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# Social Network Analysis in Strategic Management – Potential and Limitations of Application[1]

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Research on corporate networks can be seen as a modern management imperative resulting from significant determinants of the environment and the development of new business models. The aim of this article is to present the main issues of network research in strategic management in the context of use of social network analysis (SNA). The choice of a theoretical basis for explaining the processes and mechanisms of the network, specification of the type of tested network and the type of relations, as well as determination of the level of network analysis are recognised as the most important problems. In view of the specificity of strategic management, considerations are limited to the examples of a network of companies or a network of main decision-makers, such as members of management or supervisory boards. The analysis focuses on both the opportunities of social network analysis as well as its actual limitations that determine the range of potential research.

**Keywords:** social network analysis, strategic management, corporate network.

# Analiza sieci społecznych w zarządzaniu strategicznym – możliwości i ograniczenia stosowania[1]

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Badania sieci przedsiębiorstw można uznać za współczesny imperatyw zarządzania wynikający z istotnych uwarunkowań otoczenia i rozwoju nowych modeli biznesu. Celem artykułu jest przedstawienie głównych problemów dotyczących badań sieci w zarządzaniu strategicznym w kontekście zastosowania analizy sieci społecznych (SNA – *Social Network Analysis*). Za najważniejsze uznano wybór podstawy teoretycznej wyjaśniającej procesy i mechanizmy sieciowe, określenie typu badanej sieci i rodzaju powiązań oraz wyznaczenie poziomu analizy sieci. Ze względu na specyfikę zarządzania strategicznego rozważania ograniczono do przykładu sieci przedsiębiorstw lub ich głównych decydentów, takich jak członkowie zarządów lub rad nadzorczych. W przeprowadzonej analizie koncentrowano się zarówno na możliwościach analizy sieci społecznej, jak też na jej rzeczywistych ograniczeniach determinujących zakres potencjalnych badań.

**Słowa kluczowe:** analiza sieci społecznych, zarządzanie strategiczne, sieci korporacyjne.

**JEL:** L14

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## 1. Introduction

Research on corporate networks can be seen as a modern management imperative resulting from significant determinants of the environment and the development of new business models. The introduction of an additional level of strategic analysis, i.e. the level of a corporate network, to strategic management is complementary to the preeminent theoretical tradition of the discipline. Network analysis allows for supplementing sectoral analyses (developed based on the theory of industrial economics and the positioning approach of M.E. Porter) and company analyses (explained mainly by the resource-based theory, including also by J. Barney, B. Wernerfelt, and D. Rumelt). Despite a huge interest in networks in management, the network theory is viewed as a relatively young research stream (Czakon, 2012), and its potential for application and limitations are neither expressly determined nor widely known. It is of topical concern how to use the achievements of the social network theory in research tasks in the area of strategic management.

The aim of this article is to present the main issues of network research in strategic management in the context of use of social network analysis[2]. The choice of a theoretical basis for explaining the processes and mechanisms of the network, specification of the type of tested network and the type of relations, as well as determination of the level of network analysis are recognised as the most important problems. In view of the specificity of strategic management, considerations are limited to the examples of a network of companies or a network of main decision-makers, such as members of management or supervisory boards. The analysis focuses on both the opportunities of social network analysis as well as its actual limitations that determine the range of potential research.

## 2. Interdisciplinarity and Complexity of Social Network Analysis

In 1995, G. Salancik stressed that network research is not theoretical since the tools it applies solely analyse data about organisations, without explaining their essence (Salancik, 1995). A similar view was expressed by D. Knoke, who argued that the network approach represents loosely connected concepts, principles, and analysis methods rather than a rigorously deductive system (Knoke, 2001). This thesis was supported by K.G. Provan, A. Fish and J. Sydow (2007). In turn, according to S. Borgatti, D. Brass and D. Halgin (2014), such an assessment is presently unsubstantiated, given the rapid accumulation of experience and knowledge of social networks in recent years. A similar opinion is shared by a number of other authors who eagerly conduct their research using the conceptual apparatus and analysis methods of social network analysis. However, the debate on paradigmacisism of the network approach is still under way and reflects

 DOI 10.7172/1644-9584.64.2

the ambiguous assessment of its potential (e.g. Kilduff, Tsai and Hanke, 2006; Zdziarski, 2016).

Leaving aside the issue of the degree of scientific maturity of the network approach, it is worthwhile focusing on its real achievements. SNA has been developing rapidly for decades thanks to authors from various scientific fields and disciplines, such as sociology, psychology, anthropology, but also mathematics or physics. The modern concept of social network analysis developed in fact as a result of a favourable marriage of social theories with formal mathematical, statistical, and computing methodologies. According to S. Wasserman and K. Faust (1997), both social and mathematical sciences capitalised immensely on this supradisciplinary collaboration among researchers.

