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Wasserman & Faust, Chapter 2: “Social Network Data: Collection and Analysis”

2.1 Introduction
- Social network data measures at least one structural variable in a set of actors
- Concerns and theories focus on identifying structural variables and methods of measurement

2.1.1 Structural and Composition Variables
- **Structural Variables** – variables measured on pairs of actors, cornerstone of social network data sets; ex. Transactions among corporations
- **Composition Variables** – aka actor attribute variables; measurements of actor attributes that are of the standard social and behavioral science variety defined at the level of the individual; ex. Employees in corporations

2.1.2 Modes
- **Mode** – Distinct set of entities on which the structural variables are measured; can be one-mode, two-mode, etc.

2.1.3 Affiliation Variables
- **Affiliation variables** – variables that are part of affiliation networks
- **Affiliation networks** – special social networks that arise in two-mode networks when there are two modes, one of them an event, yet one set of actors
  - **Event** – ex. Clubs or volunteer organizations
- “For example, consider a set of actors, and three elite clubs in some city. We can define an affiliation variable for each of these three clubs. Each of these variables gives us a subset of actors – those actors belonging to one of the clubs.” (P.30)

2.2 Boundary Specification and Sampling

2.2.1 What is your population?
- **Population** – actors in a social network study
- **Boundary** – allows a researcher to describe and identify the populations of a study
  - Boundaries can change as actors come and go
  - They are often defined by frequency of interaction and intensity of ties with members compared to non-members
- **Realist** approach defines boundaries as actors in the data set perceive them
  - Ex. Gang members determining who’s in the gang
- **Nominalist** approach defines boundaries through research concerns
- A set of actors consist of all social units to which there are measurements or measurements can be taken
- Clarity of boundaries varies across size of population → small population, clear boundaries; large population, less clear boundaries
- Mention of **snowball sampling** and **random nets** to be discussed later in the book
- Snowball network sampling example – initial population is sampled, the population expands upon nominations from that sample, and continues in a snowball effect
2.3 Types of Networks

- Mode of a network defined as the number of sets of entities on which structural variables are measured
- Number of modes refers to the number of distinct kinds of social entities in the network
- Networks categorized by how many modes the network has and if any affiliational variables are present

2.3.1 One-Mode Networks

- **Actors** may be people, subgroups, organizations, collectives/aggregates (communities, nation-states)
  - Subgroups usually consist of people
  - Collectives/aggregates usually consist of organizations and subgroups
- **Relations** are usually viewed as representing “relational contents”
  - can be:
    - Individual evaluations: friendship, liking, etc
    - Transactions or transfer of material resources: lending/borrowing, buying/selling
    - Transfer of non-material resources: communications
    - Interactions
    - Movement: physical, social
    - Formal roles
    - Kinship: marriage, descent
- **Actor attributes** extra data about actors that, can help draw connections between actors using a variety of attributes

2.3.2 Two-Mode Networks

*Two Sets of Actors*

- **Actors** can be of the same types as those in one-mode networks, can be a mix and match of types (ex. people & people or people & subgroups)
- **Relations** are measured in at least one way between actors in the two sets
  - Ex. Collection of corporate headquarters and non-profit groups in the Minneapolis/St. Paul measuring flow of donations from corporations to non-profit groups (P.39)
- Directions of flows are important

*One Set of Actors – One Set of Events*

- **Affiliation** Networks, aka **Membership** Networks, arise when one set of actors is measured with respect to attendance at, or affiliation with, a set of events or activities
- Each social function is can be viewed as a variable with a binary measurement made as to whether a specific actor attended a specific function
  - These are affiliation variables
- **Actors** can be of the same type as one-mode and two-mode (two sets of actors) networks
  - **Acts** must be affiliated with at least one event
- **Events** are defined on the basis of membership, attendance, or interaction
  - Nature of events depend on the types of actors involved
- **Attributes** can be found in actors as well as events

2.3.3 Ego-centered and Special Dyadic Networks
• **Special Dyadic** – non-network relational data sampled from a larger population centering on the interaction between pairs; ex. Husband-Wife
  - This design can constrain interactions among actors
• **Ego-centered Network** – consists of a focal actor, *ego*, with sets of alters with ties to the ego with measurements made on the ties
  - *Personal network data*
  - Think of Karl and his 507 surveys of who knows who and who’s eaten with who

2.4 Network Data, Measurement, and Collection

2.4.1 Measurement
• Social network data is different from standard social and behavioral sciences in that its data consist of one or more relations measured among a set of actors
• Presence of relations has implications among many measurements such as the unit of observations, modeling unit, and the quantification of relations
  - *Modeling unit* – level of network analysis being studied
• **Unit of observation** is the entity on which measurements are taken
  - ex. Relationship in a dyad
• It helps to consider the modeling unit based upon what the model or network property applies
• **Rational quantification** refers to measurements and whether the relation is *directional* or *nondirectional*, and whether it is *dichotomous* or *valued*
  - *Directional* – relation has an origin and destination
  - *Nondirectional* – relation has no direction, actors are both origins and destinations
  - *Dichotomous* – relation is qualitative; is it present or absent
  - *Valued* – relation has quantitative value such as strength, intensity, or frequency

