

social networks, psychology of

We review the psychological processes underpinning network formation and network-based processes, focusing first on the nature of relationships and their formation, and then on the consequences of networks for individual outcomes and behavior. We argue that it is important to develop methodological approaches that allow us to regard these processes as hypotheses to be tested rather than as unquestioned assumptions. We suggest that different types of networks and processes are likely to lead to different conclusions about these hypotheses, and that the development of models for networks and network processes should therefore be grounded in careful empirical analysis.

The significance of social networks for an understanding of the structure and dynamics of our contemporary social world is now widely acknowledged. Different types of networks serve as channels through which, for example, knowledge is diffused, opportunities are recognized, cooperation is garnered and actions are coordinated. Networks have been invoked in many disciplines in order to explain the nature and consequences of these channelling effects, spawning interest in the capacity to model network structure. This capacity is important because of the potentially powerful interplay between network structures and the dynamics of the social transactions that they support.

Two broad strategies for network model building have been identified (Jackson, 2005): a statistical approach, in which networks are seen as the outcome of locally interactive and self-organizing tie-formation processes; and a deterministic, game-theoretic approach, in which networks are seen as the outcome of self-interested behaviour of utility-maximizing actors. In association with the statistical approach, there has been a dramatic increase in our capacity to build theoretically defensible statistical models for social networks whose parameters can be estimated from empirical observations and that have the capacity to reproduce many important global characteristics of observed social networks (for example, Snijders et al., 2006). The game-theoretic approach, on the other hand, is responsible for an impressive

accumulation of theoretical results linking strategic activities of pairs of actors to the emergence of 'efficient' network structures.

These two modelling approaches differ in two important respects. The first is in the use of deterministic or stochastic models (but see Snijders, 2001). The second distinction is a deeper one, contrasting a conceptualization of actors as self-interested rational decision makers, on the one hand, with more socialized and enculturated actors, on the other. The latter may sometimes be driven by personal utility, but may also engage in non- or extra-rational behaviours that are enabled and constrained by local social network configurations. Indeed, whereas the game-theoretic approach largely assumes that the actor's decision to form or discontinue a relationship is mediated by the actor's conscious computation of utility, the statistical approach treats this as a hypothesis, and empirically examines *whether* an actor's local network configuration appears to constrain or enable tie formation or maintenance. Thus, this second distinction encapsulates a fundamental empirical question: can network structures and processes be explained in terms of the rational activity of self-interested individuals, or are extra-rational affective, social and/or cultural processes systematically at work in the formation and impact of networks?

With this question in mind, we outline what is known about the social and psychological processes that underpin the formation of networks and the dynamics of network-based processes. We first discuss the nature of relationships and their development, and then examine their consequences for individual outcomes and behaviour. We finish by drawing some implications for model-building.

What is a network tie and why do relationships form?

A network relationship, or tie, is assumed to have some continuity in time, with a relevant past and a somewhat predictable future. This temporal continuity is facilitated by cognitive representation and the use of culturally laden relational descriptors, such as friend and friendship, or partner and partnership, features that also facilitate communication about the nature of ties. Relationships, in other words, entail complex socio-cultural schema that not only frame interpretations of past interactions but also

shape expectations concerning future ones by the actors concerned as well as by third-party onlookers.

Although tie formation has sometimes been explained in terms of the utility that ties bring for tie partners (for example, Cook and Whitmeyer, 1992), recent psychological research suggests that significant extra-rational psychological processes may also underlie tie formation. Andersen and Chen (2002) have invoked the concept of *relational self* to explain the pervasive impact of relationships with significant others on the way in which individuals interpret and respond to interpersonal encounters, and therefore form *future* interpersonal ties. This concept is founded on a demonstrable ‘transference’ effect, in which past experiences with significant others can be shown to influence new relationships, often outside of conscious awareness. Holmes (2000) has argued that the concept of relationship is best seen as grounded in the interaction between interdependent actors, and hence as an emergent property of dynamic interaction and influence processes. Generic cognitive representations about relationships called *relational schemas* are postulated to represent actors’ developing knowledge of self, partner and expected sequences of interaction (for example, Baldwin, 1992).

More generally, Fiske (2004) has proposed that four elementary and universal cognitive schemas frame *all* interpersonal relationships. These four schemas are proposed to structure potential interactions between two actors in terms of: collective belonging or solidarity, as in family membership (the *communal sharing* schema); asymmetrical difference, as in hierarchies based on skill, knowledge or social class (*authority ranking*); an egalitarian relationship, based on turn-taking and exchange, as in many friendship ties (*equality matching*); and a rational analysis of costs and benefits, as in a payment-for-service regime (*market pricing*). Fiske claims that any actual social relationship is constituted by some mixture of these forms, and that socially transmitted interpretive guidelines link these universal forms to specific relationship characteristics in a particular culture.

While relational schemas have advanced our understanding of the nature and variety of dyadic relationships, there is a recognized need to understand the specific ways in which they depend on social situations and give rise to interdependencies among relationships *across* a network. As Haslam (2004, p. 297) has observed, Fiske’s

relational models theory posits ‘a universal grammar of social relations ... out of whose rules and representations the myriad local forms of social life can be generated’. Haslam argues that the categorical nature of the relational models may underpin the complexity of human social organization by facilitating the required coordination of interpersonal obligations, rights and responsibilities. Social roles are important intermediate-level constructs in this account, and are seen as ‘distinctively implemented admixtures’ of relational models, a view that is supported by evidence that relational models mediate the effects of social roles on social cognition. More generally, social roles have been invoked by many theorists to explain interdependencies among multiple relationships across multiple actors (White, Boorman and Breiger, 1976).

