

Social Network Analysis: Concepts and Potential



- ◆ An overview of Social Network Analysis - SNA;
- ◆ Knowledge, networks and relationships;
- ◆ Notes on how SNA was developed;
- ◆ SNA what for?
- ◆ Working with relational data;



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An Overview of Social Network Analysis - SNA



“They say you are not you except in terms of (your) relation to other people. If there weren’t any other people there wouldn’t be any you because what you do, which is what you are, only has meaning in relation to other people.”

Robert Penn Warren - *All the King’s Men*



An Overview of Social Network Analysis - SNA



Questions?

- How does information flow in social organizations?
- With whom does each person effectively collaborate?
- In an organization we organograms, matrix management diagrams, work flow & process diagrams, but there is also an underlying and very effective “sociogram”.
- What is the importance of studying SNA?
 - Sociology;
 - Epidemiology;
 - Business and Administration; and
 - Knowledge management.



An Overview of Social Network Analysis - SNA

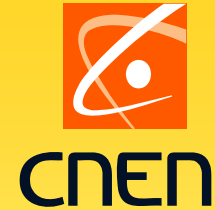


Possible uses for Administration and KM (1/2)

- To understand the natural networks of information flow within the organization, which means:
 - Who are the greatest / best receptors (and / or active searchers);
 - Who are the greatest / best disseminators (emitters);
 - Who are very active in both roles (receptors & emitters)
 - Who are those that communicate only inside the boundary of their small units; and
 - Who are those that communicate beyond the boundary of their units and even outside of the organization.

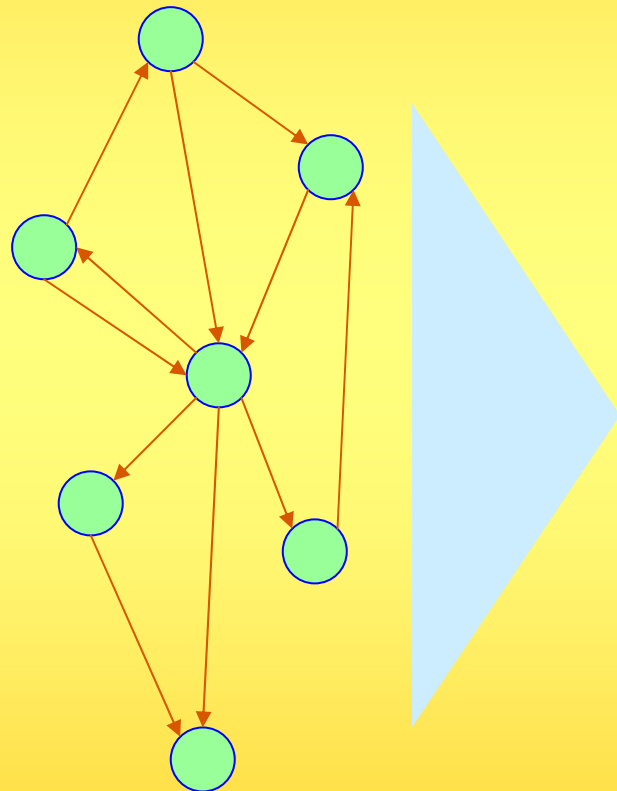


An Overview of Social Network Analysis - SNA



- Possible uses for Administration and KM (2/2)
 - To run a diagnostic of the organization potential to share knowledge, to create communities of practice, etc;
 - To find who are those with natural ability to lead projects, task forces, interdepartmental teams, etc;
 - To help in the planning of integration and team building activities;
 - To know where (with whom) to collect information to understand the repercussion of policies and management actions;
 - To provide means to improve productivity; and
 - To understand how to increase organizational flexibility and to reduce the vulnerability to people loss.

An Overview of Social Network Analysis - SNA



What is SNA?

It is a set of a methods and tools to mapping and studying the network of relationships among people, teams, groups, units within and among social organizations. It is particularly effective to evaluate the flow of information and knowledge through communication and collaboration.



