

THE NETWORK APPROACH TO EVALUATION: UNCOVERING PATTERNS, POSSIBILITIES AND PITFALLS

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Abstract

In recent years there has been a noticeable shift in evaluation paradigms away from positivist, individualist and atomistic explanations of phenomena to those seeking a more relational, contextual and systemic understanding. This growing shift in interest to the interrelationships or networks of connections between entities is apparent in fields as wide ranging as epidemiology and the study of disease contagion and transmission, the defence sector and dismantling terrorist networks, the establishment of collaborative industry and knowledge ventures and the development of integrated social service delivery systems. However, while the network notion offers the prospect of conceptualising these interconnections, the abstract nature of such descriptions, often referred to as merely as 'metaphors', have not afforded the detailed insights and operational nuances necessary to unpack these entities sufficiently to harness their inherent benefits.

A growing theoretical, methodological and computer software base is providing enhanced capacities to uncover the actual topologies or patterns/network of connections between entities – elements, people, organisations or communities and deliver a more fine grained analysis of their elements. In this way network analysis differs from conventional evaluation and research modes since its focus is on the interrelationships of entities not the characteristics of individuals.

In this paper, we review and analyse the emerging capacity of the network paradigm and network analysis as an evaluation method and show how this model can be successfully applied to a range of evaluation arenas. In doing so, we outline a framework to guide network evaluation, establish some key network indicators and highlight key methodological aspects and pitfalls.

Introduction

In recent times there has been a growing (re) appreciation of the interconnectedness between people, organisations, communities and nations. Additionally, there is growing awareness that many of the contemporary issues confronting public administrators (and researchers) do not exist in isolation. That is, these complex, 'wicked' issues such as unemployment, poverty, social exclusion, terrorism and health services are so inter-related and intertwined that they defy single agency approaches and conventional linear, positivist problem solving and evaluation techniques (Borgatti and Foster, 2003; Marchington and Vincent, 2004). As Kilduff and Tsai (2003) have noted, while conventional evaluation and research approaches are highly instrumental in determining causality and effect they are not able to capture the interactions within and between network members to uncover the topology of relationships.

As a consequence the network paradigm and research approach has emerged as both a theoretical stance and methodological model to capture the sense of interconnection and the actual interactions. Indeed, this shift from seeing issues and units as independent and self-contained to a more embedded perspective can be evidenced in the application of network approaches in fields as diverse as the examination of relationship formation in collaborations, organisational change impacts, modelling innovation diffusion, offender peer networks, and disease contagion (Kirke, 2003; Cross, Parker and Borgatti, 2002; Conway, Jones and Steward, 2001; Borzel, 1998).

While network concepts and methods have a long history, their uptake within the social sciences and the broader research arena has been slow and until recently, quite limited. For some theorists the lack of uptake can be explained by the limitations of complex computer programs, which have only recent genesis (Kilduff and Tsai, 2003). However, it is argued that, in large part, the potential of the network approach/paradigm has been restrained by; "the 'Babylonian' variety of different understandings and applications of the.... network approach", in which method, model and theory are intermixed (Borzel, 1998, p. 254). However, as the next

section demonstrates, considerable technological and methodological sophistication as well as theoretical developments have contributed to make the network approach more rounded and applicable. That is, instead of being a cacophony of bits, each of these parts presents as a building block contributing to an integrated yet multiplex approach.

The Network Approach: Providing Metaphor, Methodology and Theory

This section tracks the development, core characteristics and contribution of each of the three building blocks to the overall network approach.

Network as Metaphor

Networks are essentially defined as a stable set of relationships or linkages between two or more entities. Although the definition of network can vary considerably within and between sectors and disciplines (Borzel, 1998; Considine, 2002), all share as a common denominator an agreed notion that networks are about different types of relationships, whether these are the objectively measurable resource or economic ties or subjective emotional links (Wasserman and Faust, 1994). This notion of connections through linkages brings into play the image of networks as 'webs' of affiliations or 'nets' of links. Such metaphors are a powerful way of conceptualising, presenting and discussing the interrelationships between entities (people, organisations, communities or other phenomena). As Auster (1990, p. 65) notes the benefit of the image or metaphor of a network is that it changes the imagery from a focus on the individual to one of "constellations, wheels and systems of relationships". This shift in conceptualisation provides the space for a rethinking of the structure and dynamics of social relationships and reorientates thinking and working toward more collective means and approaches.

