

# A Concept Analysis of Social Networks

Baidyanath Biswas\*

## Abstract

*Social Networks are omnipresent in our daily lives and connect the actors in all spheres, including politics, financial markets, knowledge, relationships, and even hobbies. However, the overarching presence of specific software-enabled Online Social Networks has led to an insular view about them. In this article, we track the origins of social networks, through toy examples, in an attempt to philosophically generalize the realm of social networks. Next, we study their evolution through the examination of theoretical, empirical, and analytical motivations. Next, we visualize a social network from publicly available data on the choice of dining-table partners in a dormitory. Finally, we conclude our article with a caveat on the generalizability of the concept of social networks.*

## Introduction

Social Networks can be seen as the relationships among different actor(s) in the context of a possible area of activity such as trade, financial exchange, procurement, politics, markets, friendship, recreation, beliefs, and knowledge (Moreno, 1934). Historically speaking, social networks had existed since the primitive ages when humans had just begun to build settlements and started living as a community. According to the Greek philosopher Aristotle, *man is by nature a social animal*; and society is something that precedes the individual human being (Arendt, 1958). One might find it astonishing to know that the concept of social networks, such as the idea of information and knowledge

sharing across the community members, did exist since the early days of civilization. And all of these online applications that we see today such as Facebook, Twitter, Orkut, Myspace and YouTube among others, are merely their digitized formats. In the early 1st century B.C. in Rome, the famous statesman, Cicero began exchanging of political information through letters and documents, when appointed the Governor of a Roman Province near Turkey. He carefully allowed the interchanging of letters among his fellow statesmen and members of Roman elite families who were interconnected through marital ties (Standage, 2013). Let us now take the example of a forest ecosystem, where every organism, be it the small algae or the mighty

---

\*Assistant Professor, International Management Institute Kolkata

lion, is a part of the many invisible ties that bind the animals together in the daily cycle of food-chain and survival. In day-to-day life, we are awestruck by the cab services provided by Uber and Ola who are digitally transforming the taxi services of urban areas in India. In actuality, they are nothing but tech-enablers who are extracting the business value from the implicit and existent network of taxi cab drivers, and surprisingly we have been using them for decades. Therefore, apart from the very obvious “social networks” that we see around us, it has gradually become so profound that we are using technology to harness the invisible web of social networks that has always existed around us.

### Origin of Social Networks

The term social network was first coined by the British anthropologist J. A. Barnes (Barnes, 1954) in his classic study of the inhabitants of Bremnes, a small parish island in Western Norway. He studied the social structure of the villages in Bremnes and identified the relationships among each other. These connections were significant because Barnes noted that the socio-economic conditions of the entire island of Bremnes were dependent on them. Sometimes, the economic system would operate as it was a single entity. He also identified the *social community*, as the group of individuals in a specific society who talked among themselves, did business together, and attended church masses in similar groups. Such observations

were highly contextual to the study he conducted. Barnes also identified three kinds of social interactions at Bremnes, namely, *territory-based, industry-based and friendship-based*. While the former two types were naturally derived, it was this third type that inspired Barnes to examine more closely and finally coin the term *social networks*. For example, in other European countries such as the United Kingdom, the residents staying in the houses on a particular street did not talk to each other because they did not consider themselves equal in social status, and occupation. In contrast, due to the concept of Norwegian equality, the villagers at Bremnes considered themselves of almost identical status even though all of them did not belong to the same social status. Hence, the bond between these persons who recognized each other as *social equals* approximately aggregated to form an invisible *social class* or the *social network*.

### Can We Call Our Family Be Mapped as a Social Network?

The network of our familial relations that include father, mother, siblings, spouse, and children is an individual's social network that s/he has inherited. If we attempt to trace the ancient history of human race, we observe that the aggregation of families led to tribes and the combination of tribes led to the modern-day nations. Therefore, a typical family can work as a sample social network. If we add the list of our relatives on all sides of the family, the

modest social network now looks bigger.

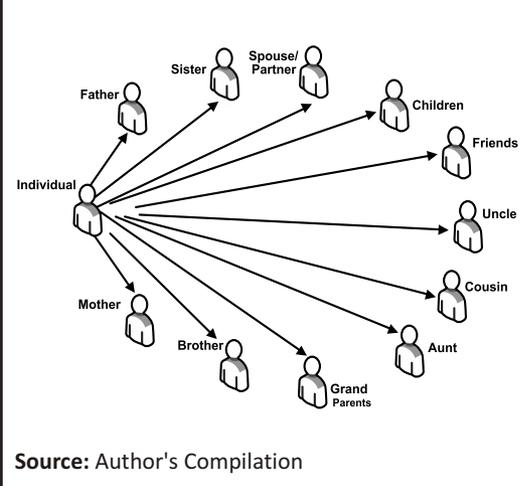
Figure 1 illustrates the social ties of an individual such as father, mother, siblings, grandparents, spouse/partner, children, cousins, uncles, aunts and friends. We have purposefully omitted the inter-relationships among these actors in Figure 1. We also realize that if the individual does not maintain relations with one or more member(s), the stability of the social network does not hold good for him/her. Therefore, a social network does not keep well, if there exists no interplay of relationships among the participating actor(s).

### The Distinctiveness of Social Network Theory

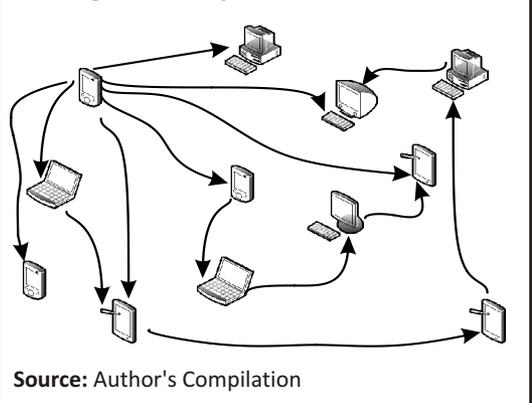
Social network theory helps researchers to look into a particular problem in a fundamentally different way than the

conventional lens of problem-solving. Traditional perspective of social sciences often does not consider the relationships among entities during analysis while social network analysis (SNA) does (Granovetter 1983). The distinctiveness of such a network with pre-defined social perspectives accounts for the *strength of weak ties* among two or more individuals in the society. Past research shows that some popular and effective SNA methodologies include, path analysis, empirical observations, qualitative surveys, and interviews, that were undertaken to realize these ties. These SNA techniques have philosophically helped researchers to identify and analyze the actual experiences by the subjects of an experiment. For example, strong relationships exist among the relatives and close friends, whereas weak and insignificant relationships exist among acquaintances and friends of friends.

**Figure 1. – An Elementary Social Network of an Individual With A Network of Familial Ties**



**Figure 2. – A Modern-Day Social Network Showing The Relationships Among Individuals Through The Computer and Mobile Devices**



**An Evolutionary Shift of Social Networks**

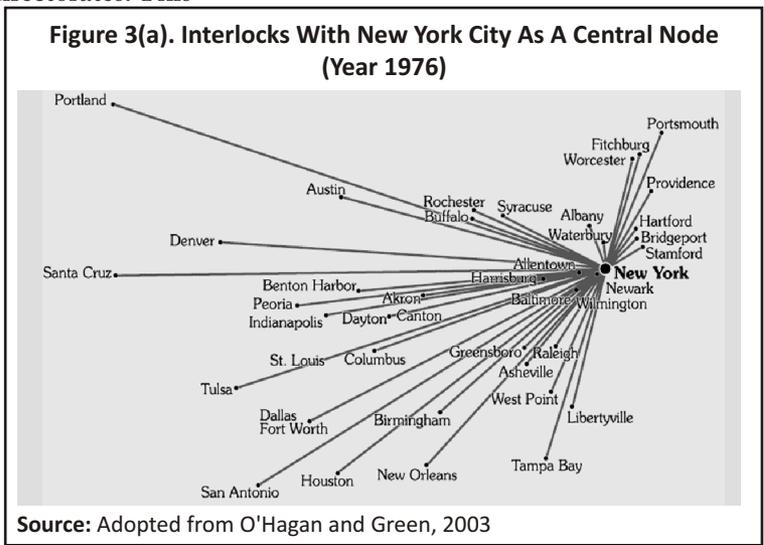
As research advanced, the idea of Social Networks has evolved since its coinage. Social scientists have drawn inspiration from the fields of Computer Science (i.e., Graph Theoretical models), apart from sociology and psychology. The application of SNA Theory has significantly evolved into the technological aspects, and thus it can be said that the boundary of the SNA concept has confined itself into a *niche* application area today (Figure. 2). In comparison with Figure 1, this technology-based network seems to exist among inanimate machines and devices. But the crux of SNA theory and philosophy lies in the fact that the *social network* is embedded in the society, its participating actor(s) and not in the machines (Freeman, 2004).

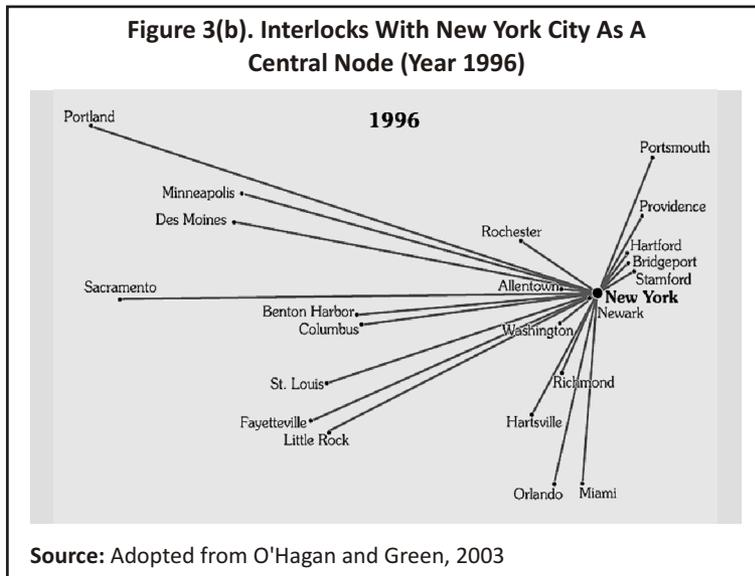
Past research has also identified the presence of social networks among business firms, such as the cases of interlocking directorates. This phenomenon was revealed in a study involving the mining corporations of South Africa, namely, De Beers, Rand Mines, Goldfields, Premier, and Chartered Co. The five firms were linked among each other by six board members who were common to each of them (Hobson, 1954). In another study by O'Hagan and Green (2003), the

authors found the existence of a corporate knowledge-transfer network that was connected by interlocking directorates among American corporations. Additionally, there existed a hierarchical pattern among the cities, and New York, the superior among them all, behaved as the central node with international firms and experts. (see Figure 3(a) and 3(b)).

**Evolution of the Social Network Theory**

Social Network Theory evolved from the disciplines of Sociology, Social Psychology and later took elements of graph theory and Computer Sciences. The origin of the subject of Social Networks can be delineated into three significant lines of research according to Scott (1991), namely (i) Social Groups and Structure; (ii) Study of Social Bonds, and (iii) Graph Theoretic Models. In the following sub-sections, we connect each of these dimensions to a theoretical, empirical, and





*The Metropolis and Mental Life* (Simmel, 1903), Simmel hinted towards the problems that an individual could face due to the opposition from society and external culture that could finally outweigh his existential individualism. Anthony Giddens presented the Structuration Theory through his seminal work, *The Constitution of Society* (Giddens, 1984), where he also hinted towards

mathematical motivation and explain them.