An Overview of Social Network Analysis - SNA



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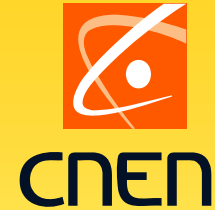
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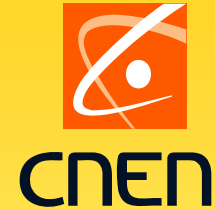
Knowledge, Networks and Relationships



- Our interest
 - The affinity of KM with the methods, techniques and approaches of social sciences;
 - It is apparent that most of the methods used in KM came from the so called “soft sciences”, usually with a good complement of statistics and mathematics in order to get some quantifiable indicators;
 - Tacit knowledge socialization is a process that can only be channeled through social networks of trusted relations;
 - Modern organizations are becoming more and more similar to complex adaptive systems and management in such systems involves more of influencing, inspiring, instilling, leading than of controlling and ordering, therefore to know and to nourish a health “sociogram” can help you more than just to rely in a *official organogram*.



Knowledge, Networks and Relationships



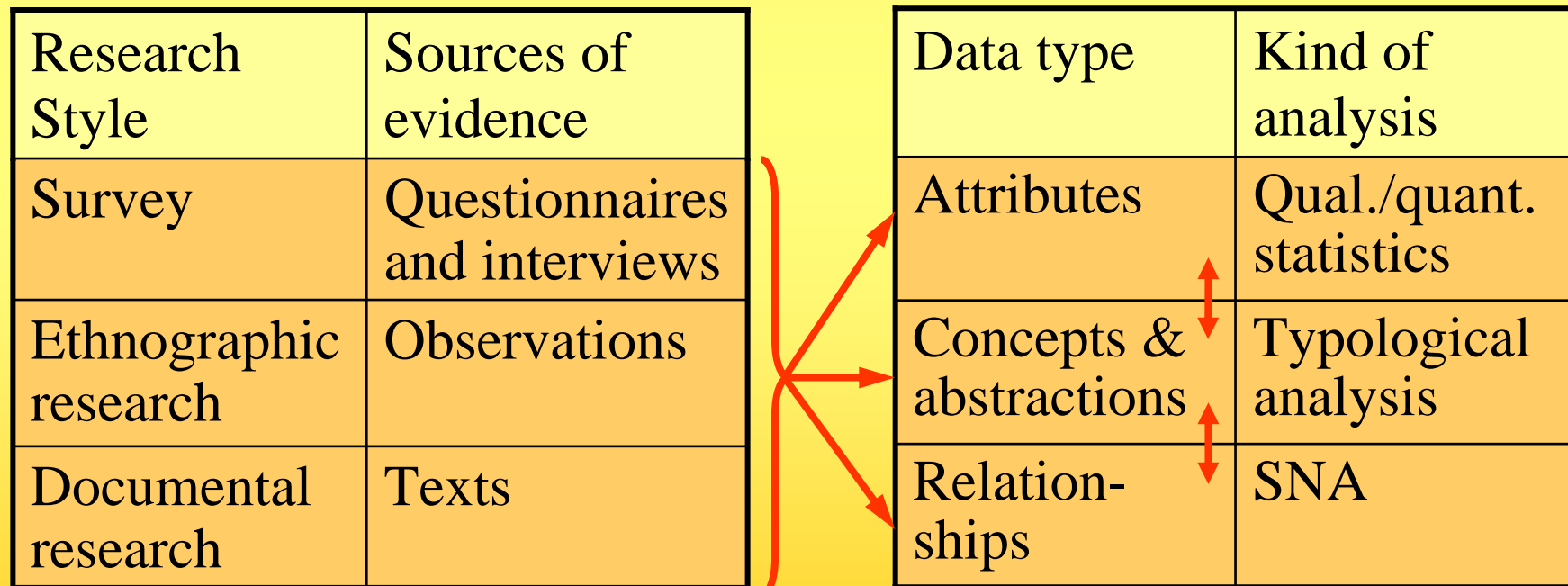
- The complexity of evidences in natural and social sciences
 - **Natural sciences:** (usually) based on evidences (data of measured variables) with well defined and universal meaning and, almost always, directly measurable through methods and instruments with known accuracy and precision;
 - **Social sciences:** based on data that characterize: (a) attributes of the agents (aptitudes, opinions, behavior and intrinsic characteristics); (b) relationships between the agents (contacts, links, friendship, transactions, clusters, etc.); and (c) concepts and abstractions (meanings, motives, intentions, definitions e typifications). Data whose measurement is subject to a good deal of semantic subjectiveness.



