REALISING THE POTENTIAL OF THE NETWORK PERSPECTIVE IN INNOVATION STUDIES

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The Rise of the Network Perspective: Simply a Fashion or Fad ?

Even a cursory review of the various business and management sub-disciplines in the post-war period reveals the ebb and flow of a whole series of management and organisational innovations: the 1980s heralded the rise of ‘Quality Circles’, ‘Portfolio Management’, MBWA (‘Management by Wandering Around’), and the focus on ‘Excellence’, to name but a few; in the 1990s the fashionable themes shifted to ‘Downsizing’, ‘TQM’ (Total Quality Management), ‘BPR’ (Business Process Engineering), the ‘Learning Organisation’, and the ‘Virtual Organisation’. Carter and Conway (2000: 1) are sceptical about the motivation and utility surrounding the packaging and re-packaging of such managerial and organisational panaceas:

“The ability of the American academic-consulting complex (Grey and Mitev 1995) to generate seductive panaceas for organisational action is not in doubt. Recent years have seen the quality movement (see Oakland 1993), the excellence tradition (Peters and Waterman 1982) and Business Process Re-engineering (Hammer and Champy 1993) become part of the corporate lexicon, a feature of the organisational world...All of these movements are characterised by an attention to promotion, in which, grand claims are made, imploring individual managers and organisations to adopt and enrol within a given technique. In short, new managerial ideas are aggressively marketed, promising a great deal to adopting organisations (see Egan 1995, Wilson 1992); they are at once rhetoric and image intensive (see Alvesson 1998).”

The 1990s have also seen the rapid rise in interest and reference to inter- and intra-organisational networks; journals and conferences in a broad range of business and management sub-disciplines from innovation studies, marketing, to public sector management, are littered with articles and subject streams concerning networks and networking behaviour. To what extent is this simply a passing fashion or fad ? Does the network perspective have something useful and distinctive to offer academics, managers, and policy-makers ? Or, in the words of Egan (1995), does the network approach amount to ‘a bauble or a breakthrough’ in developing an understanding of organisations and organisational activity ? Furthermore, to what extent does this simply reflect a change in ontology and epistemology, rather than a real change in the way organisations organise and operate ?

Arguably, this decade has perhaps seen an over-use of the network perspective in studies of organisations; an over-use that has diluted its power and legitimacy in the academic world as having something ‘original’ and ‘useful’ to say about organisations and organising. Nevertheless, this dramatic rise in the interest in organisational networks has brought the concept into the main-stream of academic, management, and policy-making discourse. Indeed, during the 1990s the network approach has successfully filtered through from the academic world into the policy arena (e.g. see references to the importance of networking in the UK Government’s White Paper on Innovation: ‘Realising Our Potential’ (1993), and numerous initiatives under the SPRINT programme, such as MINT - Managing the Integration of New Technologies); consultancies (e.g. Cooper and Lybrand (1994)); and the business world. Within and through such diverse institutions, network building and networking activity have frequently been espoused as the panacea to the regeneration of industrial regions, the encouragement of emerging industrial sectors, and for the revitalisation of the small firm sector. Indeed, Bessant (1995: 268) argues that “networks are a comparatively new addition to the policy-maker’s tool-box, and there is considerable excitement about their potential”. However, Bessant also suggests that as a consequence of this, there exists a risk that networks will be used widely and not always appropriately.

The utility of the network perspective is at least partially derived from the ease with which the concept can be expressed and applied. It is at once a concept and framework whose applicability is immediately recognisable by practitioners, whilst its academic pedigree has been firmly established, particularly within the field of anthropology where it has been widely and successfully applied in the form of social network analysis (SNA) since the 1960s. The flexibility of the network perspective, both in relation to the manner in which it may be applied (see introductory chapter), and the subject matter it may be applied to, from the diffusion of AIDS (Klovdahl 1985) to the diffusion of innovation (Rogers and Shoemaker 1971), has also been of great import to its success; it is a perspective that can throw light on phenomena at any unit of analysis, such as at the level of the individual (e.g. the social organisation within firms (Allen 1970) and within academic specialities (Crane 1972)), and at the level of the organisation (e.g. revealing the structure of industrial sectors by identifying organisational networks (Hagedoorn and Schakenraad 1992)). Furthermore, for Bianchi and Bellini (1991: 489) “historic experience has taught us the need for a systemic approach to industrial organisation” and that “the ‘network’ is a stylized concept which we can use both as an analytical tool to understand economic reality and as a reference for political action in order to modify that reality.” That is, the network concept is a useful framework for evaluating the structure and operation of existing networks, and for highlighting factors that might improve their performance.