### *Theoretical Motivation: Sociological View of Social Groups and Structures*

In the 1890's, Emile Durkheim argued that the social phenomena which occurred in human contexts could no longer be contributed toward the individual actor(s) and perhaps was a socially influenced perspective. This philosophical change prompted a completely non-individualistic approach that Durkheim proposed while explaining the phenomena of SNA. Next, Georg Simmel was fascinated with the different forms of association among these social networks but was not interested with the individual consciousness of the participant in an SNA. He also noted that these associative social structures were organic, had a life of their own, and could affect the natural growth and creativity of an individual. In his seminal work,

*Social Networks*. He identified that social actions were logically responsible for the formation of social structures and did not entirely depend on an individual.

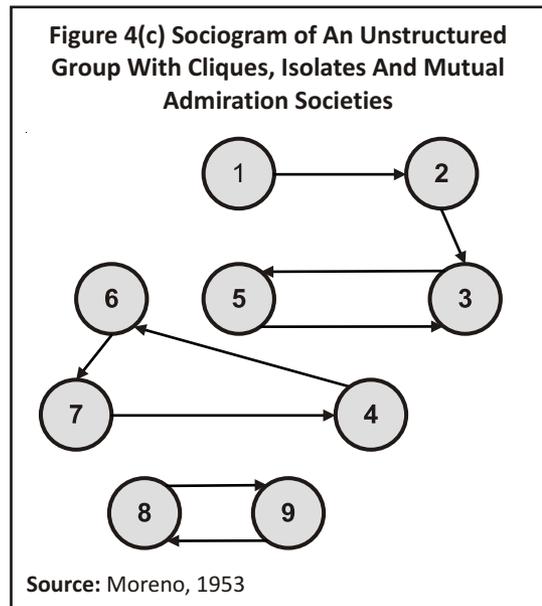
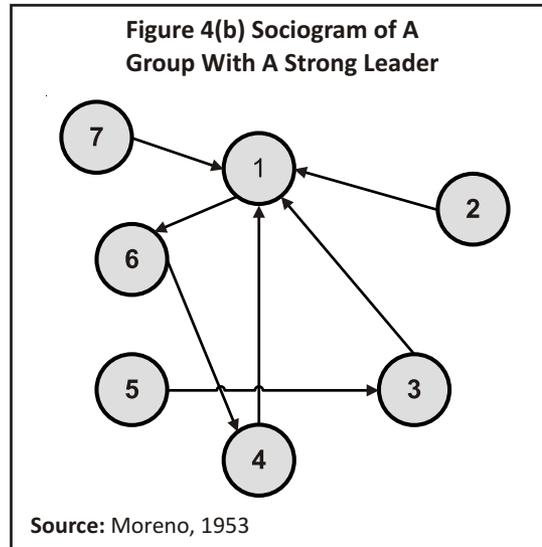
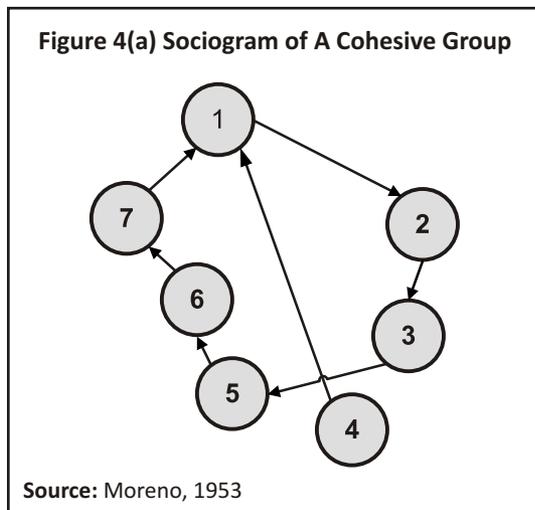
### *Empirical Motivation: Anthropological View and Study of Social Bonds*

In the mid-1950's, British anthropologists found philosophical inspiration for their unexplained empirical studies through a re-examination of social and organizational ties among the actors. They found that the traditional methodologies borrowed from economics, political science and psychology were unable to fully explain the behaviour of individuals in complex societies (Barnes, 1954; Mitchell 1969). Hence, they began to shift their attention to the study of social groups and theorized the concepts of problem-solving at group-level, and the impact of individual structures embedded in them.