Knowledge, Networks and Relationships



Social systems data types and possible forms of analysis





Knowledge, Networks and Relationships



More on data types



- **Attribute data:**

Attributes are expressed as values of variables, such as: income, occupation, education, opinion about something, etc. They are collected through interviews, questionnaires and other means. There is a plethora of statistical methods that are appropriated to treat such variables.

- **Relational data:**

They serve to characterize the relationships among agents, such as: contacts, ties, connections, etc. For such data, methods of SNA are the most appropriate.

- **Data about concepts and abstractions:**

Data that can describe meanings, motives, concepts e abstractions. Techniques to treat this type of data are not well developed. Perhaps, typological analysis of Weber (*Economy & society* 1920) seems to be the most prominent.



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Notes on How SNA Was Developed



But first a bit more of insight on SNA

- **It encompasses:**

Theories, models and applications that serve to express and to study relational concepts and processes. The principal elements of network theories are the relationships that are defined by the links (ties) among the actors (social entities) of social structure of interest.

- **Important characteristics:**

Actors and their actions are seen as interdependent, not as autonomous units;

Links are channels for transferring (flow) of resources (tangible or not);

The environment supplied by the network structure is seen as provider of both opportunities or barriers for individual actions;

Network models provide conceptual abstractions of the enduring pattern of relationships among the actors, which were coined by the social, (economic, political, cultural, organizational) environment in which they live.



Notes on How SNA Was Developed - the beginning (1/3)



▪ Gestalt tradition from psychology:

organized patterns, through which thought and perceptions are structured:

- *holos* or systems with distinct properties from those of its parts and that actually determine the nature of the parts;
- Individual perception of objects is coined inside the complex and organized conceptual scheme of the human mind;
- Such schemes are influenced by the group organization and its respective social environment


▪ Important authors:

Kurt Lewin, Jacob Moreno e Fritz Heider (Alemanha => EUA):



Notes on How SNA Was Developed - the beginning (2/3)



- **Contribuições: gestalt => sociometry => field theory => group dynamic** 
 - **Lewin** – MIT (then Michigan), has created the Center for Social Perception and Group Structure. He has stated that group behavior is determined by the field of social forces in which it is immersed. Also the environment is not independent, because what matters is how each group member perceives it. He has encouraged the use of topology and set theory. He has proposed the use of field theory to explore the interaction within the group and of the group with its environment. This line has later evolved to the general systems theory.
 - **Moreno** – has used psychotherapeutic methods to study the structure of friendship choices. He has noticed that the relationship pattern of each person in a group is both an enabler and limiter of his/her actions and, as a consequence, of his/her psycho-social development. He was the inventor of the “sociogram” to represent the properties of social configurations and also the founder of “Sociometry” journal. Earlier others have talked about web, social tissue and networks, but no one has tried to systematize this metaphor in an analytical diagram.
 - **Heider** – “Attitudes and perceptions” – he has articulated the analysis of how the various attitudes of a person towards the other are brought to a situation of balance. He has postulated that psychological balance depends on attitudes which are not contradictory one with the others.



Notes on How SNA Was Developed - the beginning (3/3)



▪ More contributions:

- Cartwright e Harary – they have used graphs to explain group behavior. This has allow to migrate form the cognitive balance within the mind of each individual (Heider) to the interpersonal balance within social groups. This theoretical framework made possible to analyze, in a systematical way, the interdependency among the attitudes of different individuals in a group. Under this framework, interesting concepts have emerged and existing ones could then be modeled like group cohesion, social pressure, power and leadership. Each participant of an unbalanced network is submitted to a discomfort and will try to dissolve the tension to which he/she is subject to. Group relations undergo a dynamic flow whose final result, if attained, is the resultant of actions and compromises of all the involved participants.
- Rapoport – he has proposed the use of sociometric ideas in large scale to develop a predictive epidemiological model of contagious applied to the transmission of ideas and innovations (using network concepts).