Despite the benefits that the network concept evokes as an image of connection, the metaphoric level of the network approach has been criticised in that the term is often applied to any type of grouping and has not been explicit in relation to the characteristics under examination, the boundary of analysis or the specifications of expectations (Dowdling, 1995). In view of this perceived lack of guidance the network concept has been described as 'imagery without technique' (Schrum and Mullins, 1988 cited Conway et al, 2001). Consequently, more detailed frameworks and theories around which to organise the concepts and techniques that comprise the network approach have been called for (Tichy, Tushman and Fombrun, 1979; Dowdling, 1995; Salancik, 1995)

Over time, as network literature has become more explicit in its conceptualisation and application of network constructs including the specification of boundaries and levels of analysis, coupled with the emergence of some network theories, the development of tools and techniques to systematise network data collection, and more sophisticated computer programs to analyse and present data, many of these concerns have been dissipated or at least limited (Borgatti, 2003; Breiger, 2004). That is, there has been a progression in thinking; conceptualisation and methodology that has enabled the network construct to move beyond merely metaphor to the representation of aspects of social structure.

Network as Methodology

New mechanisms and processes, coupled with ongoing advancements in computer technology provide guided direction for uncovering, actual as opposed to assumed, patterns of network relationships and, in doing so, have afforded enhanced insights into the structure and operation of networks. Further, the emerging terminology created to describe or theorise around network constructs, has contributed to a new language for describing the dense, often knotted and cyclical, interrelated levels of social relationships.

The emergent set of methodological development around networks was structured under the rubric of social network analysis (SNA). The virtue of network analysis is that unlike conventional analytical approaches it does not focus on the attributes or characteristics of particular individuals or cases, but on the relationships between entities (Scott, 1991; Wellman, 1983). Thus in place of accounts that examine the causal properties of variables, such as gender, age and profession attention is directed to the linkage and structural properties of types of social relationships.

Specifically network analysis is an empirical tool to measure, describe and analyse social structure on the basis of the multiple sets of relationships between people, organisations and other entities (Wellman, 1983; Kenis and Schneider, 1991). It is a collection of graph analysis methods where data on social relationships are transformed into graphs and evaluated on different analytical levels. A strong mathematical underpinning and strict coding rules enables network analysis to produce data that accurately measures the characteristics of network transactions, relationships and structures (Scott, 1991). This data and methodologies can be used to develop two core sets of analysis: graphical (visual mapping) and mathematical (statistical). These modes build on from the network as metaphor to provide increasingly more

explicit conceptualisations of network. The orientation and contribution of these two analytical approaches is now briefly discussed.

Network Mapping

The visualisation or graphical aspect of network analysis uses basic network linkage data to provide a representation of the pattern of relationships between entities as well as the overall structural characteristics of the network (Milward and Provan, 1998; Cross et al., 2002). This level of network analysis has its basis in the development of sociograms and other forms of link representation initiated by early sociologists such as Moreno (1934) in which actors are represented as a set of points or nodes (labelled by names or number or other identifying features), linked by lines to provide the network picture. As Conway et al., (2001) note the graphical orientation has the potential to 'amplify' the imagery of the network metaphor.

However, rather than relying on language and discourse, the network pictures or maps are constructed through the application of a more articulated methodology and advance purpose built network drawing software programs such as Netdraw, Visone and Pajek that produce web-based pictures to graphically depict or map out the connections (Kilduff and Tsai, 2003; Breiger, 2004).

