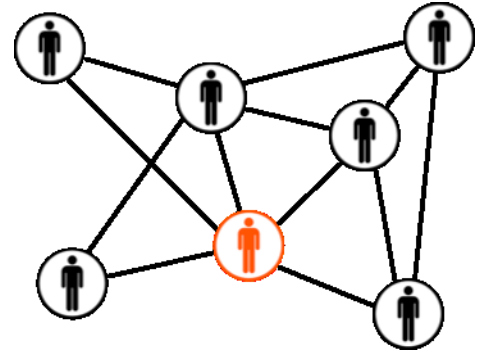


Social Network Analysis



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Introduction

- A strategy for investigating social structures through the use of networks and graph theory
- A process centered on social relations where individuals are linked to one another by invisible nodes or bonds in function of the relation they have together.

Definition of SNA



Community mapping is done by defining relationships between individuals and groups. The main goal of social network analysis is to highlight network components in groups in order to describe how associations are built, in-between individuals. Social network analysis points key individuals and main processes.

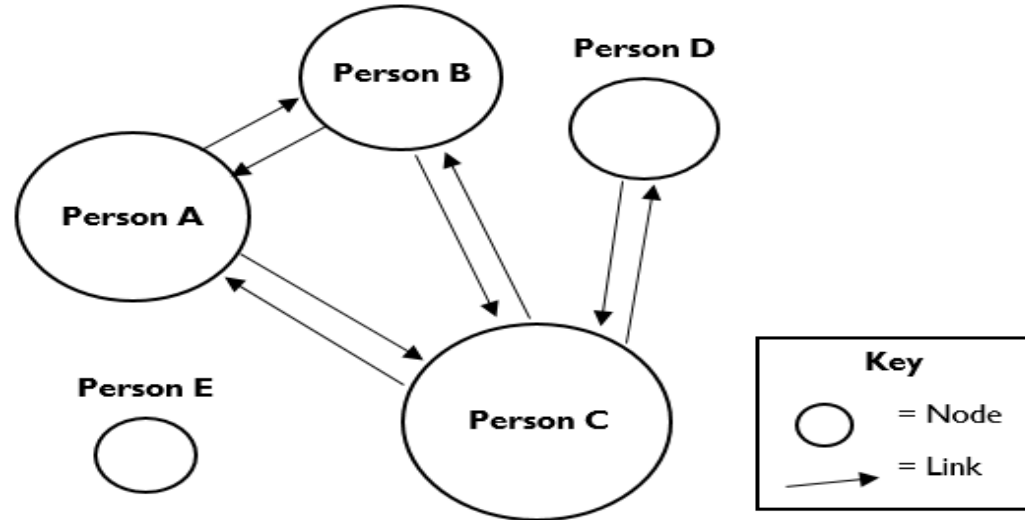
A network is simply a number of points (or 'nodes') that are connected by links. In social network analysis, generally, nodes and links represent social connection between friends, family members, colleges, etc.

Benefits of SNA, What is it good for?

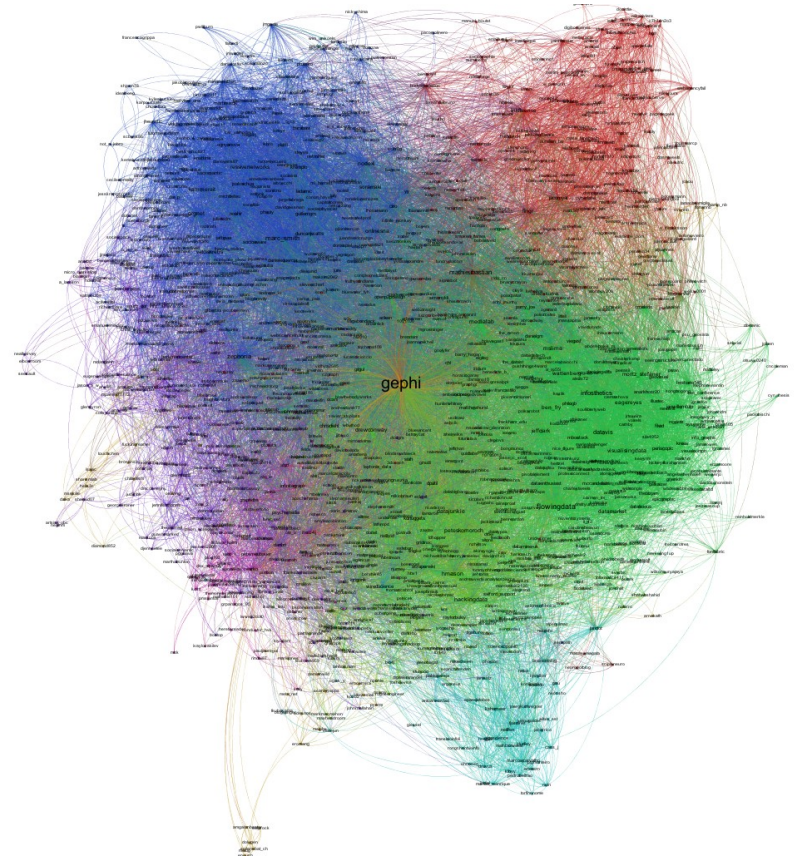
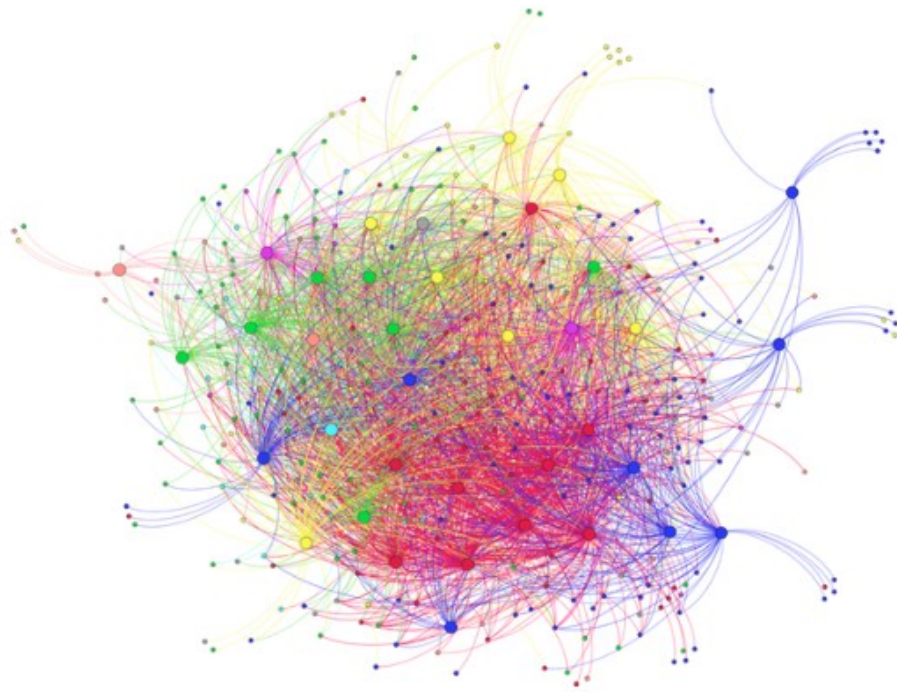
- Historical evidence has shown that SNA helps with the understanding of the work environment and Flow of information.
- It pictures how the social structure fluctuates through the time.
- It is a powerful tool that has formulated quantitative measures to qualitative approaches.(the gathered data helps to measure human behaviours)
- Many softwares have been developed such as PAJEK, GEPHI and UCINET.



Example of SNA



In the sample social network diagram above, each person is a node and each connection between people is a link. Both the absence and presence of links between nodes signify a relationship that can be measured using SNA.



