Social Network Analysis (SNA) Demonstration

Innovations in Collaborative Modeling – Track 2

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Department of Psychology
Michigan State University
SNA is not synonymous with:

Networking
SNA is not synonymous with:

The study of online networks
But SNA can be used to study...

The effects of networking on relationships
But SNA can be used to study...

The effects of networking on relationships

The characteristics of online networks
SNA is actually much broader...

“Social network analysis is neither a theory nor a methodology. Rather, it is a perspective or a paradigm” (Marin & Wellman, 2010)

– Focuses on characterizing systems by examining the pattern of relationships between a set of actors
SNA is actually much broader...

“Social network analysis is neither a theory nor a methodology. Rather, it is a perspective or a paradigm” (Marin & Wellman, 2010)

– Focuses on characterizing systems by examining the pattern of relationships between a set of actors
Actors

Referred to as *nodes* in SNA

Multiple levels of analysis

- People
Actors

Referred to as nodes in SNA

Multiple levels of analysis

- People

- Organizations
Systems

Setting where the actors reside

– Organizations, schools, classrooms
Systems

Setting where the actors reside

– Organizations, schools, classrooms

– Or larger systems like coalitions, communities
Relationships

Referred to as **edges** in SNA

Actors can be connected in many ways

- People by (a) friendship, (b) advice, (c) trust
Relationships

Referred to as *edges* in SNA

Actors can be connected in many ways

- People by (a) friendship, (b) advice, (c) trust

- Organizations by (a) resource sharing, (b) info exchange, (c) referrals
General Principles  (Wellman, 1988)

Relationships over attributes

Common to explain social phenomenon using analyses of attributes

**Economic Disparities:** Women earn less than men in the same profession.

But, attributes are proxies for structural relationships
General Principles  (Wellman, 1988)

Relationships over attributes
Common to explain social phenomenon using analyses of attributes

**Economic Disparities:** Women earn less than men in the same profession.

But, attributes are proxies for structural relationships

**Network Explanation:** Women go to different people for instrumental and expressive support in the workplace, limiting strong relationships that are important for promotions  (Ibarra, 1992)
General Principles (Wellman, 1988)

Dyads exist in a larger relational context
Focusing on dyads only misses important pieces of the relational structure that guide individual behavior
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Focusing on dyads only misses important pieces of the relational structure that guide individual behavior.

Any pair of actors is a dyad

Actors A and B appear unrelated ....
General Principles  (Wellman, 1988)

Dyads exist in a larger relational context
Focusing on dyads only misses important pieces of the relational structure that guide individual behavior

....but actually they have a mutual friend that connects them
General Principles  (Wellman, 1988)

Networks, not groups

Focus is on relationships within and across groups rather than discrete group membership
General Principles  (Wellman, 1988)

Networks, not groups
Focus is on relationships within and across groups rather than discrete group membership

Most studies focus on discrete groups like service providers who work for the same organizations.....
General Principles (Wellman, 1988)

Networks, not groups
Focus is on relationships within and across groups rather than discrete group membership

...but important ties like service referrals may cut across groups
Data Collection – Bounding & Sample

Specify a population boundary

- Naturally Occurring
  - A Classroom
  - A geographic area

- Attribute
  - Psychology professors
  - Homeless Service Organizations

All actors in population included in SNA
Data Collection – Relationships

Relationships can be measured in multiple scales:

– **Binary**: The relationship is present (1) or absent (0)

– **Ordinal**: The relationship is strong (2), weak (1), or absent (0)

– **Interval**: The relationship has a specific value (e.g., Number of emails between people)
Data Collection – Relationships

Relationships can be measured as:

**Symmetric**: Two actors are simply linked by a relationship (e.g., Jerry and Elaine are friends)

Jerry --- Elaine

**Directional**: One actor sends or receives a relationship to/from another (e.g., Jerry reports to Elaine)

Jerry → Elaine
Data Collection – Methods (Marsden, 1990)

Questionnaires & Interviews

Most common sources of network data

- Actors’ report of presence or absence of ties
- Informants used when actors are orgs

Format considerations (Wasserman & Faust, 1994)

- Roster vs. Free Recall
- Free vs. Fixed Choice
- Binary, Ratings, or Rankings
Data Collection – Methods (Marsden, 1990)

Questionnaires & Interviews

Please circle the names of all the people you hang out with often:

<table>
<thead>
<tr>
<th>Aaron</th>
<th>Elaine</th>
<th>Isobel</th>
<th>Nancy</th>
<th>Sasha</th>
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<tr>
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<td>Emilio</td>
<td>Jerry</td>
<td>Norman</td>
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Data Collection – Methods (Provan et al., 2005)

Questionnaires & Interviews

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<thead>
<tr>
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<th>Types of links (Check ✓ the box if you have this link)</th>
<th>Relationship quality (Please circle)</th>
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<tr>
<td></td>
<td>Shared information</td>
<td>Shared resources</td>
</tr>
<tr>
<td>Agency A</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Agency B</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Agency C</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>etc.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Other organizations: (please list and respond as above)</td>
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1 2 3 4
## Data Collection – Methods