Notes on How SNA Was Developed – the Evolution (1/6)



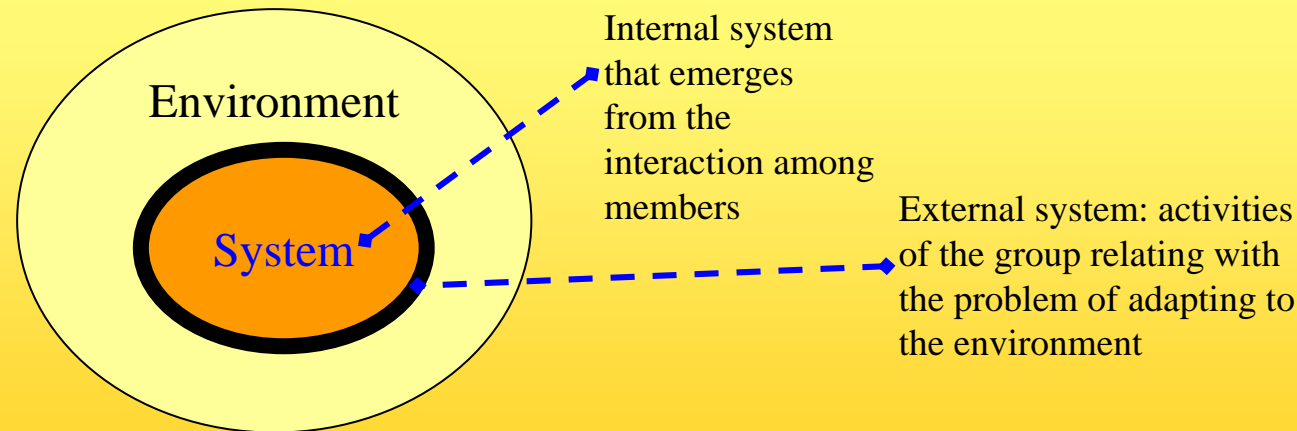
▪ Interpersonal configurations, cliques and clusters e blocks

- Radcliffe-Brown e Durkheim– (structural and functional anthropology) “large systems contain very cohesive subsystems that are highly influential (*cliques, clusters or blocks*) and analysis techniques should develop means to uncover these group structures”.
- Mayo e Warner – a combination of individual motivation and Pareto’s ideas about the non rational components of action in the theory of the elites. Mayo has observed that a management elite that has recognized the influence of group relations in the economic motivation could more successfully control worker behavior. An emblematic case: The studies in the Hawthorne site of Western Electric Company, where managers tried to find the influence of work conditions (heating, illumination, rest periods, etc.) in worker’s efficiency and they have observed that, paradoxically, efficiency increased irrespectively of the of changes. Sociograms were constructed to show the structure of the informal relations in the work group and to make an anthropological analysis. Warner in the study of “Yankee city” in New England has emphasized factors like stability, cohesion and integration in the structuring of communities. Venn diagrams were used to show intersection between cliques and matrices were used to show clique composition according to social classes (*positional analysis*).

Notes on How SNA Was Developed – the Evolution (2/6)

▪ Interpersonal configurations, cliques and clusters e blocks

- Colleagues of Warner – Cliques: (a) core – those members that more frequently and more intensively are present those that participate in the events; (b) primary circle – those that participate together with the core in some events but never as group in itself; and (c) secondary circle – just eventual participation, ie almost if they were not members.
- Homans – a pretentious and profound synthesis. He has worked with data tables, checking on people and events to which they attend, using matrices, he made rearrangements looking for logical pattern that would represent group preferences. Matrices with patterns of the cliques/grups/blocks => sistem's internal configuration.





Notes on How SNA Was Developed – the Evolution (3/6)



- **Total and parcial networks (Barnes, Nadel, Mitchell, Bott e Gluckman)**
 - Gluckman – culture and power are elements that are present in any social structure and they are equally important to the maintain as well as to the transform it. His understanding of structures is that they are network of relationships to be studied with network analysis and sociologic concepts.
 - Nadel – has focus separately on form and content. General characteristics of the structures can be described and studied with mathematics. Global system is the result of the interweaving of relationships, where implicit interactions in one sector can determine those that are happening in others. He has emphasized roles and role sets.



Notes on How SNA Was Developed – the Evolution (4/6)



- **Networks: total & partial (Barnes, Nadel, Mitchell, Bott e Gluckman) (cont.)**
 - Mitchell (following on Nadel) has focused on the sphere of interpersonal relations;
 - Identify different types of action that are combined in a variety of manners to form networks of interactions:
 - communication actions – that transfer information establishing social norms and the creation of a “certain” consensus; and
 - propositive or instrumental actions that transfer goods or services.
 - Total network = society => the whole set links that is always changing, growing and extending its links beyond any community and organization.
 - Research should focus on selected aspects of the total network, i e, partial networks such as:
 - Egocentric networks of all natures; and
 - Global characteristics of networks with respect to some social aspect such as: political connections, kinship, friendship, work relations, etc.
 - **Focus & indicators: quality of relations (reciprocity, intensity, durability); density, completeness, connectiveness, contactibility; cliques and clusters**



Notes on How SNA Was Developed – the Evolution (5/6)



- **New things from Harvard ... White, Granovetter, Lee, Wellman e Berkowitz**
 - SNA – as a method of structural analysis
 - Algebraic models using set theory dos to model kinship according to Lévi-Strauss ... Block modeling;
 - Multidimensional scaling – treating relations as social distances.
 - The famous paper of Granovetter ... “Getting a Job”
=> the “strength of weak connections”



Notes on How SNA Was Developed – the Evolution (6/6)



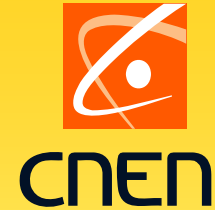
The fact is that in the last years a large apparatus of mathematical methods and computational tools were developed for SNA.

The analysts have at their disposal a a large variety of concepts, indicators and analysis techniques to help them to grasp insight and to interpret the behavior of social structures.

Matrix methods can allow the perception of patterns and graphs can show them in a easy to convey their meaning to others.



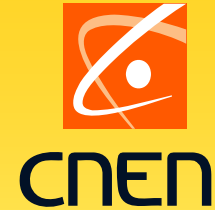
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SNA What For?



- ◆ Think about the knowledge problems of your organization and list a few issues for which SNA can help?
- ◆ How would you actually apply it?
- ◆ What else do you need to know to “just do it”



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Working with Relational Data - just starting



Observing a group of working colleagues, for a period of a few months, Mr Bean has constructed the following table. What can you extract from this simple table?

		Social Events										
		1	2	3	4	5	6	7	8	9	10	11
Persons	Fred	x			x				x		x	
	Claudia			x			x					x
	Ingrid		x			x		x		x		
	Joanne			x			x					x
	Bob	x			x				x		x	
	John		x			x		x		x		
	Charles	x			x			x	x		x	
	Anne			x			x					x
	Pauline		x			x		x		x		
	Skip	x			x					x		x



Working with Relational Data - just starting

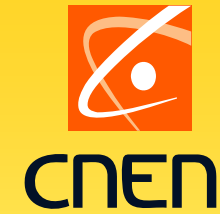


If some matrix manipulation is done, sense making becomes easier, then one can see: 3 different cliques (subgroups), each one very dense in itself and unconnected except for one element from the third clique that apparently has a weak connection with the second one.