Since the emphasis at the network mapping level of network analysis is on creating a visual representation of the pattern of relationships between network actors, data collection and measurement is centred on identifying the different types of relationship, calibrating their different structural properties and topologies (based on characteristics such as density, size, multiplexity of ties, and centrality points). Network mapping also allows for examination of the layout and positioning of the actors in terms of key roles such as gatekeepers, liaisons and core and periphery members. In doing so, network maps help to uncover hidden patterns of relationships and enables the underlying structure of relationships or their topology to become more apparent (Scott, 1991; Cross et al., 2002). It can also be used as a mechanism by which the differences and similarities in structure and function can be visually compared and contrasted (John and Cole, 1998).

As well as providing the means for evaluation, the graphical representation of relations and links and, the uncovering of basic structural patterns of interaction, afford the opportunity for administrators and network members to examine their networks, identify issues, diagnose impacts and adjust both the type and strength of relationships (Milward and Provan, 1998). On this ability for network mapping to provide an enhanced diagnostic capacity, Cross et al (2002, p. 39) note that network analysis:

... is a powerful managerial tool because it makes visible the pattern of relationships within and across strategically important networks. Simply reviewing these diagrams with managers (and actors) usually results in a myriad of recommendations, as people immersed in the pattern of relationships define and resolve issues affecting group performance.

Thus, well-constructed visual displays or network maps of relationships can have a dramatic impact on viewers and often serve to confirm or disprove an intuitive feel for a system.

Making the shift from the network as metaphor position to the mapping and analysing of network relationships and linkages requires the adoption and application of a more systematic and explicit approach to collecting, analysing and presenting the data. In order to construct the network map, it is necessary to capture linkage relations from as close to the full data set as is possible. Although a 100 per cent response rate is preferable, since the focus at this level of analysis is centred on constructing the network, it is possible to miss some data without corrupting too severely the results. However, it is necessary to take this missing data into account when analysing and reporting on the network structure and results.

Further along the network research continuum the emphasis shifts from mapping the relationships to more complex mathematical analyses of the relationship data.

Network Mathematics

As social network analysis methodologies and, in particular computer software programs have become more sophisticated and powerful, there has been an increased ability to subject network relational data to more comprehensive mathematical and statistical analyses (Kilduff and Tsai, 2003; Breiger, 2004). These developments allow for much more complex analyses of relational data to be undertaken. Modern network analysis has its genesis in the late 19th century and the introduction of mathematical constructs and mechanisms framed around number theory, relational logic and Boolean algebra. These mechanisms subsequently provided the basis for the formation of graph theory, which today constitutes the central point of reference for network analysis (Scott, 1991). Within this framework data on social relationships are

transformed into graphs and interrogated on different levels of analysis (individual agent/actor level, dyadic or triadic, cluster and/or total network) (Scott, 1991; Kilduff and Tsai, 2003). From these data complex computations and statistical analyses can be undertaken to gain a more detailed understanding of the characteristics of networks and their components.

For example, at the network level it is possible to determine how dense the interactions are between actors. Density is a measure of the number of connections compared to the total number of possible connections. The higher the proportion or ratio the denser is the network. The degree of density in a network has relevance to the level of cohesion and capacity for collective action.

The centrality measure can also provide unexpected insights into network functioning. This measure refers to the degree to which the network activity is centred on one or a few actors – the core. This provides information on where the influence or power in a network may be concentrated. Other network level measures include reachability, which refers to the average number of people per person over all possible steps. In high reachability networks, norms and values may defuse more quickly.

At the tie level of network, researchers are frequently interested in the strength of relationships, which is the combined measure of intensity, frequency and time directed toward a linkage. Different strengths of ties are argued to provide specific outcomes. For example, weak ties are useful for information gathering and dissemination, while strong ties provide for cohesion and collective action. Multiplexity refers to situations where there are multiple links between actors either in terms of their roles or exchanges.

Achieving this more refined level of network analysis is dependent on a more articulated and systematic methodological framework being designed and securing as close to a 'whole' network response set as is possible (Breiger, 2004). At this level of analysis, holes and missing data can have a much more serious impact on the accuracy of data output and consequently on the result derived.

In this way it can be seen that network analysis processes and mechanisms offer significant and previously unobtainable insights into the operation and structure of networks. The combination of these computational aspects with the drawing elements provides for highly instructive 'unpacking' of elements.