(Provan et al., 2005)

### Questionnaires & Interviews

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<td></td>
</tr>
<tr>
<td></td>
<td>Referrals sent</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Referrals received</td>
<td></td>
</tr>
<tr>
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<td>✓</td>
<td></td>
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Data Collection – Methods (Marsden, 1990)

Observations

– Used in small settings where actors have face to face interactions

– Benefits
  • Measures actual interactions
  • Does not require verbal responses

– Drawbacks
  • Time & resource intensive
  • Not always feasible
Data Collection – Methods (Marsden, 1990)

Archival Records

– Network data are obtained from records
  • Newspapers
  • Board meeting minutes
  • Email logs

– Benefits
  • Low budget
  • Can be used to study historical networks

– Drawbacks
  • Measures are often indirect proxies
Data Collection – Ethics

Confidentiality: Network data cannot be anonymous.
  – Limit access to identifiable data
  – Destroy identifiers as soon as possible

Secondary Participation: Non-respondents can still be named by others.

Providing Feedback: Easy to compromise confidentiality and feedback can be misused.
# Representing Network Data

## Matrix

<table>
<thead>
<tr>
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<th>Elaine</th>
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<th>Kramer</th>
</tr>
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<tbody>
<tr>
<td>Jerry</td>
<td>--</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Elaine</td>
<td>1</td>
<td>--</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
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## Sociogram
Representing Network Data

**Matrix**

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<td>--</td>
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<td>--</td>
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<td>--</td>
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<tr>
<td>Kramer</td>
<td>1</td>
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Each circle is an actor in the network
# Representing Network Data

## Matrix

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Each line represents a relationship between two actors.
SNA Demonstration  
(Kornbluh & Neal, in press)

Promoting Academic Success Project (PAS)  
– Intervention Goals

• To increase academic achievement among minority boys
SNA Demonstration (Kornbluh & Neal, in press)

Promoting Academic Success Project (PAS)

– Intervention Goals

• To increase academic achievement among minority boys

• “Lead teachers” selected by principals to encourage attendance at PD sessions and intervention use
SNA Demonstration (Kornbluh & Neal, in press)
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System
- An elementary school implementing PAS
SNA Demonstration  
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System
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Actors
- All regular and special ed teachers
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Relationships
- Advice on (a) family involvement, (b) behavior management, (c) instruction, & (d) promoting positive relationships.

Behavior management advice
SNA Demonstration  (Kornbluh & Neal, in press)

Data Collection
– 10 to 15 minute structured interviews

4a. Please name the teachers in your school from whom you might seek advice around managing the behavior of minority boys. [PROBE: Is there anyone else?]

<table>
<thead>
<tr>
<th>Name</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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Questions that SNA can help answer:

– What are the implications of teachers’ existing advice networks for the spread of PAS strategies?

– Are the lead teachers optimally situated in the network to be able to spread PAS strategies?
SNA Demonstration (Kornbluh & Neal, in press)

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Multiplexity

- Do actors share multiple types of ties?

- In this study: Do teachers tend to go to the same peers for different types of advice?
Teachers tend to get advice from different people depending on the type of information they are seeking.

Only 32% of relationships present in the behavior management network were also present in the involving families network.
### SNA Demonstration

(Kornbluh & Neal, in press)

#### Multiplexity

<table>
<thead>
<tr>
<th>Advice Relationship</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Instruction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Family</td>
<td>.33</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Positive Relationships</td>
<td>.42</td>
<td>.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Behavior</td>
<td>.39</td>
<td>.32</td>
<td>.39</td>
<td></td>
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Implication: May need “specialized” lead teachers based on content of advice.

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Centrality

– How many relationships does an actor have in a network?

– For directed networks:
  • Indegree-How many ties does an actor receive?
  • Outdegree-How many ties does an actor send?

– Normed as a percentage of all possible ties in the network
SNA Demonstration (Kornbluh & Neal, in press)

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Behavior Management Advice

Lead teachers 4 & 8: Gave advice to 10.53% of peers & 5.26% of peers
Behavior Management Advice

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Alternate teachers 20 & 26 gave:
advice to 21.05% and 42.11% of their colleagues
Behavior Management Advice

Bottom Line: The principal’s selected lead teachers may not be the ideal lead teachers for spreading info about PAS.
SNA Demonstration (Kornbluh & Neal, in press)

SNA can provide a “birds eye” view of social systems

– This view eludes individual community members or leaders

– Can be used an alternative method for identifying leaders/key informants in a setting

– Can help identify how relational structure might facilitate or hinder communication
Exercise

Think of a social network that you might be interested in exploring in your own work.

**Who are the actors?**
- Are they people or organizations?
- How would you set the boundaries of your network?

**What relationships would you explore?**
- What scale of measurement is most appropriate?
- Are the relationships symmetric or directional?

**How would you collect the data?**
Questions?

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Analysis for the SNA demo is described in: