Overview of Network Theory

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Wasserman and Faust, Chapter 1:

Say something about relationships, structures, and structural variables.

The Social Network Perspective

1) Actors and their actions are viewed as interdependent rather than independent
2) Relational ties (linkages) between actors are channels for transfer or “flow” of resources (either material or nonmaterial)
3) Network models focusing on individuals view the network structural environment as providing opportunities for or constraints on individual action
4) Network models conceptualize structures (social, economic, political, and so forth) as lasting patterns of relations among actors

Network methods can focus on dyads (two actors and their ties), triads (three actors and their ties), or lagers systems (subgroups of individuals, or entire networks).

Formal descriptions: In this first, descriptive context, network analysis provides a vocabulary and set of formal definitions for expressing theoretical concepts and properties.

Model and Theory Evaluation and Testing: alternatively, network models may be used to test theories about relational processes or structures.

The social network perspective has a distinctive orientation in which structures, their impact, and their evolution become the primary focus.

The three major mathematical foundations of network methods are graph theory, statistical and probability theory, and algebraic models.

Actor: discrete individual, corporate, or collective social units.

One-mode Networks: collections of actors that are all of the same type

Relational Tie: a linkage between actors. Can include evaluation of one person by another, transfers of material resources, association or affiliation, behavioral interaction, movement between places or statuses, physical connection, formal relations, or biological relationship.

Dyad: a tie between two actors.

Triad: a subset of three actors and the (possible) tie(s) among them.
Subgroup: any subset of actors, and all ties among them.

Group: a collection of all actors on which ties are to be measured.

Relation: the collection of ties of a specific kind among members of a group.

Social Network: consists of a finite set or sets of actors and the relation or relations defined on them.


Central argument: Network analysis is a broad intellectual approach to the study of social structure, not simply a method or technique. Wellman also argues that there is a unity of three distinct traditions: the anthropological concept of the social network, the sociological concept of social structure as social network, and structural explanations of political processes.

To study social structure is to study the patterns of ties that link members and constrain their actions. The study of these deep structures is network analysis. The most important characteristic of individual units is their position in social networks. Resources are allocated according to these positions. Dyadic ties are themselves affected by the larger structure.

- Origins in Anthropology: Originally a network was a set of ties linking social system members across social categories and bounded groups (example of migrant workers, p. 158). Evolved into concepts to analyze the structure of ties.
- Origins on Sociology: All social structures are social networks. “Formalists” study how the form of networks determines behavioral consequences. “Structuralists” use network analysis to answer any question about social structure.
- Origins in Political Science: Politics is about patterns of relationships among interest groups and the allocation of resources as a result of these patterns.

Network analysis avoids normative explanations of social behavior (i.e. people act this way because they learn that they are supposed to). They say that individual motives are best left to psychologists.

Network analysis does not focus on individual attributes, but rather on involvement in structured social relationships. They prefer to aggregate social regularities by equivalent structural location rather than by equivalent categorical membership.

The network itself is sometimes the focus of attention. All members have indirect access to all other members. But networks are not bounded. The social world consists of networks of networks.

¹ Summary by Terence Meehan. Some text is taken verbatim from the article. Do not use text from this summary without consulting the original article.
Sophisticated mathematics are used in social network analysis.

Analytic Principles:

1. Ties are asymmetrically reciprocal, differing in content and intensity
2. Ties link network members indirectly as well as directly; hence ties must be analyzed within the context of larger network structures
3. The structuring of social ties creates nonrandom networks; hence network clusters, boundaries, and cross-linkages arise.
4. Cross-linkages connect clusters as well as individuals
5. Asymmetric ties and complex networks distribute scarce resources differentially
6. Networks structure collaborative and competitive activities to secure scarce resources


Central Argument (stated 5 different ways, for your amusement):

- Analysis of weak ties can illuminate relations between groups.
- It is through networks that small-scale interaction (interpersonal ties) becomes translated into large-scale patterns (diffusion, social mobility, political organization, social cohesion).
- In other words, the personal experience of individuals is closely bound up with larger-scale aspects of social structure.
- Those to whom we are weakly tied are more likely to move in circles different from our own and thus have access to information different from that which we receive.
- Weak ties are more likely to link members of different small groups than are strong ones, which tend to be concentrated within particular groups.

Strength of ties depends on a combination of the amount of time, the emotional intensity, the intimacy and the reciprocal services of the relationship. Ties can be strong, weak, or absent. Strong ties are between “friends” while weak ties are between “acquaintances”.

The stronger the tie between A and B, the larger the proportion of individuals in S (the set of all persons with ties to either or both of them) to whom they will both be tied. This describes the overlap in friendship circles.

There is evidence that the stronger the tie connecting two individuals, the more similar they are.

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Summary by Terence Meehan. Some text is taken verbatim from the article. Do not use text from this summary without consulting the original article.
If A is strongly tied to B and to C, then B and C must be at least weakly tied to each other.

All bridges are likely to be weak ties. A bridge is a line in a network that provides the only path between two points.

A tie is a “local bridge of degree $n$” if $n$ represents the shortest path between its two points (other than itself).

As with bridges in a highway system, a local bridge in a social network will be more significant as a connection between two sectors to the extent that it is the only alternative for many people (that is, as its degree increases).

**Local bridges are very likely to be weak ties.**

Resources (info, money, etc.) can be diffused to more people when passed through weak ties rather than through strong ties. More people can be reached through weak ties.

Example of the rumor (page 1366) and “hysterical contagion” (page 1367).

Example of forwarding a booklet (page 1368). In one study, white senders were asked to forward a booklet to a target who was black. If the first white to black “flow” was between acquaintances, the success rate was 50%. If this flow was between black and white “friends,” then the success rate was only 26%. This is direct evidence of the strength of weak ties.

In one study, people who recently got a job through a personal contact tended to get it from acquaintances rather than from friends.

Two possible explanations for the inability of a working-class neighborhood to mobilize against “urban renewal.” One, the characteristics of their category: “working class” unable to organize effectively. But studies have shown that some working class communities can organize effectively. So Granovetter looks at the social structure and finds few weak ties. Instead people are confined to cliques of family and close friends. Community organization became impossible. This is analytic speculation as the empirical evidence was not available.

Let P choose O and O choose X: then P choosing X is most likely when both ties – P-O and O-X – are strong, least likely when both are weak, and of intermediate probability if one is strong and one weak.


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3 Summary by Terence Meehan. Some text is taken verbatim from the article. Do not use text from this summary without consulting the original article.
Central Argument: Economic action is embedded in ongoing structures of social relations. Actors are neither entirely independent (undersocialized) nor slaves to societal norms and values that have been internalized (oversocialized).

Classical and neoclassical economics assumes rational self-interested behavior by independent individuals. An alternative assumption is that behavior is entirely determined by social relations and a desire to win approval from others. The truth, according to Granovetter, is somewhere in between.

Social atomization is a prerequisite to perfectly competitive markets. Neither is obtained.

Granovetter argues that the under and over-socialized theories both assume that atomized individuals make decisions. He argues instead for the importance of ongoing social relationships.

Criticizes new institutional economics, which claims that institutions (contracts, courts, etc.) developed to reduce mistrust and malfeasance.

Instead, Granovetter assumes trust is a function of ongoing relationships. Reputation is one important aspect of this embeddedness and this allows economic transactions to flourish.

What is the relationship between individuals and social structure

People work really hard to build up trust in their social relations. People prefer to transact with people they know and trust. Therefore networks and informal organizations are important. People embedded in formal and informal networks that affect their behavior. Actors have choice within the constraints provided by trust, reputation, relationships. What network you’re in determines what choices you get.

Formalizing informal networks are a possible solution, inter-organizational networks, for example.