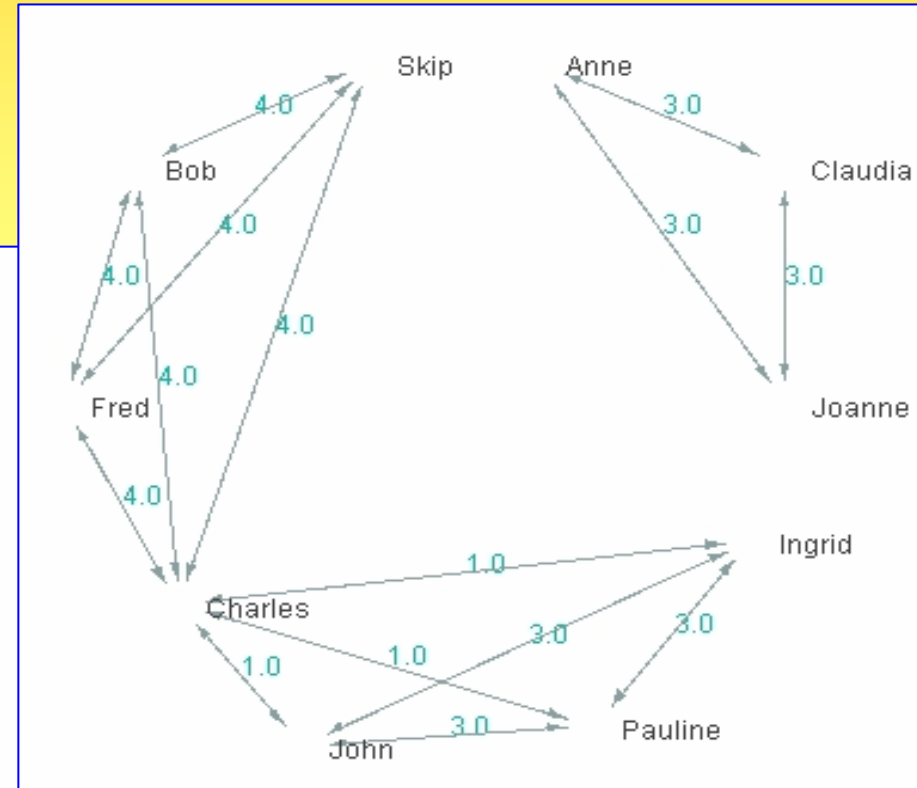
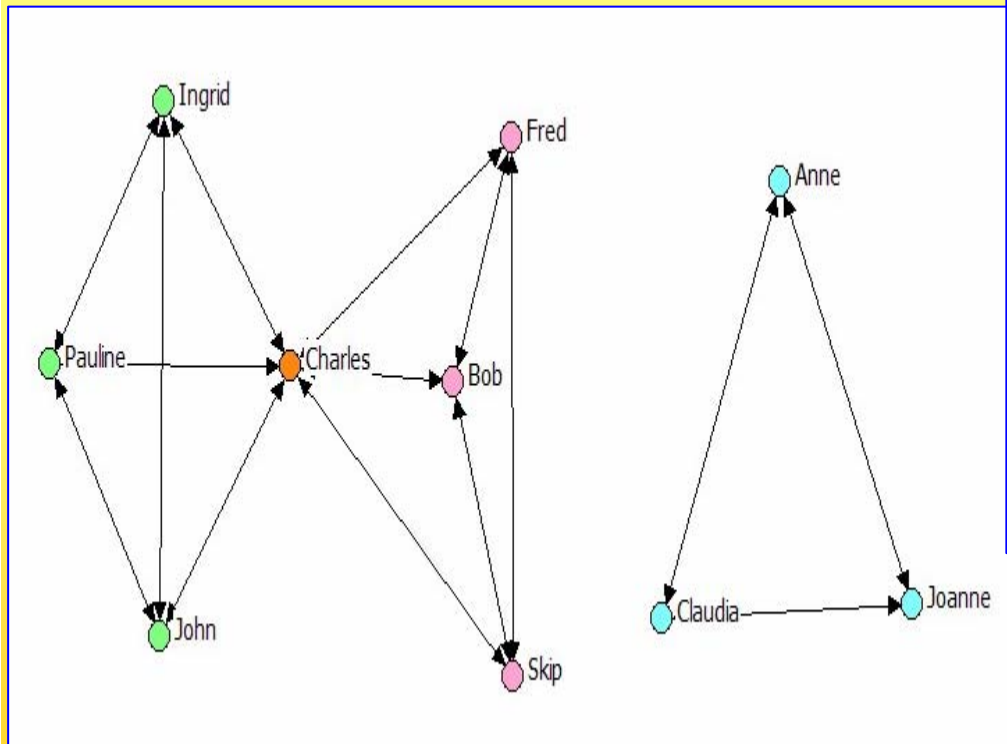
		Social events										
		A	B	C	D	E	F	G	H	I	J	K
Persons	Anne	x	x	x								
	Claudia	x	x	x								
	Joanne	x	x	x								
	Ingrid				x	x	x	x				
	Pauline				x	x	x	x				
	John				x	x	x	x				
	Charles							x	x	x	x	x
	Fred								x	x	x	x
	Bob								x	x	x	x
	Skip								x	x	x	x



Working with Relational Data - just starting



... and the resulting network can be represented by "sociograms".





Working with Relational Data - just starting



... or by a socio-matrix, also called adjacency matrix

	Anne	Claudia	Joanne	Ingrid	Pauline	John	Charles	Fred	Bob	Skip
Anne	0	3	3	0	0	0	0	0	0	0
Claudia	3	0	3	0	0	0	0	0	0	0
Joanne	3	3	0	0	0	0	0	0	0	0
Ingrid	0	0	0	0	3	3	1	0	0	0
Pauline	0	0	0	3	0	3	1	0	0	0
John	0	0	0	3	3	0	1	0	0	0
Charles	0	0	0	1	1	1	0	4	4	4
Fred	0	0	0	0	0	0	4	0	4	4
Bob	0	0	0	0	0	0	4	4	0	4
Skip	0	0	0	0	0	0	4	4	4	0