At the level of the organisation, evidence suggests that networking activity, particularly within high technology sectors such as telecommunications, computing, and bio-technology, has been increasing rapidly since the 1980s (Hagedoorn and Schakenraad 1993, Chen 1997). In this sense, the network approach encapsulates an emerging phenomena rather than just simply representing a change in ontology and epistemology. At the level of the individual, however, evidence would suggest that extensive personal networks and networking has been an important feature of the creative and innovation process throughout the post-war period (e.g. Menzel 1962, Price and Beaver 1966, Crane 1972, Allen 1970); here the re-emergence of the network perspective is revealing an existing phenomona, and thus represents a change in ontology and epistemology. It would seem then, that the network both as a perspective and a phenomena is more than simply a passing fad or fashion.
The ‘Taken-for-Granteds’ of the Network Perspective in Innovation Studies

As noted earlier in the book, the ‘network’ as a metaphor is a powerful way of viewing organisations; it changes the imagery from a focus on pairs of dyadic relationships to one of “constellations, wheels, and systems of relationships” (Auster 1990: 65) and of ‘webs’ of group affiliations (Simmel 1955). This perspective is important, since as DeBresson and Amesse (1991: 364) argue, “interactions between firms...are iterative and broad in content, time and space, [and] what matters is the complete set of relationships”. However, Tichy et al (1979: 507) contend that:

“Such a model of organising, if it is to move beyond the metaphorical stage, requires a coherent framework and accompanying methods of analysis that are capable of capturing both prescribed and emergent processes.”

Yet, one of the most striking features of many of the articles concerning innovation and technology networks is the general lack of explicitness. This lack of explicitness can be seen in relation to the nature and boundary of the network under investigation, the nomenclature employed, and to the features of the network that are being investigated and revealed; in particular, the term ‘network’ is expected to speak for itself. However, the term ‘network’ means different things to different people, to the extent that there is little common ground beyond the metaphor. For example, is the ego-centred set of dyadic relationships of a given actor a network when it makes no reference to how the ego-centred network is embedded within the broader network?

The lack of explicitness in many network papers in the innovation and technology field would appear to stem from the fact that the dominant starting point is the imagery provided by the network metaphor. Some consider this to be ‘imagery without technique’ (Shrum and Mullins 1988). Those studies and papers whose starting point is the social network literature, for example, draw from a long and rich tradition in which a great deal of focus has been placed upon creating a coherent framework for the systematic analysis of networks; thus, the social network literature explicates the various approaches to abstracting ‘partial networks’ from the ‘total network’ (see Table 3 in the chapter by Conway) and is thus more explicit about the rules of inclusion or exclusion of the actors, linkages, and flows under investigation. While the social network literature has much to offer innovation studies, Rogers (1987: 14) warns that “far too much, I fear, we admire mathematical elegance in our network tools and tool-makers, while largely ignoring what useful objects we can dig up with these tools”. Indeed, Wellman (1983: 156) argues that network analysis should be viewed “as a broad intellectual approach, and not as a narrow set of methods”. Nevertheless, the greater explicitness in the social network literature, the development of tools and techniques to systematise data collection, data analysis, and data presentation, as well as the emergence of some useful network theory, are important contributions that are often overlooked in ‘looser’ applications of the network approach. As the authors have argued in earlier publications, perhaps the adoption of a middle-ground (as illustrated in Figure 1) between the extremes of the mathematical and metaphorical orientations may be a way forward (Conway 1997a, Jones et al 1998). A graphical orientation has the potential to both amplify the imagery of the network metaphor whilst embracing a more systematic and explicit approach to collecting, analysing and presenting relational data (Conway 1997a, Conway and Steward 1998a, 1998b, Steward and Conway 1998). The potential of this approach is demonstrated in the chapters by Conway (on mapping informal networks), Steward (on mapping innovation networks and risk arenas, and the overlap of these two networks in the
shaping of technology), and Jones and Beckinsale (on mapping interactions during a sample of innovation projects), and is one possible way in which innovation studies may realise greater utility from the adoption of a network perspective.

