive. Fifty-nine of a possible 136 relationships were mutual. These mutual positive choices clearly reflected the group's dynamics, and enabled their vibrant discussions. Looking at the sociogram of the negative choices, I was shocked. There were many negative choices (34% of possible relationships). The extent of negative choices went a long way in making sense of the difficulties this group was experiencing in collaborating. I realised that displaying this map of negative choices would emphasise the key rejecters and would not assist group members at this point in time. I decided that giving each group member their personal data of the number of choices made and received, positive, negative and neutral, alongside group norm data, would enable group members to compare their insights if they chose to talk about it with each other.

During the workshop and in the ensuing weeks, the negative choices were discussed fully within the informal network. Both the manager and team members reported that there were significant positive developments amongst a number of team members who had not previously worked well together. However, during the workshop, it was the maps of positive choices that stimulated the group's formal agenda.

Both the group in the investigation and the researcher need to exercise wise judgement as to the basis of disclosing the findings. Ignoring negative and neutral responses is not an option. It is important for all researchers to be aware of the flow of positive and negative feelings in any group. While maps can be created, often they are not of particular assistance to group members, as it is easy to read too much into them, especially

about others' choices or relationships.

In our culture, positive feelings are more valued and considered desirable. Negative feelings are often overlooked or provide serious concern. As Zerka Moreno points out: "Not being chosen, rejected or being overlooked within dyads, groups and societies, can be both devastating at worst, and wounding at best". ... and by "identifying rejection with being unloved and therefore unlovable: people become anxious, depressed and generally feel unworthy. Nevertheless, being rejected is a part of reality that not everyone can love us and actually, there is no reason why they should". (Moreno ZT 2000:234)

The considered 'no' is extremely important in group life and it takes skill to work with it effectively. It is part of 'what is'. To simply map relationships between people without taking into consideration positive, negative and neutral relationships is to consider only a fraction of the real picture. These positive, negative and neutral forces provide the dynamic flow of interpersonal connections, creativity and vitality in groups, which, in turn, damage, maintain, and evolve social networks.

While many SNA researchers and practitioners avoid displaying and working with negative dynamics in groups, sociometrists are more inclined to map and explore these relationships. SNA technology allows us to identify grapevines, alliances, cliques, inter-group relations, and cleavages. This capacity must be accompanied by a willingness and commitment on behalf of the researcher to work with the participants to explore, refresh and develop relevant networks. Sociograms are a snap shot in time, reflecting relationships of the participants in a moment in time, similar to a financial statement of accounts. The relationships and statistics are not set in concrete. The idea of working with cleavages, structural holes and interpersonal rejection may be both alarming and intimidating for researchers, participants, their group leader, and the organisation. However, one of

the originating purposes of displaying group relationships was to give the group information about itself to "free up" the actors to participate more fully in life (Moreno ZT 2000).

Both sociometrists and SNA researchers need to declare whether what is being displayed is the investigator's perception (perceptual sociogram) and the assumptions behind the perception, or whether the map has been generated from participant's choices; and to identify the moment in group life the snap shot was made.

What SNA Has to Offer Sociometry

Despite these differences there are many things that SNA has to offer sociometry. Firstly the mapping technology provides the ability to display and reconfigure sociometric data e.g. the percentage of relationships in the group within the total possible. Secondly the research into social networks has allowed the nature of formal structure and informal relationships to be more finely investigated. David Krackhardt and Jeffrey Hanson's definitive paper, '*Information Networks: the company behind the chart*', emphatically displays the differences in relationships between advice and trust networks and the formal structure of the same actors (Krackhardt and Hanson 1993).

In addition SNA offers
- valuable technology and methodologies for collecting data (e.g. near sociometry),
- significant research experience in identifying and displaying diffusion networks (e.g. opinion leaders in health behaviour),
- expanded definitions of groups (e.g. substance abusers),
- extensive hypotheses and experience in researching and assigning qualities to online group behaviour, and
- forums for developing a wider body of knowledge.

What Sociometry Has To Offer SNA

What sociometrists have to offer social network analysts is a vision for working with people to produce creativity and vitality and refreshed networks by stimulating and relevant explorations. Sociometrists offer encouragement to social network analysts to consider themselves as participants in an exploration, and expect to engage with resistance as an essential aspect of working with people and their informal networks. In this way, theories of behaviour being developed by SNA researchers will have a stronger working relationship with practice.

Becoming Bilingual - The Terminology

Given this, a shared language will enable greater understanding and relevant application of social network exploration.