How is it composed

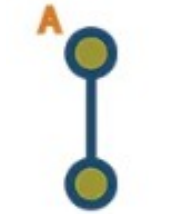
Density

Potential Connections:

$$PC = \frac{n * (n-1)}{2}$$

Network Density:

$$\frac{\text{Actual Connections}}{\text{Potential Connections}}$$



Nodes (n): 2

Potential Connections: 1 (2*1/2)

Actual Connections: 1

Network Density: 100% (1/1)



Nodes (n): 3

Potential Connections: 3 (3*2/2)

Actual Connections: 3

Network Density: 100% (3/3)



Nodes (n): 3

Potential Connections: 3 (3*2/2)

Actual Connections: 2

Network Density: 66.7% (2/3)

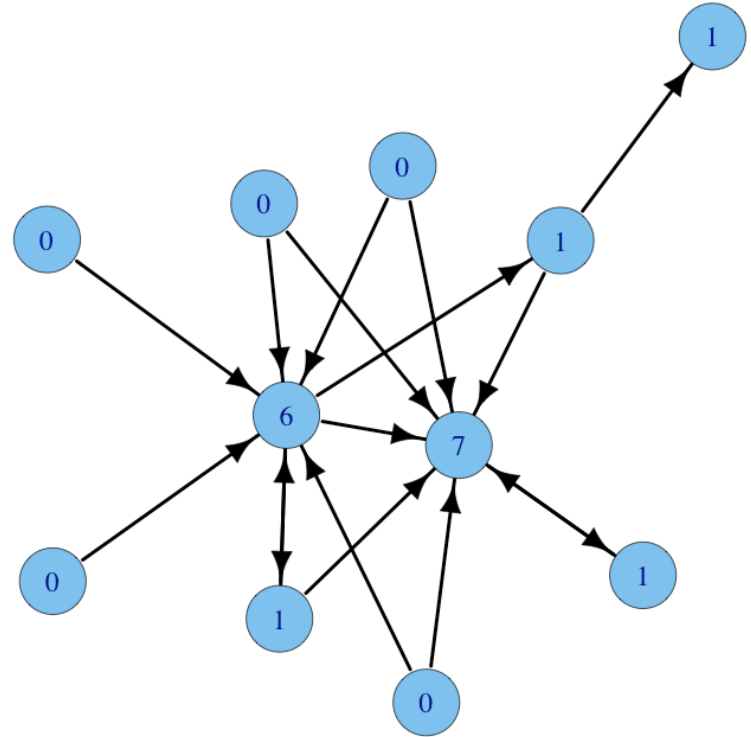
How is it composed

Degree Centrality

$$d(i) = \sum_j m_{ij}$$

$m_{ij} = 1$ if there is a link
between nodes i and j

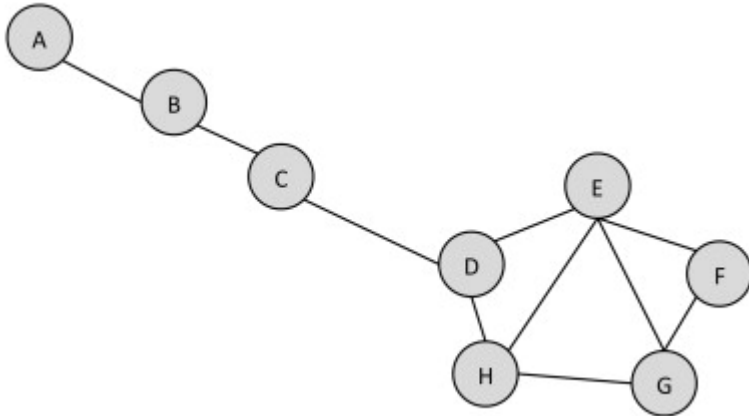
$m_{ij} = 0$ if there is no such link



How is it composed

Closeness Centrality

Consider the graph below



Node	Shortest Path from D
A	3 (D-C-B-A)
B	2
C	1
E	1
F	2
G	2
H	1

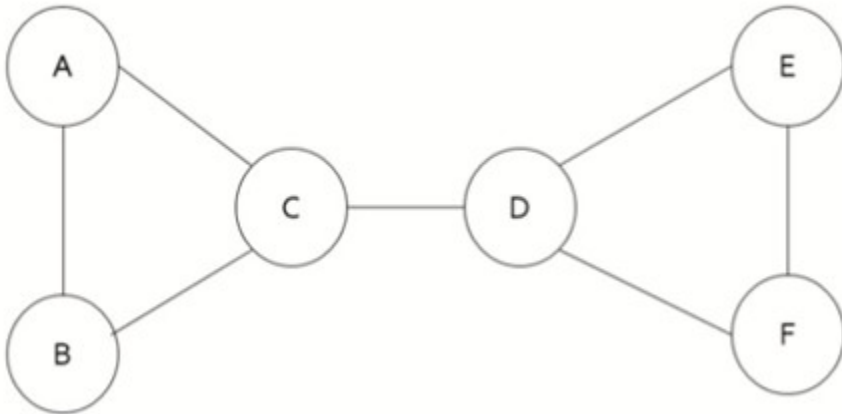
The average of those shortest path lengths is:
 $(3+2+1+1+2+2+1) \div 7 = 12 \div 7 = 1.71$.

We divide by 7 because there are seven other nodes.