![Diagram showing Alternative Approaches and Orientations in Studying Networks](adapted Conway 1997a, Jones et al 1998)

Figure 1: Alternative Approaches and Orientations in Studying Networks (adapted Conway 1997a, Jones et al 1998)

![Diagram showing Deconstructing the Network and its Components](

Figure 2: Deconstructing the Network and its Components
One of the ways in which the broader social network literature can usefully inform innovation network studies is through the efforts that have been placed in elucidating the key dimensions of both the network itself, and of the individual components that make up the network: *i.e.* actors, links, and flows (see Figure 2). This literature provides a useful set of characteristics for comparing the morphology of networks over time, or between the networks of different firms or industrial sectors at a single point in time. The deconstruction of the network into its component parts, and of these component parts into a set of key characteristics, is also an important contribution for the systematic collection of data.

**Issues Relating to Existing Network Research**

While the network perspective has been widely adopted in a broad range of disciplines, such as economics, anthropology, social psychology and sociology, to study all manner of phenomena, there are few articles that take stock of the progress and gaps in network research. Nevertheless, such reflection is important if the network approach is to realise its potential; comments by Rogers (1987) and Salancik (1995) are particularly useful in this respect. Although Rogers and Salancik are referring specifically to the social network literature, their comments are generalisable to those studies broadly adopting the network perspective. Furthermore, the following comments are not aimed specifically at innovation network studies, although they have particular resonance with such research. In providing a critique of the network approach, Salancik (1995: 345) starts by asking “what role a network perspective might uniquely play beyond acknowledging and highlighting the importance of social relations for organizational and inter-organizational affairs”. This is a key question, since, as Salancik (1995) points out, many of the findings of network studies could have been obtained without the use of existing network theory and tools. By raising the issue of the nature of the uniqueness of the contribution provided by the network perspective, one is drawn into recognising both the existing weaknesses and potential of the network approach. The weaknesses in existing social network research include: (1) an under-emphasis on data-gathering; (2) a lack of focus on the dynamic of the network and the flow of content through the network; (3) an under-emphasis on theory building; and (4) a lack of explicitness in sampling and in the setting of the boundary of the investigation. These issues will now be dealt with in turn.

**An under-emphasis on data-gathering**

With reference to social network analysis, Rogers (1987: 17) argues that “without good data, network analysis is worthless”; by ‘good data’ it would appear that Rogers is referring to the need for ‘complete’ data with respect to the actors and relationships within a network under investigation. This is particularly important where the focus is socio-centred and mathematical social network techniques are to be applied to the data to reveal network characteristics such as density and connectedness (this is illustrated in Figure 1). However, the reference to the need for ‘good data’ also highlights a general under-emphasis on data-gathering in network studies, whether or not the researcher is adopting a mathematical orientation. It is not uncommon in the innovation studies literature for network data to be fairly shallow and superficial. In particular, more emphasis needs to be placed on gathering data on the nature of relationships and the various flows through these linkages in the network. There is also a paucity of longitudinal data on networks and their component parts. these more specific areas of data gathering will now be explored further.
Short-changing network message content and time

Alba (1982) argues that network analysts have focused mainly on the form of networks, while largely ignoring the content of the information that flows through network links. Rogers (1987: 19) suggests that “perhaps a major reason for ignoring network content is due to our overwhelming dependence in network data-gathering upon sociometric, who-to-whom questions”. This concern is supported by Salancik (1995: 346) who believes that “there is a danger in network analysis of not seeing the trees for the forest. Interactions, the building blocks of networks are too easily taken as givens”. Innovation studies would certainly benefit from such a focus since key areas of interest include the management and sharing of tacit knowledge (e.g. Nonaka and Takeuchi 1995), and the sourcing of ideas and inputs in successful innovation (e.g. Conway 1995, Conway and Steward 1998).