Sociometry	Social Network Analysis
People, Participants, Group members	Nodes, Egos, Actors
Group, Organisations	Nodes, Alters
Choice, Relationships	Ties, Paths, Degrees, Edges
Choices made	Degrees out
Choices received	Degrees in
Sociometric star (person most highly chosen in response to a criterion): positive star, negative star and star of neutrality	Star, centrality
Isolate: a person who does not choose and is not chosen	Isolate: a person or node with no links
Mutuality, Reciprocity: a relationship where people choose one another	Symmetric link
Non-mutual relationship	Asymmetric link
Pivotal person	Liaison, Bridge
Sociogram	Sociogram
Social atom	Ego network

Conclusion

Both sociometrists and social network analysts are working with groups and organisations in mapping relationships. Both have interests in the development of effective relationships and interactions and will continue to build the body of knowledge about relationships and group behaviour. Sociometrists have spontaneity as their focus in explorations, where social network analysts are focussed on generating and interpreting mathematical data in understanding relationships and assessing their effect on individual and group behaviour.

Both sociometrists and social network analysts are obliged to work with the results they are producing and not ignore that they are working with people and their psychosocial and socio-emotional relationships. People do have a strong response to the display of their previously invisible relationships and any researcher is doing participants a disservice if a group is left in a worse state than when they entered it. SNA practitioners are in danger of being labelled 'voyeurs' if they continue to remove themselves from those they are researching. It is a fallacy for researchers to believe it is possible to research and 'analyse' a group without being affected by their own relationship with the group and group members and vice versa.

Both social network analysts and sociometrists need to take care with how sociograms and graphs are used and with whom. Well-designed processes and willingness by investigators and researchers to work with the interests and concerns of group members will create new responses, new relationships and refresh existing networks. •

Footnote:
1. SNA software does not yet provide capacity for mapping asymmetrical relationships.

References:

Blake R and McCanse A (1989), 'The Rediscovery of Sociometry', *The Journal of Group Psychotherapy, Psychodrama and Sociometry,* Vol 42, No.3.

Borgatti SP and Molina JL (2005), 'Toward Ethical Guidelines for Network Research in Organisations', *Social Networks* 27: 101-117.

Borgatti S (2005), *Social Network Analysis: Overview of the Field Today*, Presentation for NAS Statistics on Networks Conference, Slide 6.

Cross R and Parker A (2004), *The Hidden Power of Social Networks: Understanding How Work Really Gets Done in Organizations*, Harvard Business School Press, Boston.

Freeman LC (2004), *The Development of Social Network Analysis: A Study in the Sociology of Science*, Empirical Press,

Jones D (1996), *Sociometry at Work*, Thesis for ANZPA accreditation as Sociometrist, ANZPA.

Krackhardt D and Hansen J (1993), 'Informal Networks: the company behind the chart', *Harvard Business Review,* July - August, pp 104-111.

Krebs, Valdis (2004), *Power in Networks*, www.orgnet.com

Moreno JL (1953), *Who Shall Survive?*, Royal Publishing Company, Virginia.

Moreno ZT (1987), 'Psychodrama, Role Theory and the Concept of the Social Atom', in Zeig J (ed), *The Evolution of Psychotherapy*, Brunner/Mazel, New York, pp 341-358.

Moreno ZT (2000), 'The Function of 'Tele' in Human Relations', in Zeig J (ed), *The Evolution of Psychotherapy: A Meeting of the Minds*, Brunner/Mazel, New York.

Moreno Z.T (2006), *The Quintessential Zerka*, (edited by Horvatin T and Schreiber E), Routledge, NY

Scott J (2004), *Social Network Analysis: A handbook,* Sage.

Valente TW, Gallaher P and Mouttapa M (2004), 'Using Social Networks to Understand and Prevent Substance Use: A Transdisciplinary perspective', *Substance Use & Misuse*, Vol. 39, Nos. 10-12, pp. 1685-1712.

Williams A (1991), *Forbidden Agendas*, Routledge, London.

Websites:
<http://www.insna.org> for International Network for Social Network Analysis Annual Conference.

<http://www.insna.org/INSNA/schools_inf.html> for Graduate programmes offering training or emphasis in Social Network Analysis.

<http://www.cmu.edu/joss/> for Journal of Social Network Structure.

<http://www.visualcomplexity.com/vc/index.cfm?domain=Social%20Networks> for social networks diagrams.

<http://www.analytictech.com/borgatti/publications.htm>for publications on SNA.

<http://www.analytictech.com/downloaduc6.htm> for UCINET and PAJEK software.

<http://orgnet.com> for INFLOW software.

SNA Discussion Forums & User Groups:
SOCNET: SOCNET@LISTS.UFL.EDU
UCINET :   ucinet@yahoogroups.com