Social scientists W. Lloyd Warner and Elton Mayo developed sociograms to analyze social networks. Jacob Moreno designed the famous social graphs during the study of the formation of groups and sub-groups (Moreno, 1953). He termed these artifacts as *sociograms*, and the discipline came to be known as *sociometry*. A *sociogram* aims to graphically represent the group structure between individuals in a two-dimensional space, using the nodes as a person and their relationships as linking lines (see Figure 4(a), 4(b), 4(c).

Van Zelst (1952) identified that at a workplace, employees are expected to work with their buddies at their sides than work with someone imposed by the top management. Later, George Homans unified these theories under a common philosophy and established sociometry as a robust technique for SNA (Homans, 1958).

*Analytical Motivation: Graph-Theoretic*



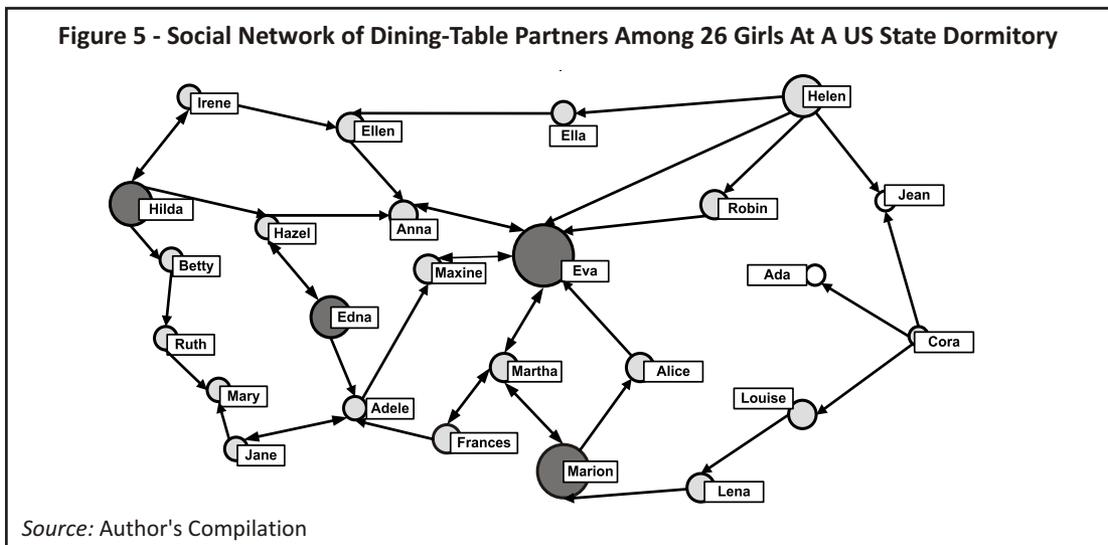
*Models*

Recent applications of Social Network Theory are observed in the areas of online communities and software applications.

Often a graph is used to represent the relationship(s) between the actors in a social network, with the nodes and the edges of the graph denoting the relationship between them. With the help of graph theory, a social community network, the users and their connections (ties) can be algebraically represented in a 2-by-2 format known as the adjacency matrix. The number of links that converge into a node is known as the in-degree, and the number of nodes diverging out is known as the out-degree. Philosophically, this approach has restricted the concepts of Social Network Theory among online users within the purview of Twitter, Facebook, Myspace, YouTube, and many other applications. For example, the Google PageRank algorithm (Page et al., 1999) also employs social network theory to present the desired webpage(s) to the internet users in a fast and efficient manner.