2.4.2 Collection
• Social network data can be collected through techniques such as:
  - Questionnaires
  - Interviews
  - Observations
  - Archival records
  - Experiments
  - Other techniques such as ego-centered, small world, and diaries/journals

*Questionnaire*
• Most commonly used collection method
• Usually contains questions used to identify and measure relations between actors
  - Ex. Karl’s 507 survey
• Three types of question formats
  - Roster vs. free recall
  - Free vs. fixed choice
  - Ratings vs. complete rankings
• **Roster vs. free recall** – issue of whether questionnaires should be presented with a complete list, *roster*, or respondents be allowed to generate lists of names, *free recall*
  - Roster can only be used if researcher knows entire members of the set prior to gathering data
Free recall can be used if entire members of the set may not be known
Ex. Friends in a class vs. community elites (P.46)

- **Free choice vs. fixed choice** –
  - *Free choice* – actors are not given constraints on nominations or responses
  - *Fixed choice* – actors are given constraints on how many nominations or responses they can provide
  - Ex. Responses about the environment vs. top three people respondent interacts with (P.47)

- **Ratings vs. complete rankings** – used to reflect intensity;
  - *Ratings* – require respondents to apply a quantitative value to relations
  - *Complete rankings* – require respondents to rank their ties to all other actors based on what is being measured
  - Ratings and rankings with multiple responses produce valued relations; are dichotomous and directional

**Interview**
- Used to gather network data when questionnaires are not feasible such as an ego-centered network
  - Ex. CEO interviews in Minneapolis/St. Paul (P.48)

**Observation**
- Used to gather network data in the field, usually relations among relatively small groups of individuals engaged in face-to-face interaction
  - Multiple examples given on P.49 including observation of primates
- Is also used to collect affiliational data for attendance at events

**Archival records**
- Measures ties through previously recorded interactions
  - Commonly used in political science regarding interactions among states and sociology in “who cites whom”

**Other**
- Other designs can be used for cognitive social designs, experimental studies, and sample studies
  - **Cognitive social structure** – design where respondents are asked about perceptions of network ties
    - Ex. Fast food restaurant perceptions (P.51)
    - Collects more information than standard sociometric designs as the respondent reports not only on their own ties, but ties belonging to other actors
  - **Experimental** – two ways to collect data
    - Method 1 – select a group of actors, observe their interactions in an experimentally controlled situations, then record interactions between pairs of actors
    - Method 2 – select a group of actors, specify which actors can interact with each other during the experiment, then record interactions between only those specified pairs of actors
    - Ex. Group problem-solving experiments (P.52)
  - **Ego-centered** – respondent is set up as ego with data measured among the ties from the ego to the alters
    - Ex. Survey of “whom you discussed matters important to you” (P.53)
• **Small world** – an attempt to determine how many actors a respondent is removed from a target individual based on acquaintanceship
  o Ex. Six degrees of Kevin Bacon
  o Can be used to compare demographic characteristics and chains
  o *Reverse small world* – focus on ties from a respondent to a variety of hypothetical targets

• **Diary** – respondent keeps a continuous diary/journal/record of whom they interact
  o Variance of ego-centered
  o Data sets frequently include information on the type and characteristics of the alters

2.4.3 **Longitudinal Data Collection**
• Focuses on network change over time using methods previously discussed
  o Commonly used to examine friendships over time
  o Ex. Interaction among fraternity members over time (P.55)

2.4.4 **Measurement Validity, Reliability, Accuracy, Error**
• **True structure** – social structure referring to a relatively prolonged and stable pattern of interpersonal relations

• **Observed pattern** – measured network data that might contain error

**Accuracy**
• Issue of “informant accuracy” – information collected using verbal reports vs. information collected through observation
  o People are not good at accurately reporting on their interactions in particular situations

• Researchers argue true structures of most interest and network studies should focus on long-term patterns, not particular interactions among individuals (Freeman & co.)
  o What people report is more related to long-term interactions than particular instances
  o Issue comes up when looking at interactions among organizations being reported on by members with imperfect information about the organization

**Validity**
• A concept of a measure is *valid* to the extent that it measures what it is intended to measure
  o Is rarely tested rigorously

• **Construct validity** – a more formal construct, arises when measures of a concept behave as expected in theoretical predictions
  o Network construct of social network measures can be studied by examining how these measures behave in a range of theoretical propositions

**Reliability**
• A measure of a variable or concept is *reliable* if repeated measurements give the same estimates of the variable

• Three approaches have been used to assess the reliability of social network data:
  o Test-retest comparison
  o Comparison of alternative question formats
  o Reciprocity of sociometric choices
• “True” value of a variable must be assumed to not change over time for test-retest comparison to be accurate → usually inappropriate in social network analysis as networks change over time
• Can be assessed at different levels of analysis
• Sociometric questions using ratings or full rank orders are more reliable than fixed choice designs (Mouton, et al.)
• Sociometric questions about more intense or intimate relations have higher rates of reciprocation than sociometric questions about less intense or intimate relations (Marsden, et al.)
• Reliability of aggregate measures (ex. popularity) is higher than the reliability of “choices” made by individual actors (Burt, et al.)

Measurement error
• Occurs when there is a discrepancy between the “true” score or value of a concept and the observed (measured) value of that concept
• Measurement error – the difference between the true and observed values
• Levels of analysis must be kept in mind when determining the implications of measurement error
• Very common among fixed choice designs → not everyone will agree on all choices being presented, thus making measurement error an inherent factor

Introduction
- “Fugitive problem” of informant accuracy in reporting past events, behavior, and circumstances
- Theoretical propositions detailed enough to allow us to:
  o Deduce judgments about the validity of proposed operational measures
  o Estimate just how accurate our measurements are to determine reasonable margins of error

Literature Review on Informant Accuracy
- Three substantive areas where informant accuracy has been studied
  o Recall of child care behavior
  o Recall of health seeking behavior
  o Recall of communication and social interactions

Child Care
- Weisner tested accuracy of mothers’ recall of caring for their children
- Recall was inaccurate by about a third to three quarters, usually as a result of underreporting
- Use of trained field observers to judge levels of disagreement between respondents and professionals
- Greater disagreement on levels of activity, less disagreement on roles
  o Is someone taking care of you? (activity)
  o Are you caring for anyone else? (role \rightarrow caretaker)

Health Care
- Cannell and associates
- Comparison of “data obtained from interviews with data obtained from objective records” on pediatric history and other kinds of health behavior
- Underreporting found in interviews, increased as time passed
  o “the best documented phenomenon of underreporting of health events as well as of a wide variety of other types of events and behaviors, is the decrease in the reporting of events as time elapses”

Communications and Social Interactions
- Bernard and company
  o Tested recall of social network or communication contacts through series of seven experiments
  o Concluded that what people say about their communication bears no useful resemblance to their behavior
  o Individual differences in accuracy could not be accounted for by actor attributes
  o “the error is so great that statistical and numerical techniques for washing data collected by recall instruments cannot solve the problem”
- Hyett study of telephone habits
People who made very few calls tended to overreport, those who made a great many calls tended to underreport.

**Some Isolated Studies**
- Young & Young
  - For publicly available information there was both agreement and accuracy
  - For questions where the answers were not public there was very little agreement and high inaccuracy
- Other studies with similar outcomes to Young & Young (P.500-503)
  - Some of interest include drug usage and smoking

**Summary of the Literature**
- On average, about half of what informants report is probably incorrect in some way
- Social scientists are accustomed to low correlations between variables representing different concepts → case is very different
  - Weak relationship between two distinct concepts is to be expected
  - Weak relationship between a concept and the accurate measurement of the concept is unacceptable
- In the absence of either a well-defined theory or a clearly described dependent variable it becomes meaningless to discuss the validity or accuracy of such conceptual variables
  - A well-defined theory is needed to seriously discuss validity and separate our assessment of the validity of the operational measure from the more general question of the validity of the theory itself
  - Difference between theory and methods
- Given that people are telling the truth and practicing deceit in responses, it is hard to imagine how to test the validity of attitudinal or other internal-state responses against anything
- Transforming qualitative measures into quantitative measures in an index, correlation between attitude and behavior increases

**What Can Be Done?**
- Sudman & Bradburn
  - “Memory effects in surveys can be described as a function that is the product of effects due to omissions and telescoping”
  - Events in the past are likely to be recalled as being more recent than they actually are
- **Aided Recall**
- Sudman & co.
  - Idea that memory is subject to systematic distortion due to cultural training
  - Reporting cultural norms rather than dredging up actual events, circumstances, behaviors, or personality traits
- Accepted fact that informants are inaccurate as memory decays exponentially over time
- Ex. Kronenfeld study (P.509)
Chantal Pinard

**Cognitive Structure and Informant Accuracy**  
Linton C. Freeman; A. Kimball Romney; Sue C. Freeman

**Introduction**
Freeman, Romney, and Freeman’s article focuses on the “relationship between what people do and their recollections of those doings” (pg 310). The authors build on prior research undertaken most notably by Bernard, Killworth, and Sailer (BKS) in the 1970’s and 1980’s. The BKS studies resulted in the conclusion that two main errors are often made by informants reporting on interactions with others:

1. Informants forget some of the others  
2. Informants “generate false recalls by claiming to have interacted with others with whom they have not” (pg. 310)

BKS summarizes that these two errors are so common that approximately half of what informants report is incorrect in some way. But is this important? The authors argue that the main concern of social scientists is in the relatively long-term patterns of repeated events and therefore the question is how well data gathered corresponds to long-range patterns of social structure. The authors argue that errors introduced by both forgetting and false recall are “systematically biased” and that when these biases are consistent, recall responses can provide a better index of long-term patterns than single observations.

The authors attempt to defend this argument by recording social acts over an entire school term to provide a solid index of the social structure being examined and by surveying cognitive literature on memory that the authors believe explain the observed pattern of response bias in their data.

**The Study**
Data were collected at an ongoing colloquium series assembled by the Mathematical Social Science Group at UC Irvine. Those attending were primarily students and faculty from the Mathematical Social Science Program, but also students and faculty from other programs.