History:

- 100 years before Moreno, Comte hoped to found a new field of “social physics”.
- 50 years before Moreno, Durkheim had argued that human societies were like biological systems in that they were made up of interrelated components. Thus, social norms were thought to be a product of the structure of the social environments people were embedded in.
- Jacob Moreno and Helen Jennings use “sociometry” at Hudson School for Girls in 1932 to explain runaway girls, providing a way to make previously abstract social structures more tangible.
- In the 1940’s and 50’s, work in social network theory advanced on several fronts, including the use of matrix algebra and graph theory to formalize fundamental social-psychological concepts. Researchers at MIT did laboratory studies on group communication to determine centralized structures like the star outperformed decentralized structures. This was due to shortened distance of all peripheral nodes from the obvious integrator in more centralized structures.
1978, Kochen and de Sola Pool tackle the “small world” problem. 20 years later, Stanely Milgram tested their propositions empirically, leading to the now popular notion of “six degrees of seperation”. (Also, the Kevin Bacon game)

During the 40’s and 50’s there were also studies of urbanizations effect on communities as well as “cliques”.

In the 1960’s network studies became very popular in the field of anthropology. At the conceptual level, S.F. Nadel defined societies as systems of relationships. Others, building on Levi-Strauss, represented kinship systems as relational algebras that consisted of a small set of generating relations and derived relations. Still others used network theory to explain outcomes like variation in paternal and maternal roles among 20 British urban families.

In the 1970’s, the center of gravity of network studies shifted to sociology. Landmark studies included Lorrain and White’s reduced models that collapsed nods that were structurally equivalent as well as Granovetter’s strength of weak ties theory.

By the 1980’s social network analysis was an established field, with the professional organization International Network for Social Network Analysis, the annual Sunbelt conference, specialized software like UCINET, and its own journal Social Networks.

In the 1990’s, network analysis entered into a great many fields, including physics, biology, management consulting, public health, and crime/war fighting.

Social Network Theory: Its not just descriptive or a methodology but a theory with some key points.

1) Types of ties. Social scientists typically distinguish among different kinds of dyadic links both analytically and theoretically. Much of social network can be seen as working out how these different kinds of ties affect each other.

2) The importance of structure. Social environment for explanations, whether through influence processes or leveraging processes.

3) Research questions. Researchers have tended to emphasize variation in structure across different groups or contexts, using these variations to explain different outcomes. Both the social and physical sciences have shared the research goal of explaining the formation of network ties, and more generally, to predict a host of network properties, such as the clusteredness of networks or the distributions of node centrality. Broadly speaking, outcomes fall into two main categories: homogeneity and performance. Node homogeneity refers to the similarity of actors with respect to behaviors or internal structures. Performance refers to a node’s outcomes with respect to some good.

4) Theoretical mechanisms. The simplest mechanism involves direct transmissions from node to node (either physical or mimetic). The adaptation mechanism states that nodes become homogenous as a result of experiencing and adapting to similar social environments. The binding mechanism states that social ties can bind nodes together in such a way as to construct a new entity whose properties can be different from those of its constituent elements. The exclusion mechanism refers to competitive situations in which one node, by forming a relation with another, excludes a third node.

Policy Networks: a set of public agencies, legislative offices, and private sector organizations that have an interest in public decisions within a particular area of policy because they are interdependent and thus have a “shared fate”.

Collaborative Networks: collections of government agencies, nonprofits, and for-profits that work together to provide a public good, service, or “value” when a single public agency is unable to create the good or service on its own and/or the private sector is unable or unwilling to provide the goods or services in the desired quantities.

Governance networks: entities that fuse collaborative public goods and service provision with collective policymaking (business improvement districts or some environmental mitigation effort for example)

Historical Roots

30 to 40 years ago, a set of social and economic changes took hold in the US and across the world, with conservative parties like the Regan and Thatcher Administrations taking power and starting rapid programs of privatization and marketization of the private sector. Despite the new push of NPM (new public management) certain “wicked problems” for which the market seemed poorly suited for classic contracting. Networks arose in part as a response to the insufficiencies of NPM and provided a more flexible alternative when markets or bureaucracies failed.

Preaching What Is Already Practiced

Network forms spread during the 70’s but really took off during the 1990’s under the Clinton Administration. Research has been playing catch up with network structures already put in place. Network studies, then, are a response to a new administrative reality driven by social, political, and economic forces.