It follows from these claims that tie formation processes should depend on the type of tie under consideration. While some ties may be consciously negotiated at a dyadic level, independently of other ties, others may be subject to subtle influences arising from the embedding of the potential tie in a local social setting that comprises ties to and among third-party actors with their own mix of potentially competing and potentially cooperative goals. As a result, Fiske’s communal sharing relations, for example, should exhibit much stronger interdependencies across pairs of relation partners than relations of the market pricing kind. Such effects have been empirically demonstrated. For example, Granovetter’s influential hypothesis concerning the ‘strength’ of weak ties was based on the distinction between the highly clustered structure of ‘strong’ tie networks and the less structured, more open, spreading character of ‘weak’ tie networks, an hypothesis that has received empirical support (Granovetter, 1982). There is also evidence that different types of network tie can be mutually interdependent and subject to generalized forms of exchange and interlock through ties to third parties (for example, Lomi and Pattison, 2006). Indeed, changes in patterns of cross-network interdependence have been invoked in explanations of social and economic innovation (for example, Padgett and McLean, 2006).

In addition to the interdependencies just described, there is also compelling evidence for the impact of individual actors’ characteristics on the formation of network ties. Tie partners are more likely to share socio-demographic characteristics such as gender, age, ethnicity, and religion (for example, McPherson, Smith-Lovin and Cook,

2001). The formation of relationships is also clearly a function of social settings that affect the probability of any two actors having an opportunity to interact (Feld, 1981). The psychological literature on relationship formation emphasizes the importance of more psychological similarities among potential tie partners, a premise that has been extended by Robins and Boldero (2003) to include a comparison of potential tie partners' aspirations and obligations.

Taken together, these structuring influences on tie formation can be seen as operating at multiple levels, with broad socio-demographic factors at work on a larger scale, and more micro-social and psychological factors at work at more local scales. Whereas the broader factors can often be regarded as exogenous influences on tie formation, the more micro-level factors are usually best seen as endogenous, with the tie formation processes for one pair of actors having consequences for tie formation among their network partners, and their partners, and so on. While some of these interdependencies may operate outside the awareness of individual actors, there are also circumstances in which actors seek out institutional settings and particular relationships precisely for the strategic 'networking' opportunities that they provide. Moreover, expected interdependencies can themselves be countered: Padgett and Ansell (1993) coined the term 'robust action' to describe behaviour that is open to multiple interpretations, and therefore has the capacity to elide third-party influences on tie formation.

How do relationships affect individual outcomes?

An actor's location in a social network is an important aspect of social context and hence potentially plays an important role in determining many types of future behaviour apart from the development of social ties. There are a number of related mechanisms by which such effects might occur (for example, Pattison, 1994). First, network ties serve as a conduit for information, and hence specific network locations can have a dramatic impact on the information or other resources that any one actor possesses (for example, Burt, 2004). This information can itself be subject to subtle filtering effects, such as the suppression of information perceived to be inconsistent with shared understanding at a community level (Lyons and Kashima, 2003). Second, network ties can influence actors'

understanding of relationships among others as well as expectations about the future behaviour of others. For example, they are likely to be more certain (and more accurate) in judging the relationships involving their network partners and, to a lesser extent, their network partners' partners (Kumbasar, Romney and Batchelder, 1994). Finally, social influence effects may be brought to bear as actors weigh up – consciously or unconsciously – the views of others in forming or modifying their own beliefs (for example, Friedkin, 1998; Robins, Pattison and Elliott, 2001).

Implications for model-building

Models for network structure and network evolution almost certainly need to accommodate many of the exogenous and endogenous influences on tie formation just described. An appropriate model class is the exponential family of random graph models that was first introduced by Frank and Strauss (1986), building on the general formulation of statistical models for interacting systems of variables by Besag (1974). The use of principled approaches to specifying potential tie interdependencies (Pattison and Robins, 2002) has led to models that yield impressive fits to even large observed network structures (for example, Goodreau, 2006). Interestingly, these models combine a Markov dependence assumption (that potential network ties with an actor in common are dependent, conditional on the state of all other potential ties in a network) with a 'longer range' form of assumed dependence (Snijders et al, 2006) in which, in some circumstances, ties involving discrete pairs of actors are also conditionally dependent. The necessity of these assumptions in many empirical contexts (Robins et al., 2006) suggests that interdependencies among ties within local social contexts are indeed an important influence on observed network forms.

Models for individual states and choices (including beliefs and actions) may likewise need to accommodate subtle network-based interdependencies among the states and choices of their tie partners. Robins, Pattison and Elliott (2001) have developed a general social influence modelling framework for this purpose, akin to the network modelling framework just mentioned.

It is important in the context of the question posed earlier – whether network structures and processes can be explained in terms of the rational activity of self-

interested individuals, or whether there are extra-rational processes at work in the formation and impact of networks – to develop observational designs and analytic methods that allow us to regard tie formation and network processes as hypotheses to be tested rather than unquestioned assumptions. We might speculate that different types of networks and different types of social processes are likely to lead to different conclusions about these guiding hypotheses, and that, as a consequence, models should continue to be developed from multiple perspectives and to be grounded in careful empirical analysis. Finally, it is worth noting that the development of methods for estimating models from longitudinal observations may prove particularly helpful in sifting among alternative approaches to model building, not just for models of network evolution and social influence dynamics but also for new approaches to modelling the co-evolution of networks and behaviour (Snijders, Steglich & Schweinberger, 2006).

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See also emergence; learning and information aggregation in networks; network formation; networks, mathematics of; networks, sociology of; social interactions (theory); social interactions (empirics); social networks in labour markets; social networks, sociology of

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