Over the course of the colloquium attendance patterns were recorded for nine consecutive sessions and the attendance records were used to produce two data sets. The first data set was individual attendance. The individual attendance record demonstrated a pattern of long-term social participation. The second data set consisted of the record of the ninth and final session. The ninth session was designated as the target event about which informants would be questioned.

Five days after the target event 33 people were interviewed. 16 of the 33 people attended two or more sessions but missed the target session and the remaining 17 people were in attendance at the target session.

**Data Results**
65 people attended one or more sessions and there were no errors due to people’s forgetting that they attended the target session or anyone absent falsely claiming to have attended the target
session. There was a .72 correlation between attendance frequency at the nine sessions and presence or absence at the target session and a .85 correlation between attendance frequency and number of times named by informants. If recollection had been perfect 272 people would have been reported as attending the nine sessions total. However, 115 attendances were not reported. On 26 occasions false attendances were also reported. A ratio of 141 errors out of 272 opportunities is 52%, similar to the BKS estimate that “about half of what informants report is incorrect in some way” (Freeman et al. pg 312).

The resulting data displayed inconsistency between the target event and the informants’ recall of the event. However, there was evidence in the data that the informants provided an index of a long-term pattern of participation.

Cognitive Organization and Memory
The authors discussed five general principles dealing with memory that are consistent with the experimental results in memory research that have emerged from contemporary cognitive psychology.

1. Human memory is organized
2. The organization embodied in a mental structure is revealed in free recall
3. The organization of memory is based on experience
4. The tendency of a person to recall an element that occurred in an event depends on two factors:
   a. The amount of elaboration of the person’s mental structure
   b. The degree to which the element is typical in events of the kind being examined
5. The tendency of a person to falsely recall an element that did not actually occur in an event depends on two factors:
   a. The amount of elaboration of the person’s mental structure
   b. The degree to which the element is typical in events of the kind being examined

Cognitive Organization and the Data
Three patterns arose from the data:

1. Many people who attended the designated session of the colloquium were forgotten
2. Some who were absent were falsely recalled
3. The overall tendency of informants who made these errors was to bias their recall in the direction of the long-term attendance patterns

A high number of false recalls suggests that some of the informants had a highly developed mental structure. On the other hand, the high number of attendees forgotten suggests that some of the informants lacked such a highly developed mental structure.

From the data and the authors’ consideration of cognitive organization they developed five hypotheses, which were ultimately supported by an analysis of the data:

1. Informants with more experience should generate more false recalls than informants with less experience.
2. More experienced informants should forget fewer others who did attend the target session.
3. Regular attendees will be seen as typical elements in the setting and consequently, if they were present at the target session, will be less likely to be forgotten by the informants.
4. Regular attendees will be seen as typical elements in the setting and consequently, if they were absent at the target session, will be more likely to be falsely recalled by the informants.
5. In-group informants should display more organization in the lists of targets they remember that out-group informants.

Conclusion
The authors’ results support the BKS finding that people’s recall or memory of the details of a particular event is poor. More importantly, the authors show that recall responses are biased towards the long-term patterns of such events and that pooling the “wisdom” of high-knowledge informants is very useful if researchers desire information on long-term patterns.

It seemed that although we asked the question “Who was there?” the question our informants actually answered was more like “In a typical setting like the one we’re referring to, who is likely to be there?”
Assessing the Political Landscape: Structure, Cognition, and Power in Organizations
David Krackhardt

Introduction
In this study the author attempts to determine how closely each person’s perception of a network is approximate to the “actual” network and how this relates to power. The study ultimately suggests “that power accrues not only to those who occupy central network positions in organizations but also to those who have an accurate perception of the network in which they are embedded… Cognitive accuracy of the informal network is, in and of itself, a base of power” (pg. 343).

Power
Krackhardt includes several types of power in his study but narrows them to two different assessments of power that informants would recognize as “influence bases” in organizations:
   1. The ability to get things done in spite of resistance
   2. The ability to influence people through personal appeal and magnetism (charisma)

Network Assessments
Krackhardt’s study was based on the cognitive social structures for two different types of networks that have proven to be useful in understanding the dynamics of informal organizations:
   1. The advice network
   2. The friendship network

Structural Powers
Krackhardt also takes into consideration factors that operate to give certain actors privilege and power within an organization. The first factor is centrality. Centrality in informal network predicts power (Brass, 1984) and central involvement in social systems increases one’s ability to “see” the social system (Freeman et al).

A second structural power is the formal position a person has in an organization. The more authority a person has the more power and responsibility they have. The more authority a person has the more they are allowed to see a clearer picture of the informal network.

There are both cognitive and structural power bases in organizations. Krackhardt argues that formal and informal structural factors and cognitive accuracy influence power and that “controlling for formal and informal bases of power, cognitive accuracy of the informal network will be correlated with individual power in the organization” (pg. 346). See Figure 1 below.
Krackhardt used a small entrepreneurial firm called Silicon Systems for his study. Silicon Systems was owned by three top managers and all 36 employees worked and saw each other regularly in the single-floored building.