Different way of measuring: Different data collection

Network analysis provides for a set of methods for the analysis of social structures and methods that are specifically orientated toward the identification and investigation of the relational aspects of these structures. Because it visualises results in different ways and performs different types of analyses, network analysis requires different data to other types of social science research. Specifically the network approach is focused on securing data that identifies the type of relationships between entities. These relationships may be comprised of the feelings or sentiment people have for each other, the exchange of information, or tangible exchanges such as goods or money. Specifically, four potential types of relational ties have been distilled from the literature (1) affect exchange (liking, friendship, kinship), (2) influence or power exchange, (3) information exchange, and (4) goods and services exchange (Tichy, Tushman and Fombrun, 1979; Scott, 1991).

Collecting Relational Data

There are a number of options available for gathering network linkage data, including primary observation, archival records, diary recording, interviews and various types of questionnaire/survey (Milward and Provan, 1998; Wasserman and Faust, 1994). Each of these options has benefits and limitations and has particular application to the variety of data sought and the type network analysis to be undertaken. At the network as metaphor level of examination, the emphasis is on identifying and tracking the shift in orientation from a singular to more collective orientation. Data collecting within this mode is concentrated on examining the language or discourse underpinning or informing action. Key data collection sources for this approach therefore centre on the examination of documents (reports, minutes, strategic planning publications and other official documents) or are generated from interviews/focus groups with network actors.

As the type of analysis extends to graphical and statistical processes, it becomes necessary to secure a different type of data to enable the computation of connections. While it is possible to generate some of this data from interviews, generally some form of questionnaire or survey self-report is a useful and popular mechanism for collecting relational data. These methods provide a succinct mechanism for capturing the type, frequency and even quality of the interactions/relationships by asking network actors to report on a set of network or relational variables (Knoke and Kuklinski, 1984).

Self-reports can cause measurement problems, especially around the ability of respondents to accurately recall their connections with other network actors (Knoke and Kuklinski, 1982). Nevertheless, there are a

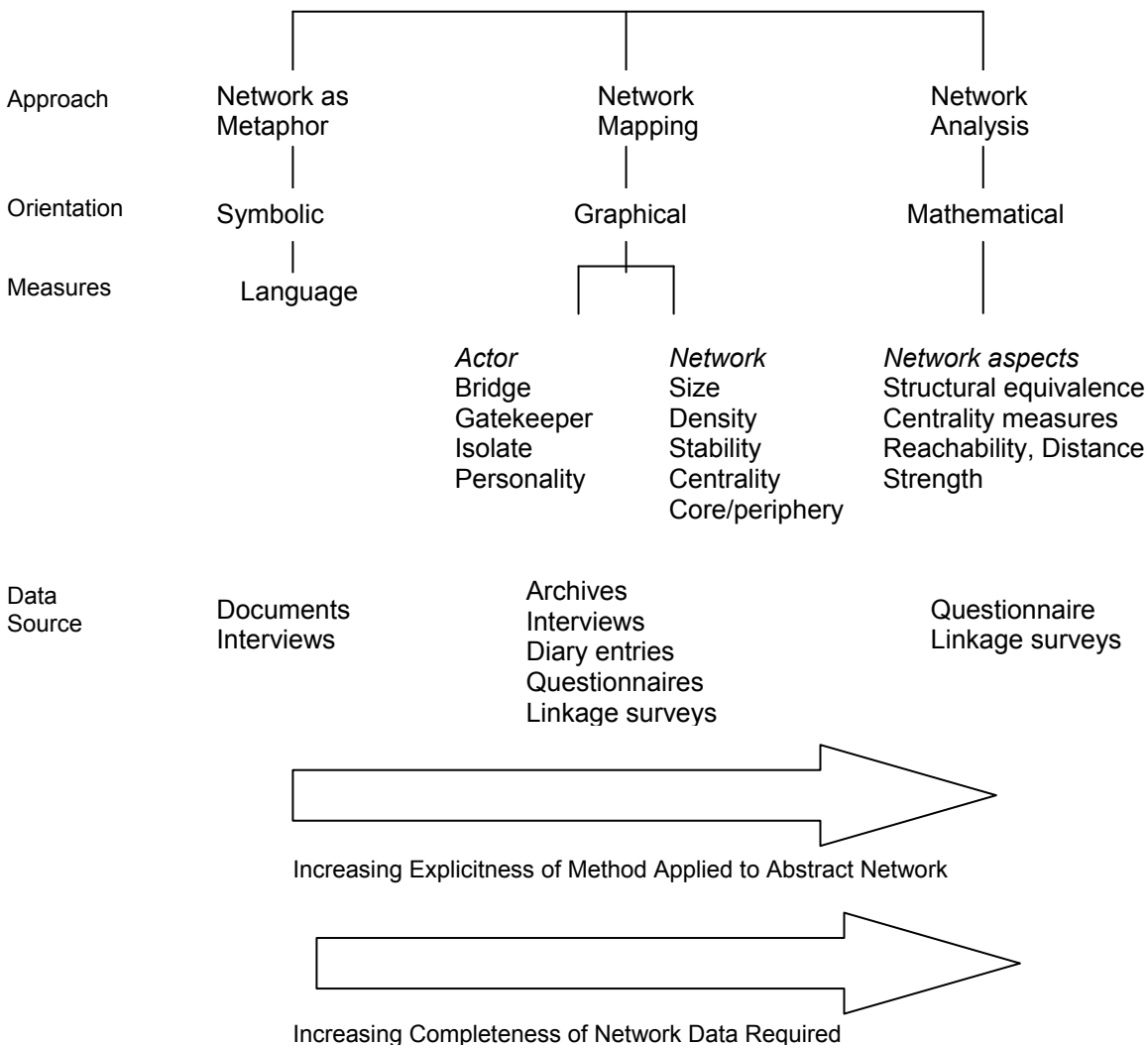
number of ways to protect or reduce errors relating to recall problems. The most effective is to be precise and as specific as possible in terms of the timelines and content under examination coupled with the use of structured linkage instrument to guide the responses (Knocke and Kuklinski, 1982; John and Cole, 1998). Provan and Milward's research on mental health and other human service networks (1995; 1998) provides a good example of such a linkage survey data gathering strategy.

Personal characteristics

It should be noted that while the emphasis within the network approach has been on identifying and codifying relationships, there is a growing body of researchers focusing on how the attributes of actors (personalities, cognition, sex) can shape network structure and outcomes. This emergent 'individual agency' approach, evident in both the literature and in the development of more recent computer programs, goes against some of the strongly held earlier views that the study of individuals in networks is 'a dead end' endeavour (Mayhew, 1980: 335). However, as Kilduff and Tsai (2003) note the presence of particular actors in networks can have overwhelming impact on the nature, structure and outcomes of networks. Therefore, while the primary emphasis of network analysis is on the total network, it is important to be open to the possibility of personal attributes as an additional source of insight. Nevertheless, even with these new possibilities in mind, it is imperative that the network 'relationship' orientation not be lost to a return to an emphasis causal and personal attribute measures.

Deconstructing the network approach to highlight of each of the steps comprising the total perspective has allowed for the individual characteristics and contribution of each to be demonstrated as well as the way in which they build-up to an integrated model for evaluation. The danger in deconstructing elements is always that it can create a sense of complexity and discontinuity. However, the figure (Figure 1) below which is based on the work of Conway et al. (2001) to which we have added two additional layers of constructs (measures and data sources) provides a coherent framework with which to conceptualise the various elements of the network approach as well as begin to guide research and evaluation within this perspective.

Figure 1: Framework for Studying Networks



From this introductory review of the literature informing the network approach it is evident that there are a number of ways in which this model may be adopted for research and evaluation. That is, each approach has its merits and application. The objective is to be able to select the level most appropriate to the research or evaluation task at hand.

This section has demonstrated that over time the network approach has amassed a broad repertoire of methodologies and techniques to tap, calibrate and recalibrate and analyse relational data. However, increasingly it is becoming apparent that the network approach is more than a 'narrow set of methods' (Wellman, 1983, p. 156) or even a toolbox for describing and measuring relational configurations (Kenis and Schneider, 1991, p. 44). It has evolved into a much more multiplex research apparatus (Breiger, 2004) Indeed, the often-held criticism that the network approach is atheoretical, that is it is powerfully descriptive but not theoretical (Salancik, 1995, p. 348) is under threat with recent reviews for example Borgatti (2003), Borgatti and Foster (2003) and Kilduff and Tsai (2003) demonstrating that network theories abound in virtually every area of scholarship.

Network as Theory

The network approach starts from the perspective that actors' position in a set of relationships or networks can enhance or constrain their actions. That is, it postulates that the position of actors and the type and nature of their relationships with others within the network, determines the outcomes (Borgatti, 2003; Kilduff and Tsai, 2003). Additionally, the emphasis on the connections between entities rather than attributes, gives network theorising a holistic orientation

Although the network theory literature is generally embedded within other bodies of prose and research, frequently spanning multiple fields of interest and disciplines; it is possible to identify some seminal and emergent theoretical contributions that derive from this approach. Granovetter's (1973) seminal work on the strength of weak ties offers perhaps the best insights into the notion of network relationships and their impact. On examining the way that people gained employment, Grandovetter theorised that it was the weak ties between people, rather than their close and greater relationships that afforded access to the new information necessary to track down job opportunities.

Drawing on these notions of relational strength a body of theory around cohesion and clustering has been developed. Cohesion theorists argue that densely embedded networks that have multiple (type and frequency) connections are more advantageous because they are closed and therefore allow for consolidation of thinking and action (Walker, Kogut and Shan, 1997). That is, dense networks comprised of strong and frequent connections foster the development of shared norms, common understanding and importantly the level of trust necessary for the sharing of opportunistic information and collective action. However, following Grandovetter (1985) it is also argued from this perspective that strong ties add little value in the search for new information (ideas, knowledge and resources) because everyone in the network has access to the same resources. Networks subject to insufficient new input (resources and ideas) can slide into a type of groupthink that limits the development of innovative responses or can lead to entropy.

Structural Hole theory has been presented by Burt (1992) as an alternative theoretical perspective. Structural Hole theorists posit that networks are open social structures in which advantages are derived from the ability of network actors to position themselves strategically to bridge holes and therefore quickly learn about, garner and leverage off presenting opportunities. It is argued that people and organisations that bridge structural holes tend to have access to newer information; learn faster and therefore are more likely to generate innovation.

An additional substantial area of network theory development is subsumed under the social capital literature set (and clearly is based on and has a strong resonance with Grandovetter and Burt's work, among others). In general terms social capital consists of the trust, norms and relations or networks between people and communities (Putnam, 1993; Stone, 2000). The social capital proposition is as Burt (2000) has succinctly stated: "Better connected people do better". Social capital theorists largely differentiate their approach according to the two model theorems noted above: cohesion and structural holes.

Additional theoretical developments have been put forward to enhance and predict effectiveness within the human services arena (Provan and Milward, 1995) as well as explain network formation, linkages and governance arrangements within the business sector (Jones, Hesterly and Borgatti, 1997; Kogut, 2000; Uzzi, 1996). Together these theoretical perspectives demonstrate that, far from being 'atheoretical' there is a substantial body of thinking and theorising that can be used to inform and guide network activities, including its evaluation.

DISCUSSION: POSSIBILITIES AND PITFALLS OF THE NETWORK APPROACH

Clearly network research has distinctive features that differentiate it from conventional approaches and make it amenable to many contemporary evaluation tasks. First, by focusing on the connections and patterns of relations rather than the attributes of actors, the network approach offers an alternative conceptual and theoretical perspective. Further, in shifting the orientation from the previous emphasis on linear, positivist, and individualistic conceptions of phenomena to a more holistic, relational and systemic perception, the approach is more aligned with the context of contemporary society and the issues/problems that confront us.

A further advantage of network analysis mode is the ability to examine and analyse relationships at a number of different (and inter-related) levels of analysis: dyads, actor and network. The overlap of these levels of analysis allows for the micro, meso and macro levels to be linked, a characteristic so often missing in conventional evaluation mechanisms (Borgatti and Foster, 2003). On this Fountain (1994, p. 273) noted:

Following remarkable growth in analytical technologies the network perspective offers both rich descriptive capacity and rigorous methodologies for the study of both micro and macro level phenomena.

An additional virtue of the network approach and particularly network visualisation methods is that that they permit a 'thick description' of complex and often hidden social processes. Further, the capacity of network approaches to draw on a range of methods means that it is possible to integrate qualitative, quantitative and graphical data, allowing for a more thorough and 'fine-grained' analysis. As well as providing the basis for a new way of thinking, the network approach has also contributed to the construction of a set of terminology and language which allows researchers from a range of fields to discuss issues from a common perspective.

Drawing on some of the network theories and processes identified above it is possible to highlight a number of advantages of the application of network approach to research and evaluation. For example it can be used to:

- Show how a range of variables (information, disease, offending) are disseminated and communicated, and, which people or roles occupy key positions within networks as well as what could happen if these relationships are adjusted/removed.
- Uncover graphically (visually) as well as statistically (through various measures of centrality) who is core to the group and, in doing so; indicate who is in the best position to influence the group.
- Objectively identify group boundaries; ascertain who is in and who is out; and whether there are cliques or factions within the network's parameter. This diagnostic capacity has benefit for strategic network building and monitoring.
- Unpack and determine the level of social capital within a network and predict how this might be strengthened.
- Track flows of information and resources can aid the understanding of innovation development and diffusion.

Although the networked approach offers some clear advantages over conventional research processes, there are also potential pitfalls

Pitfalls and Considerations

Unless identified and addressed, the pitfalls associated with the network mode can limit the effectiveness of this research mode and hamper its broader adoption in the public arena. As has been stipulated the network approach is based on relationships and relationship-based data. Often in order to acquire the network data sets (and especially to ensure full response rate) there is a need to establish a relationship with the network under review and its members. This can have immediate implications in the accuracy of the data reported as well as expose the researcher to the potential for 'capture' and 'over rapport' and the associated loss of objectivity (Fenno, 1990; Rhodes, 2001). A concerted effort to retain a level of 'distance' from the process is generally not enough to guard against this condition. Additional strategies such as the meticulous recording and transcribing of all case notes, interviews and focus groups coupled with the use of a research diary and/or reference group to encourage reflection and self-criticism may need to be employed.

A related consideration and one that has been attracting growing interest is that of network ethics. Indeed, a special issue of *Social Connections* (the SNA journal) was recently dedicated to the ethical dilemmas in social network research (Volume 27, Issue 2). The increased application of network analysis in 'real world' situations has provided the primary basis for this emergent consideration. Network research has the potential to provide important insights into the structure, operation and even effectiveness of networks. However, without careful consideration (and even with this) it also can identify people and in doing so expose them, however inadvertently to social consequences such as reprimand or exclusion (Borgatti and Molina, 2003,

2005). As Kadushin (2005) rightly implies the nexus between getting good data and doing the right thing is a dilemma for network researchers. Network ethics requires special consideration for those involved in paid consultations. The answer would seem to be in being clear about what the purpose of the research is, who will benefit and carefully stating upfront the expectations and protections to both participants and research purchasers.

Given that a network is not a sample of a unit under investigation but the unit, establishment of a clear boundary of the network under investigation is one of the fundamental issues that need to be addressed when conducting network-based research. A textbook definition of a social network assumes a discrete set of actors linked together by a discrete set of relations (Wasserman and Faust, 1994). Since the unit of analysis is the network it is necessary to both define the parameters of the network and determine who is to be included and excluded from the study. Laumann et al. (1983) define this process of specifying inclusion and exclusion as 'boundary specification'. On the importance of this process, Laumann et al. (1983, p. 18) stated argue that "the problem of boundary definition should be given conscious attention and that "care must be given to specify the rules of inclusion" in relation to both "the selection of actors or nodes...and to the choice of types of social relationships to be studied".

Some, and particularly earlier network researchers such as Mitchell (1969) and Fombrun (1982) take a more practical or pragmatic approach to solving the boundary-setting problem, with both arguing that this be based on the objectives of the research. On this aspect, Fombrun (1982, p. 288) stated: "if there is no agreed boundary to an inter-organizational network, the choice of the boundary should reflect the purposes of the researcher and the research hypothesis of the study". The boundary specification problem can be avoided to a certain extent if the network under observation is isolated from others or can be clearly contained (Kossinets, 2005). It is also possible, as Laumanns et al. (1983) has suggested, to define the boundary by way of an assessment of the connections. However, the extended linkages and connections within and across real-world networks can make the specification of boundaries problematic. Indeed, even where there appear to be natural boundaries of member lists, the network researcher must be cautious in determining the boundary line (Laumann et al., 1983; Knoke and Kuklinsky, 1982).

In view of these considerations, the network researcher should be cognisant of the need to ensure that the approach by which boundaries are drawn up is well considered, relevant to the network under study and reflective of the intent, since this will provide the basis for the 'sample' of linkage relationships for examination (Auster, 1990). Carelessness in boundary specification can distort the overall configuration of the network. With this in mind, Fombrun (1982, p. 288) warns that the "conclusions drawn from the study need to be carefully scrutinised for the possibility of alternative explanations grounded in the effects of the untapped networks".

An additional and related important problem in network research is that of non-response. As noted earlier, network research relies on collecting data on as close to complete data and preferably the full set of relations rather than sampling components (Knoke and Kuklinski, 1982). Missing responses create 'holes' in this data set and problems with specification arise exponentially. This has important consequences for the accuracy of the network pictures created and most significantly on the statistical calculations (Breiger, 2004; Kossinets, 2005). Efforts to secure a full network data set are therefore a vital aspect of this approach and can be time consuming and highly frustrating. The establishment of rapport and follow-up, and, on-going contact with members or those in key, influential positions within the network are effective strategies, as is re-acquainting the respondent to the benefits of participation (Laumann et al., 1977; Knoke and Wood, 1981).

Finally, while the network approach offers much in the way of presenting data in new and interesting ways, on its own it does not always provide the necessary additional insights into, for example, the dynamics of network evolution (Rhodes, 2006). For this reason as John and Cole (1998) and others argue it has a stronger influence when used to complement other approaches. As Rogers (1987, p. 285) suggests: network analysis can be used to 'turbo-charge' other approaches.

Conclusions

The objective of this paper was to provide an introductory review of the networked approach and allied methodologies to demonstrate its application to research and evaluation within the public arena. The review has demonstrated that given its ability to identify, uncover, map and measure the interrelationships within and between networks, the network approach, offers an alternative evaluation perspective and technique. Importantly, as well as having utility across a wide array of fields of interests, the network approach offers considerable flexibility in terms of the level of analysis, level of study, the focus on linkages and, the theoretical reviews and insights able to be gleaned.

In some ways however the very strength of the network approach, that is its versatility, its flexibility and multiplicity can create problems in conceptualisation, limiting its application and utility. In response, this paper draws out some of the key network methodological and analytical components to provide a basic framework to address some of these issues and to establish some direction with which to guide network based research and evaluation.

It is widely agreed that society is entering into an era of networks (Castells, 1996; O'Toole, 1997) and it is likely that the network concept will continue to have an impact across many areas of endeavour for some time. Networked arrangements are being brought into play to solve a wide array of social and public problems as well as to generate innovation and profitability. Despite the growing emphasis and reliance on networks, determinations of their effectiveness are largely unknown or remain in the realms of intuition. This paper has argued, network analysis, with its distinctive processes and focus on relationships provides an appropriate mechanism with which to begin to undertake evaluation. Thus rather than being based on trendy terminology, lightweight methodologies and processes, and limited theory the network approach presents as a breakthrough offering new evaluation tools and processes for those charged with the formation, administration and evaluation of networked arrangements. In this way, offers the potential for a comprehensive, integrative, interdisciplinary approach that enables specialists, practitioners and administrators across a wide array of interest and fields to formulate and work on problems using a common language, analytical framework and theoretical basis.

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