Challenges Facing Scholarship

Definition

Network can refer to a number of different things, including (but not limited to) a gathering of actors with different levels of coupling, operationalized at various levels of analysis, using multiple conceptual approaches and agendas, using multiple conceptual approaches and agendas, and an array of static versus dynamic and agency-based notions. Thus, we have an amorphous set of studies that do not necessarily belong to a distinct intellectual tradition or even a clear understanding of what studies hang together as a subset of a broader tradition.

There are three general ways in which “networks” are used in the public administration literature.
1) A metaphor for an organizing concept. Here we see studies that invoke a network conceptualization of a social phenomenon that may not necessarily have a structure or corporate entity that defines the network.

2) To refer to the methods and methodological paradigm that surrounds networks, social network analysis. In this use, structure and the measurement of structural dynamics is the focus.

3) Used in utilitarian terms as an approach or as a tool to understand public service provision. Here networks are used to get something done.

Scholars do date have not self-consciously placed their studies in a subsection of the literature, so there are few opportunities to determine whether findings are commensurate with one another and thus cumulative in their effect on the literature.

Unit of Analysis

The appropriate unit of analysis for network studies has yet to be resolved. The debate about unit of analysis comes into play with regard to whether “whole networks” must be studied or if there is leverage in studying component substructures. Both perspective has merit but there has been a lack of systematic work on networks as a whole, hindering our ability to understand how the whole functions separately from its parts.

Terminology

While we see reference to networks with regard to coordination, collaboration, and cooperation, these functions can also exist outside of networks. Readers often assume that networks are coordinative and/or cooperative mechanisms when this may simply not be the case. We call for clearer distinctions to be drawn to establish what networks are explicitly built to foster the three predominant collective action functions and which are not.

Disconnect between Formal and Informal Network Research

Formal Networks: multiactor arrangements explicitly constituted by public managers to produce and deliver public services. These can take a number of forms including contracts, enabling legislation, memoranda or understanding, joint agreements, etc. For the past 15 years, the study of formal networks has been a central focus of public management research, shedding light on things about power structures, overcoming obstacles, identifying important network management skills, etc. Challenges that the field still face include understanding how networks perform over time, network boundary specification, and forming conclusions that can be generalized.

Informal Networks: From task forces, to coalitions, to ad hoc committees, public and nonprofit organizations participate in a wide range of networks that do not bring its members together through formal means. There is no distinct body of literature on informal networks and thus, little advancement of our understanding of this pervasive mechanism of governance. Informal networks tent to be emergent structures used for information sharing, capacity building, problem solving, and service delivery. Many informal networks have in common their tendency to become formalized over time.

Methodological Issues
Sampling of Public Sector Networks: Collecting network data is a lengthy process usually requiring several waves of surveys or application of snowballing techniques to identify all relevant actors. It is usually easier to access formal networks instead of informal networks. Boundary specification may induce bias through faulty recall of actors, omission of research, or artificial boundaries. New methods are in development to deal with these challenges such as using cell phone records with multimillion data points, online data collection and mining, etc.

Generalizability of Single-Case Studies in Network Research and Lack of Data

We often cannot generalize from single network case studies in one specific sector, agency, or state to other contexts in the public sector since the permutations of agencies and levels within substantive policy arenas make the public sector a unique research setting. However, there has been a move toward more systematic data sharing and information dissemination developed in different research communities and funding agencies.

Changes Over Time and Dynamic Network Methods

There needs to be a move away from static studies of networks and toward dynamic network studies to understand the evolution of networks. So far there are only a few studies out to the Dutch school that are widely accepted in the research community.

Future of Public Administration Network Research

We offer four additional areas of concern that ought to be considered as the field moves forward.

1) Other disciplines are farther along in the study of networks than Public Administration. We should be cognizant of and draw from other fields to advance our own understanding of network issues in public sector contexts.

2) Scholars should foster closer ties with technical disciplines that are developing new methods and measures, such as computer science and statistical physics.

3) The field needs to complete metastudies of network cases. Understanding what you understand is an important step in any young field of inquiry.

4) Scholars need to become more engaged with practitioners.