The author asked questions of the employees to assess how powerful and charismatic each employee was in the organization. Krackhardt asked questions relating to reputational measure of power (the ability to get things done and charisma) and cognitive social structure (friendship and advice) and also assigned scores based on the formal position of each employee. The author gave a formal position score of 3 to the three owners, a 2 to the five managers, and a 1 to the remaining 28 employees.

**Centrality**

The three most common measures of centrality are:

1. Degree: the number of links connected to the person
2. Closeness: the inverse of the average path distance between the actor and all others in the network
3. Betweenness: Betweenness is the measure of centrality most closely aligned with the idea of power. It is an indication of the non-redundancy of the source of information.

Krackhardt argues that centrality “is expected to lead to power because it provides an exclusive control of information flow” (pg. 352). Krackhardt uses Freeman’s between index to measure centrality in this study because the person with the best betweenness position in the network will have a more accurate picture of the network as a whole and therefore more power.

**An Overview of Results**

- Charisma and potency had high reliability coefficients showing that there was agreement in the organization on who was influential on each of these dimensions.
- Only centrality in the friendship network is significantly related to power. Advice centrality is not significant in the equation. These findings mean “that any advantage a person has by being central in the routine advice network is attributable to his or her formal position of power in the organization” (pg. 354).

- Formal authority is correlated with reputed power, but the two networks relate in different ways to one’s power base. Centrality in the friendship network is a key factor in reputed power, not centrality in the advice network. However, cognitive accuracy of the advice network “adds a significant amount of explained variance to one’s power reputation” (pg. 356).

- Advice and friendship centrality are strong predictors of power, however, friendship centrality is not strongly correlated with formal power while advice centrality is. Those with advice centrality are also those with higher formal authority.

Conclusion

Krackhart demonstrated that knowledge of a specific network is associated with reputational power in that network “independent of other structural bases of power” (pg. 358). Formal position is significantly related to advice centrality and power. However, formal position does not significantly relate to cognitive accuracy and neither does centrality. This is in opposition to Freeman and Romney’s research.

Krackhardt suggests that one reason for a lack of support for certain parts of his model may be the size of Silicon Systems. Because the organization was small, employees all knew each other and were perhaps relatively more informed of each other’s relationships than might have been the case in a larger organization. It is possible that if the same study were undertaken in a larger organization more aspects of the model would prove true.
Lindsay Coughtry

The Social Structural Basis of the Organization of Persons in Memory

Devon D. Brewer

This study describes the similarities in cognitive structures that individuals within different organizations have when thinking about their organization’s networks. Three communities were studied: 1. A graduate academic program; 2. A Taiwanese-American religious fellowship; and 3. A university’s public affairs department. All members of these networks were asked to list from memory every member of their network. It was found that in most cases, and regardless of the type of organization, the respondents recalled members of the network as they adhered to perceived structure.

Psychologists have used this method with great effect to study semantic cognitive structure, learning how words are related to each other in the mind as they are freely recalled by respondents. This study is one of the first to use this method to understand how people are linked in the mind.

There are three patterns of free recall that have been identified. 1. Adjacently recalled persons are connected by some type of relationship, thus reflecting a cognitive structure within the recaller’s mind. 2. The order in which people are recalled reflects their salience in the mind, the first person thought of likely has much more meaning than the last. 3. How often a person is recalled indicates that person’s salience within the recaller’s mind; even if the frequency is 1, that person is far more salient to the recaller than someone who is not remembered.

As an example: If I were asked to recall everyone in a small three person network made up of Jim, Jack and Jill, and I listed 1. Jack, 2. Jill, but completely forgot about Jim, we could learn something about how this network is organized in my brain. Jack was listed first so he obviously has the most meaning to me within the network. Jill was listed second, which could imply that she has some relationship with Jack for me to link them together. Jim, well, he has little meaning for me within this network and probably little connection with the other two people as well.

The next step is to discern what the overall structure is that is causing me to list these people in a certain way. Did I list Jack first because he is my brother (Kinship)? Because he has cool hair (Individual Characteristics)? Because he is sitting right next to me (Spatial)? Or because his name is alphabetically first? That is what this study aimed to find out.

Study 1: Graduate Academic Program

Fifteen graduate students were asked “Who are all the graduate students in the program?” The results show that people within the same cohort (subject year) were recalled adjacently much more often and with much less time between responses than with people who were from different cohorts.
This graph shows how closely students were listed when the respondents freely recalled them in a list. The number indicates the recalled persons year in the program. Most of the 2\textsuperscript{nd} year students are clumped together on the left, meaning that the respondents generally listed the 2\textsuperscript{nd} years all in one group.

Another finding was that a respondent would recall students in closer cohorts than more distant ones. A 3\textsuperscript{rd} year student would first recall other 3\textsuperscript{rd} students, followed by 4\textsuperscript{th} and 5\textsuperscript{th} year students, and then later on start recalling students from more distant cohorts.

While this study showed that the cohort structure was critical for how the network was organized in memory, it could not show which aspect of the cohort structure was most important; the basic organization of a university setting, or the tendency for social interaction to stay within a cohort.

**Study 2: Tawanese-American Religious Fellowship**

This study asked 25 people within a religious fellowship to recall all persons within the entire fellowship. The results showed that people recalled adjacently were much more likely to be socially close than chance would predict. The adjacency of recalled names could also not be explained by other social structures, such as kinship or gender. In fact, two respondents attempted to list everyone in alphabetical order, yet their response pattern clearly showed a bias for social proximity.

Again, response time was significant when the respondents were listing the members of the organizations. When two adjacently recalled people were highly socially connected, the respondent took very little time between recalling them. When they were not very socially linked, the respondent took much more time between recalling the two people.

As social proximity decreases, inter response time rises.
Finally, the order that persons were recalled by respondents revealed social network influences. Persons socially closer to the respondent were recalled earlier, as were people who are highly visible within the organization.

**Study 3: Department in a Formal Organization**

This third study asked thirteen employees of a public affairs department to recall the names of their coworkers. The result showed that work proximity was the defining structure of recall, those people who worked closely together were often recalled adjacently. Importantly, factors such as status within the organization, spatial locations within the office, and work sections within the department could not account for the clustering of recalled people.

This graph shows how recalled persons are clustered. The circles represent the accepted social proximity between people, so all the circles in the lower right are people who are generally
perceived to work with each other frequently. The linked triangles are those same people as they
were recalled by respondents, the closer the triangles are, the closer they were listed to each other
by the respondents. So those people in the lower right who worked together were also recalled
together.

Once again response time between adjacently recalled people relied on their social proximity,
and the order that people were recalled in was based on proximity to the respondent as well as
social visibility.

Conclusions:

These studies show that the “underlying cognitive structure of persons in a community is based
on the community’s social structure”, and not any other type of structure such as kinship,
physical closeness, or hair color. Also, there are only a few variables that dictate the ‘salience’
of person (how early on they are recalled) which include their social proximity to the respondent,
their status within the social network, or their visibility within the network. Finally, this pattern
of recall was the same among all respondents from all three different types of organizations, and
across time (the third study was repeated after 3 weeks with the same result).

Why does this cognitive structure dominate the way we think about networks? There are at least
two (non-competing) possibilities: 1. Interactions among people are observed and those
associations are committed to memory, thus making them conveniently easy to recall in this type
of study; and 2. Evolutionarily, accurate knowledge of social networks is so important and
advantageous that humans think about each other primarily through the lens of social structure, it
is ingrained in us to think this way.
Accuracy and Reliability of Self-Reported Data in Interorganizational Networks

Michael Calloway, Joseph P. Morrisey, and Robert I Paulson

This paper focuses on interorganizational (IO) studies using network analysis, and the potential problems that such methods of research might hold. In contrast to more traditional survey research where errors and data reliability have been thoroughly explored and accounted for, IO studies run into problems that have yet to be investigated. The authors focus on two issues that researchers using network analysis for IO studies should be aware of; the reliability of responses from respondents within the organizations, and the extent of systematic error in those data.

To understand these problems in the context of actual research, the authors analyzed IO network data collected for an evaluation of a large network of organizations, the Robert Wood Johnson Foundation Program on mental Illness, which included between 31 and 44 organizations that provide mental health support services.

Data were collected through interviews and questionnaires given to targeted members of each organization. The interviews dealt with the individuals specific job and questions about their organization. The questionnaire asked about the relationships between their organization and all other organizations within the community. While not specifically designed to evaluate data reliability and error, the study was large and well-bounded allowing the authors to systematically measure reliability and errors.

Objectively measuring the accuracy of each respondents statement concerning the relationship between organizations is extremely difficult and costly process. Instead, the authors analyzed the reciprocity of relationships between respondents. Two questions from the study were used to analyze the data; 1. To what extent does your agency receive information from this other agency? and 2. How well coordinated are the activities of your agency with those of this other agency? Respondents answered between 0 and 4 where 0 = ‘not at all’ and 4 = ‘a lot’.

Results

The authors took the data from these two questions and ‘dichotemized’ them, basically saying that any response over a 0 (no relationship) becomes a 1 (yes relationship). They then took that information and transposed it and so could compare the reciprocity of stated relationships. In short, they could answer the question of Org. A said they had a relationship with Org. B, did Org. B say they had a relationship with Org. A? If that relationship is usually confirmed then the data is reliable, if it is not then the data is not very reliable.

Reliability

Among the 39 organizations in City 1, there was only a .336 correlation, thus a relatively low number of relationships were reciprocated. In total, correlations for each question were .44 and...
An explanation for these low numbers may be that the questions asked are not as perfectly symmetrical as they are being used here. If someone answered ‘1’ to a question, that might indicate a very weak relationship that is justifiably unreciprocated by the other organization. Yet the authors are using it on a yes or no basis, so it perhaps unfairly results in lower reciprocity.

The authors also point out that there is little basis to compare these numbers with other similar IO network studies. Thus, they repeat the process, only on an organization by organization basis using an ego-centric analysis of each org. to find the actual percentage of agreement.

The overall percentage comes to 70% reciprocity for the information sharing question and 68% for the coordination question. These numbers are comparable with similar ego-centric studies. A study on best friends found confirmed relationships hovered around 75%, while studies on reciprocal relationships among e-mail senders and receivers was just over 50%.

In short, data collected in IO network studies can be considered reliable.
Systematic Error

In order to assess the amount of systematic error in the study the authors correlated the proportion of relationships that were reported as ‘intense’ (were rated a 3 or 4 for the original question) to the proportion of confirmed relationships. The idea is that if there a large number of reportedly intense relationships there should also be a large number of confirmed relationships. If not, there are some serious systemic reporting issues within the data. There are mostly positive correlations here, although only two of them significantly so. City 1 shows a negative correlation under the first question. The authors conclude that there is some systematic error in the data, but they are relatively inconsequential when compared to cognitive network studies.

<table>
<thead>
<tr>
<th>City</th>
<th>Number of organizations</th>
<th>Number of dyads</th>
<th>Information network</th>
<th>Coordination network</th>
</tr>
</thead>
<tbody>
<tr>
<td>City 1</td>
<td>39</td>
<td>1482</td>
<td>-0.105</td>
<td>0.270</td>
</tr>
<tr>
<td>City 2</td>
<td>38</td>
<td>1406</td>
<td>0.341 *</td>
<td>0.237</td>
</tr>
<tr>
<td>City 3</td>
<td>44</td>
<td>1892</td>
<td>0.389 b</td>
<td>0.296</td>
</tr>
<tr>
<td>City 4</td>
<td>31</td>
<td>930</td>
<td>0.238</td>
<td>0.243</td>
</tr>
</tbody>
</table>

* significant at 0.05;  
 b significant at 0.01.

Conclusion

This study counters two major concerns that have cropped up over the use of IO network research. Because some studies have shown that people are unable to recall contacts accurately, there is a suspicion that the subjective nature of these studies would lead to data quality problems. The other concern is that as more intense relationship lead to more accurate data, research in this field would have large amounts of systematic error.

The authors expressed optimism that these results show that despite being a relatively new way of studying large organizational networks, the data collected is not unreliable and prone to errors as some might suspect.
Filling in the Blanks: A Theory of Cognitive Categories and the Structure of Social Affiliation
by: Linton C. Freeman

Affiliation- refers to stable interpersonal relationships that involve both frequent interaction and positive sentiment.

The author’s focus in the paper is how the actors recall their affiliation as well as those who are around them. While the author suggests that accuracy of these affiliations are pretty accurate there is a cognitive structure formed on their affiliation not present in the world of experience. The author wants to look at how this cognitive structure is imposed.

I. The Accuracy of Reports on Social Affiliation

Affiliation involves both interaction and sentiment. In order to measure affiliation without relying on reports, it is measured through the correspondence between reported affiliation and interaction even though data on interaction can be biased at times (Marsden and Campbell).

The author brings up a few studies referenced earlier to show the importance of the study of interaction on reports of affiliation and the difference between specific interaction recall and interaction pattern recall. They first bring up the studies of BKS and the other Freeman reading. These findings showed the lack of specific interaction recall due to bias. The Freeman study did show that enduring patterns however can be recalled accurately and quite easily. To follow this up Cairns et al (1985) and Freeman et al (1988-89) both expand these studies and find that there is a close correspondence between interaction patterns that were observed and their subjects’ perceptions. But how do the do so?

II. How People See Social Affiliation

Earlier work done by those such as Barnett (1932) and others have suggested that human experiences or perceptions are indeed grouped by design or a schema. Objects or events that seem to belong together are grouped by humans into a category while others are grouped into differing categories. Categories are built on characteristics the object or experience has.

While most studies to this date in categorization have discussed non-human objects, Freeman argues that Affiliation is indeed categorized as well. The constant discussion between people about “their group” implies the existence of categories when it comes to affiliation. There is also studies including the previously noted Cairns et al. which show that people do indeed categorizes people using various methods such as who hangs out with whom which was the center of the Cairns et al study.

An experiment by DeSoto (1960) even further proves this category pattern. When subjects were asked to examine and learn social structures of who like whom. They were fastest in learning when the relation was symmetric and transitive, the exact kind of relation that produces
categories. Cognitive psychology also pushes this idea further stating that not only are there
groups, but there are sub groups of grouping within the structure otherwise known as
“taxonomic”.

The author points out that there is little doubt that people categorize themselves but in a different
study done by Freeman it shows that the patterns used to organize into groups don’t allow for
direct categorization. So how can this be done?

III. Cognitive Categorization of Messy data

In a study done in 1957 Campbell anticipated the author’s question. Campbell argued the clusters
formed by humans are poorly formed and thus can’t be the result of any simple mechanism.
According to the author the answer to this is people respond to the patterning they perceive in the
external world. At the same time however the recognize and simplify that patterning. So while
they reflect real world regularities, they are often exaggerated. For example a Robin for most
people may work be a better example of the category bird than a penguin would.

But how do humans actually fudge the data to simplify it?

IV. A Theory of Cognitive Construction of Affiliate Groups

An assumption here is made that the patterns are largely visible to all those who are concerned,
thus everyone at one point will have the opportunity to view the pattern in an unbiased method.
The issue is how do observers connect the dots with regards to who is indeed interacting and
who isn’t with regard to frequencies when there is a questionable connection? In Freeman’s
experiment that he does based on Desoto’s findings he realizes that people simply add in the
missing link if it seems like people might have interacted. Rather than assuming it hasn’t people
assume it has because it probably was just simply overlooked. The best way to see this is through
figure 3 on page 9 (125)
As we can see lines are created by assuming an interactions have been made thus forming a relation. So while categories may not be entirely based on independent observation, they are based on interaction. Because of this people in the same community should be able to provide similar affiliation images. The only ones who may differ would be those who are part of the community fare less than the average person within the community.
The Boundry Specification Problem In Network Analysis by: Edward O. Laumann, Peter V. Mardsen & David Prensky

The ideals and methods that belong to the theme of “network analysis” have grown rapidly over recent time.

Network analysis is important because it is a device that allows “sociologists to escape from the aggregate psychology characteristic of much survey analysis and move to the study of social relations and their consequences for individual and group behavior. A second importance revolves around anthropology and as a way to discover the interaction-based group memberships of actors (i.e. political, religious and economic subgroups).

The goal of network analysis is “to explain, at least in part, the behavior of network elements…. and of the system as a whole by appeal to specific features of the interconnections among the elements”. It allows for an integration of various levels of analysis features of a specific network looking at effects of a collective group on individual behavior or vice versa.

The authors discuss the focus of their study: the problem of specifying system boundaries. When selecting boundaries, omissions or carelessness in decisions can cause misleading results if key actors or events are left out. Which actors do we include to the analysis as well as what types or relationships are the biggest questions. More so than survey analysis

There are two main approaches when it comes to investigators establishing network boundaries, 

Realist and Nominalist.

Realist Approach

1. Adopts the presumed vantage point of the actors themselves in determining boundaries. All about how the actor perceives things with regards to membership and boundaries.
2. Referred to by Beraitewaite as a “phenominalist conception of facts”

Nominalist Approach

1. Analyst constructs his own a conceptual framework self consciously to serve for his own analytical purpose
2. No assumption that reality itself will conform to the analysts distinction

Definitional Foci for the Inclusion of Actors

Focus on one or more of three sets of components: Actors, Relations or Activities…these also can combine to form multiple foci producing a fourth set
Actors

1. May be persons, corporate actors or other collective entities or groupings that are treated as unique elements
2. Using a restriction based on some attribute or characteristic of the actor in the network
3. Two approaches to determining inclusion of actors
   a. Positional- refers to presence or absence of some attribute, most commonly being the occupancy of a position in a formal group
   b. Reputational approach- Uses judgments of knowledgeable informants in delimiting participant actors

Relations

1. Including actors participating in a social relationship of a specified type. An example of this would be measured by frequency type.
2. Includes procedure known as “snowball sampling”
3. Used infrequently

Activities

- Basically just referring to an event which could help selecting the actors and boundaries

Multiple Foci

- Any combination of two foci

The Illustrative Boundary Specification Strategies

(See table on next page)

In conclusion the author states that there is no sense in which social networks must naturally correspond to social systems. The authors choose to use the Nominalist view when it comes to defining a social system, “a plurality of actors interacting on the basis of a shard symbol system.” The main issue is where the standard of common relevance is found to put the boundary at that point. The strategies and theories laid out in this article help to present a guide for us to find the proper boundary.
A typology of boundary specification strategies for delimiting actors within a network, with example

<table>
<thead>
<tr>
<th>Definitional Focus for Delimitation</th>
<th>Attributes of Nodes</th>
<th>Relation</th>
<th>Participation in event or activity</th>
<th>Multiple Foci</th>
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<tbody>
<tr>
<td>Meta-Theoretical Perspective</td>
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<tr>
<td>Realist</td>
<td>I.  Corporate group (Weber, 1947)</td>
<td>III.</td>
<td>Multiple Foci</td>
<td>VII. Klasse fur sich (Marx)</td>
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<td></td>
<td>- Bank wiring room (Roethlisberger and Dickson, 1939)</td>
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<td>community (Barth, 1975; Laumann, 1973; Yancey, Ericksen and Juliani, 1976)</td>
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<td>- Monastery (Sampson, 1964)</td>
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<td>- high school (Coleman, 1961; Fararo and Sunshine, 1964)</td>
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<td>- Norwegian Island Parish (Barnes, 1954)</td>
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<td>- cell room of electrozinc Plant (Kapferer, 1969)</td>
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<td>- high school (Davies, 1970)</td>
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<td>V.  Participants in a community controversy (Dahl, 1961)</td>
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<td>VII. Klasse fur sich (Marx)</td>
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<td>II. Klasse fur sich (Marx)</td>
<td>IV.</td>
<td>Small world problem (Travers and Milgram, 1969; Erickson, 1978)</td>
<td>VI. Invisible College (Crane, 1972; Burt, 1978b; Breiger 1976)</td>
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<td>VI. Invisible College (Crane, 1972; Burt, 1978b; Breiger 1976)</td>
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<td>- Supporters of psychotherapy (Kadushin, 1966)</td>
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<td>- National elite circles (Moore, 1979)</td>
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