### Experiments with a Social Network

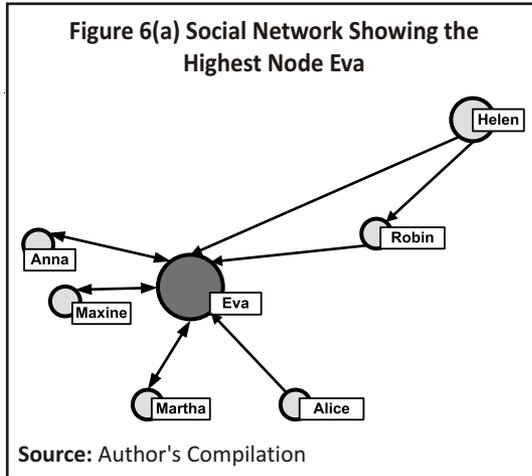
We illustrate the social network of the choice of dining-table partners among 26 girls at a New York State Training School in the 1940's. The data is available from the UC Irvine network data repository (UCI, 2006). The girls are represented by the nodes (or vertices), and the person(s) they would like to sit next (i.e., the first and second choices), are represented by the lines joining them. We used Gephi tool to plot the data in Figure 5 graphically. There are 26 girls (i.e., nodes) and 52 relationships (i.e., edges) in the network. The intensity of the grey colour and size of the node signify the in-degree and out-degree of each node respectively, such that the node (s) with a darker grey (or black) colour and larger diameter, can represent a higher in/out degree. The girl with the highest degree is “Eva” as shown in Figure 6(a) and Marion is the second highest as shown in Figure 6(b).



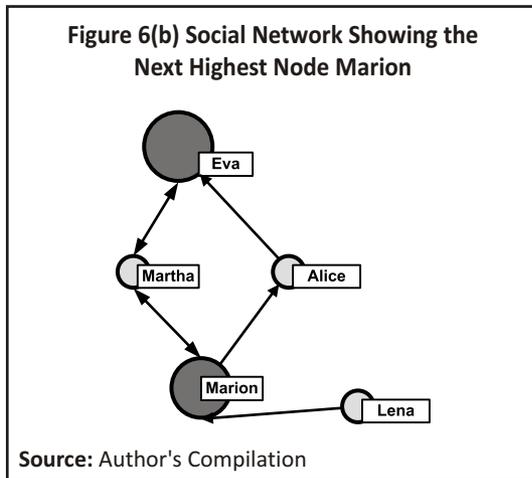
**Novel Applications of Social Networks**

Social network analysis has become a promising technique in marketing, and healthcare, apart from economics, and

SNA has become a novel methodology over traditional survey methods, observation studies, and interviews, which were earlier not scalable, lacked generalizability, and faced missing data problems.



Application of social networks have cut down on physical sales and marketing campaigns, reduced investments, amplified word-of-mouth endorsements, and made products assortments directly accessible to the clients (Harris and Rae, 2009). They have also increased customer engagement, improved transparency among buyers, promoted cross-selling of products, and provided easy and personalized recommendations to current as well as potential buyers. SNA has helped scientists to deal with public health problems and effective policy-making, such as to analyze the spread of obesity in a community (Christakis and Fowler, 2007), adolescent tobacco use (Ennett and Bauman, 1993), drug intake, and spread of diseases during an epidemic. It also helps healthcare organizations to quickly train medical personnel, communicate in the time of crisis, (such as tweets from people stuck during Bihar and Chennai floods, mark myself safe app in Facebook), and improved services through constant feedback from the patients.



psychology especially after the modern internet revolution. Recent advances of the Web 2.0 has enabled scientists to mine social network data, messages, and other media sources to gather insights from users. Thus,

**What are not Social Networks?**

When we have successfully defined the realms of social networks, then we must be able to distinguish them from other entities (i.e., that are not matching the attributes of social networks). For example, when we strike

conversations with our friends, colleagues, and relatives, these do not constitute social networks. Therefore, conversations (including telephonic, verbal and even email exchanges) do not represent social network behaviour. Even though it may seem trivial not to recognize such phenomena as social networks, we must be careful to accept such instances into the scope of SNA discussion. Additionally, we often use the term networking or social networking loosely, when we meet and interact with new people at a social gathering or a conference.

### What are not the only Social Networks?

As we reach towards the end of this study, we must be able to distinguish instances of social networks that we see around us in the day-to-day world and separate the clichés from the more innovative ones. Technology experts also deviate from their original views on SNAs, so much so that they have coined the term SNS (Social Network Services) and PNS (Professional Network Services) to distinctly identify them. For example, Facebook is a typical SNS, whereas LinkedIn can be categorized as a PNS.

Social Network Analysis became a popular field of study and was adopted as a lens to examine social, technological, and economic problems. But at the same time, it should not be confined to the myopic view that only specific online software serves as exemplary social networks. With a keen mind and sharp eye, we can unlock systems with social ties in a

variety of application areas, which can become classical instances in the future.

### References

- Arendt, H. (1958). *The Human Condition*. University of Chicago Press.
- Barnes, J. A. (1954). Class and Committees in a Norwegian Island Parish, *Human Relations*, 7, pp. 39-58.
- Christakis, N. A., & Fowler, J. H. (2007). The spread of obesity in a large social network over 32 years, *New England Journal of Medicine*, 357(4), pp. 370-379.
- Ennett, S. T., & Bauman, K. E. (1993). Peer Group Structure And Adolescent Cigarette Smoking: A Social Network Analysis, *Journal of Health and Social Behavior*, pp. 226-236.
- Freeman, L. (2004). *The Development of Social Network Analysis. A Study in the Sociology of Science*.
- Giddens, A. (1984). *The Constitution of Society: Outline of the Theory of Structuration*. University of California Press.
- Granovetter, M. (1983). The Strength of Weak Ties: A Network Theory Revisited. *Sociological Theory*, 1(1), pp. 201-233.
- Harris, L., & Rae, A. (2009). Social Networks: The Future of Marketing for Small Business, *Journal of Business Strategy*, 30(5), pp. 24-31.
- Hobson, John A. (1954). *The Evolution of Modern Capitalism, A Study of Machine Production*. London, New York: Allen & Unwin, Macmillan.
- Homans, G. C. (1958). Social Behavior as Exchange. *American Journal of Sociology*, 597-606.
- Mitchell, J. C. (Ed.). (1969). *Social Networks in Urban Situations: Analyses of Personal Relationships in Central African Towns*. Manchester University Press.
- Moreno, J. L. (1934). *Who Shall Survive? A New Approach to the Problem of Human Interrelations*.
- Moreno, J. L. (1953). *Who Shall Survive? Foundations of Sociometry, Group Psychotherapy and Socio-Drama*.

O'Hagan, S. B., & Green, M. B. (2004). Corporate Knowledge Transfer Via Interlocking Directorates: A Network Analysis Approach. *Geoforum*, 35(1), pp. 127-139.

Page, L., Brin, S., Motwani, R., & Winograd, T. (1999). *The PageRank Citation Ranking: Bringing Order to the Web*, Stanford University

Scott, J. (2012). *Social Network Analysis*. Sage Publications.

Simmel G. (1903). *The Metropolis and Mental Life*, Oxford and Malden, MA: Wiley-Blackwell

Standage, T. (2014). *Writing on the Wall: Social Media-The First 2,000 Years*. Bloomsbury Publishing, USA.

UC Irvine Network Data Repository (2006), Dining-table partners in a girls dormitory at a New York State training school, Available at: <https://networkdata.ics.uci.edu/netdata/html/diningTablePartners.html>

Van Zelst, R. H., & Kerr, W. A. (1952). A Further Note on Some Correlates of Scientific and Technical Productivity, *The Journal of Abnormal and Social Psychology*, 47(1), pp. 129-138.