How is it composed

Betweenness Centrality

Calculate the between centrality for the node C

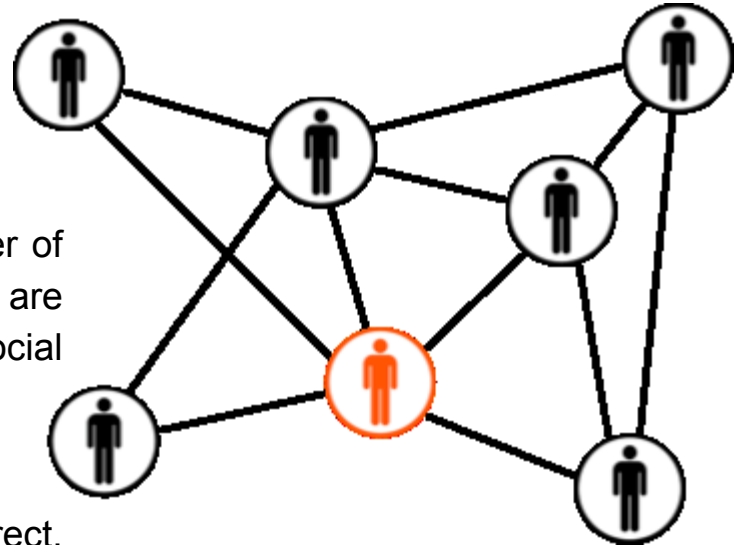


	σ_{uw}	$\sigma_{uw}(v)$	$\sigma_{uw}(v) / \sigma_{uw}$
(A,B)	1	0	0
(A,D)	1	1	1
(A,E)	1	1	1
(A,F)	1	1	1
(B,D)	1	1	1
(B,E)	1	1	1
(B,F)	1	1	1
(D,E)	1	0	0
(D,F)	1	0	0
(E,F)	1	0	0

Results of SNA

SNA is generating diagrams that are showing to the user of the software the relationships between individuals that are contained in the data. Data could be criminal links, social links, potential feuds, etc.

SNA is based on intelligence data, which might be incorrect, incomplete or untimely. Thus, SNA is usefully considered in combination with other sources of information, and operational experience.





Conclusion

SNA is a powerful tool for creating better work environment

SNA depends on a various amount of variables and it has to be under development all the time

SNA guarantee constant growth of work environment because it is constantly changing and developing

SNA is in a strong correlation with information from operational experience