In addition, Rogers (1987: 19) argues that “past network research has mainly been cross-sectional in nature, thus ignoring time as a variable”. Salancik (1995: 348) sees this as problematic: “a network analysis taken in a snapshot of time might miss the organizing that is going on and the stable system that eventually evolves”. However, a few network scholars have effectively brought time into their studies, including Klovdahl's (1985) investigation of the diffusion of AIDS, and more specific to the innovation literature, the work of Hagedoorn and Schakenraad (1992), concerning the trends in strategic alliances and joint ventures between leading firms in a number of information technology sectors. Again this is an area that is beginning to be addressed by a number of researchers at Aston Business School, for example, see the chapters by Conway, and Jones and Beckinsale.

Theory-less orientated research

Rogers (1987: 14) argues that “while we can easily point to numerous important network data-analysis contributions, it is much more difficult to identify really significant theoretical advances”. Indeed, this view is supported by Burt (1980:134) who contends that “the lack of network theory seems to me to be the most serious impediment to the realization of the potential value of network models in empirical research”. Granovetter (1979) has called this the theory-gap in network studies. Salancik (1995: 348) is more pointed in his criticism:

“To be productive in understanding organizations, network analysts will need to become more theoretical about the things that they study. When questions about network effects are asked, the source of the questions are usually other theories. Thus many questions about interacting organizations are framed from resources dependency theory. Many questions about diffusion of practice or attitude within or between organizations are framed from general theories of social influence or social comparison. Network analysts often don’t ask how their perspective addresses a theoretical problem, but how network analysis can be used to look into a problem area...Instead of capitalizing on opportunities for applying the craft, network analysts will surely advance our understanding of organization better by constructing network theories about organization…a network theory of organization should propose how structures of interactions enable coordinated interaction to achieve collective and individual interests”.

One such important network theory is the strength-of-weak-ties (Granovetter (1973); Rogers (1987: 14-15) recognises both the attractiveness “of its seemingly paradoxical nature” and the
fact that network scholars altered their methods of measuring networks as a consequence. Another important contribution to network theory, is the related concept of ‘structural holes’ (Burt 1992). Both of these network theories are important to developing our understanding of innovation and entrepreneurship (Conway 1997b. It is only through such theoretical contributions that the network perspective will be able to develop a distinctive contribution to our understanding of organisations. In this regard, Krackhardt (1995: 350) offers the following advice:

“A good theory of organizations builds on existing literature and yet provides new insight into otherwise confusing or contradictory phenomena. It must be falsifiable but should be accompanied by solid empirical support for its predictions. It should be clear and sensible, but also interesting and not trivial. The theory is better if it can be generalized to a large set of phenomena, applying to a range of units of analysis, such as the individual, the organization, and perhaps even larger social entities. If a theory satisfies all of these conditions, then it would also be nice if it stipulated practical implications for organizational members”

Making explicit the boundary of analysis

Establishing the boundary of the network under investigation is one of the fundamental issues that need to be addressed when conducting research employing the network perspective. Yet despite this, few published studies are explicit in specifying the researchers rules of inclusion. Laumann et al. (1983: 18) argue that “the problem of boundary definition should be given conscious attention” and that “care must be given to specifying 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”. However, a key problem in network sampling arises from the difficulty in specifying the boundary of the network. Barnes (1979: 416) argues that “networks are interesting but difficult to study since real-world networks lack convenient natural boundaries”. In her study of the networks of scientists (‘invisible colleges’) Crane (1972: 14) saw boundary setting as problematic, contending that “the amorphous character of [scientific] research areas complicates the problems of defining the membership of the social circles”. However, the network researcher must also be wary of natural boundaries, since as Alba (1982: 43) argues, “natural boundaries may at times prove artificial, insofar as individuals within the boundaries may be linked through others outside of them”. Indeed, the network researcher has to be particularly wary in setting the boundary in investigations of innovative activity given the importance of boundary-spanning to the innovation process. This point is highlighted in the chapter by Conway:

“A key characteristic of informal and social organisation is their tendency to span organisational boundaries: team boundaries, functional boundaries, and even the organisational boundary itself. Such boundary spanning interaction is the essence of the interactive model of innovation (Rothwell and Zegveld 1985). The interactive model places great emphasis on the ability of innovative organisations to manage relationships across interfaces, both within the firm (between project groups, functional departments, and divisions), and externally (within and across industrial sectors, geographical regions, and nations).”

For Fombrun (1982: 288) the solution to the boundary-setting problem should be based on the objectives of the research, arguing that “if there is no agreed on boundary to an inter-
organisational network, the choice of the boundary should reflect the purposes of the researcher and the research hypotheses of the study”. Mitchell (1969: 40) supports this view, arguing that:

“Clearly some limit must be put on the number of links to be taken as definitive for any specific network, otherwise it would become co-extensive with the total network. This difficulty is resolved by fixing the boundary of the network in relation to the social situation being analyzed...There can be no general rule.”

Nevertheless, the researcher should be aware that the approach through which boundaries are drawn up is a critical step in the research process, since it creates the sample of linkages that are examined Auster (1990). Laumann et al (1983) also note that carelessness, in what they term system specification, can distort the overall configuration of the network. With this in mind, Fombrun (1982: 288) warns that the “conclusions drawn from the study must be carefully scrutinized for the possibility of alternative explanations grounded in the effects of the untapped networks”.

Concluding Comments

While it is true to say that the network perspective has been particularly popular among academics, policy-makers, and managers alike, during the 1990s, it has been argued that the network perspective is likely to have a more enduring impact than other management fashions of recent years. Importantly, both the perspective and the phenomena are seen to have great utility among a broad range of constituents. In part this is due to the ease with which the concept can be expressed and applied by both practitioners and academics. The network perspective also offers a great deal of flexibility in the manner in which it may be applied and the subject matter or phenomena it may be applied to. However, it has also been argued that there are too many ‘taken-for-granteds’ in the application of the network approach within innovation studies and that there needs to be greater explicitness and depth in its usage by academics if the field is to gain the full potential from the perspective. In this respect, there is much to learn from the broader social network literature, particularly from anthropology and sociology. In order that the network perspective matures within innovation studies in such a way as to provide a distinctive and useful contribution, it has been argued that various needs require attention, these include: (1) the need for ‘deeper’ data-gathering that goes beyond the investigation of structure; (2) a greater focus on the dynamic of the network and the flow of content through the network; (3) the need for theory building; and (4) the need for greater explicitness in sampling and in the setting of the boundary of the investigation. The various chapters in this book begin to address these issues, but much work still needs to be undertaken if the full potential of the network perspective is to be realised within innovation studies. The greatest challenge, perhaps, is the development of useful and robust theory.

References


Coopers & Lybrand (1994). *Good Practice in Managing Transnational Technology Transfer Networks: 10 Years of Experience in the SPRINT Programme*. Volume 1 / Subject Papers.


Introduction. The viability of the innovations in the economy is estimated via its national innovative capacity. A similar approach was applied to evaluation of the innovative strength of the national innovation system in the. But for the system perspective the sole condition of attraction of the public and private investment into the R&D sector is not enough. It is necessary to draw strategic inference from the fact that the organized research works prove to be the main tool in transformation of the innovations into commercial value and that the ability of the firms to take part in such research works vary greatly. Thus, companies need to develop business models that realize the value potential of novel technologies (Chesbrough and Rosenbloom 2002) in uncertain contexts. The sale, licensing, and trading of technology have become a large-scale activity. Many studies adopt a single-firm perspective and mostly seek to identify generic elements in a business model. In doing so, they ignore the necessary linkages between networked business models as well as possible heterogeneity among firms. The empirical part of the paper presents the networking dynamics of the main firms, mainly large pharmaceutical companies and big venture capital firms, which interact in open innovation with small biotech companies.