The interdisciplinary use of the network approach is a consequence of the fact that both the entities of studied networks (the so-called nodes or actors) and relations linking them (the so-called edges) can apply to any structure. Networked entities can comprise persons, teams of people, firms, regions, states, international organisations, or NGOs, but also articles, websites, games, sporting events, films, concerts, etc. The relations analysed in the network perspective may, in turn, be based on cooperation, conflict, participation in joint ventures, exchange, transactions, communication, etc. The catalogue of research contexts in which network analysis is applicable is expanding incessantly.

The methods of social network analysis developed markedly in the 1970s, relying on the use of matrix analysis methodologies and the graph theory. The approach evolved further over the past several years, entailing the development of methods that allow not only for describing the network but also for drawing conclusions on relationships within these networks and the processes occurring in them (Batorski and Zdziarski, 2009). Mathematicians and physicists who took interest in networks contributed to the development of theoretical models of complex networks and to the introduction of new concepts to social studies (Watts and Strogatz, 1998; Barabási and Bonabeau, 2003).

The notably interdisciplinary nature of the approach, both in terms of the development of the theory, methods, and their applications, does not facilitate a clear analysis and evaluation of the network stream. A characteristic feature of SNA advancement is that network concepts and principles of network analysis are nearly simultaneously and oftentimes independently developed by a number of different researchers from varied disciplines. Accordingly, it is indispensable to confine the discussion to the area of science that is the closest to management, i.e. to social sciences, which embrace a variety of disciplines, from economics to psychology. In this area, social network analysis is founded on a general definition of a network and on relatively uncomplicated assumptions. A network is a set of nodes (e.g. persons, groups, organisations) connected by a set of social relations

(e.g. friendship, transfer of funds, co-membership) of special type (Gulati, 1998; Borgatti and Foster, 2003). The main assumptions concern, however: the occurrence of interdependence between networked actors, the nature of ties that function as channels of transfer or flows of (tangible and intangible) resources, the perception of the network for the entity as a source of opportunities and constraints, as well as the ability to conceptualise (social, economic, political, etc.) structures as durable patterns of relations among actors in the form of network models. The definition of a network and the indicated general assumptions of social network analysis can be complied with by numerous theories derived from different disciplines. That is why it is actually difficult to pinpoint one and only theoretical foundation for social network analysis. The use of SNA in a particular scientific field is conditional upon the fitness of specific network theories to explain and solve its specific problems.

Social network analysis has been more widely introduced to management relatively recently, predominantly due to M. Granovetter and his concept of embeddedness dating back to 1985. As viewed by M. Granovetter, every economic action is inherently embedded in social relations and, therefore, each and every economic exchange is also a social exchange (1985). Initially, SNA was used with respect to interaction between people. Presently, it is believed that its adaptability is much better and can concern highly differing entities forming networks. In recent years, this method has had applications in research on corporate networks in management. Corporate network research found in literature, carried out on the basis of structural analysis, usually deals with selected aspects, including networks resulting from capital ties (Rotundo and D'Arcangelis, 2010), networks of connections among supervisory board members (Zdziarski, 2012), or networks of joint projects (Dimitrios, 2010).

The diversity of networks and ties actually necessitates crucial choices to be made by researchers, including adopting a mainstream theory to follow in designing network research and interpreting results, specifying the type of networks and nodes, establishing the type of ties, determining the type of a general network model on which analyses will base, or determining the level of network analysis. Tab. 1 presents the variants, frequently interdependent, of the above aspects of network research. Subsequent parts of this paper present in more detail the specific decision problems in the context of strategic management.

## 3. Theories in Social Network Analysis in Management

According to S. Borgatti and D. Halgin (2011), it is crucial to distinguish between two types of theories, namely the network theory and the theory of networks, in the discussion on contemporary theories in the context of social networks. The first type of theories focuses on mechanisms and

 DOI 10.7172/1644-9584.64.2

| **Selected decision problems** | **Variants** | |
|---|---|---|
| Mainstream theory | Social capital theory | Strong ties theory (Coleman, 1988) |
| | | Strength of weak ties theory (Granovetter, 1973) |
| | | Embeddedness theory (Granovetter, 1985) |
| | | Structural holes theory (Burt, 1992) |
| | Power and control theory | Structural holes theory (Burt, 1992) |
| | | Power theory (Cook and Emerson, 1978) |
| | | Resource dependence theory (Pfeffer and Salancik, 1978) |
| | Theories of networks, including complex network theories (Watts and Strogatz, 1999; Barabási and Bonabeau, 2003). | |
| Type of network | Coordinated (strategic) network or uncoordinated (business) network | |
| | Open network or closed network | |
| Types of ties | Similarity | |
| | Social relation | |
| | Interactions | |
| | Flows | |
| Level of network | Egocentric network | |
| | Full network | |

*Tab. 1. Selected variants of variables of social network analysis. Source: the author's own work.*

processes which, along with a particular network structure, lead to specific outcomes for individuals and groups. This aspect is closely related to such theoretical foundations as the concepts of strong ties (Coleman, 1988), strong weak ties of M. Granovetter (1973), or structural holes of R. Burt (1992), embedded in the social capital theory. The first concept represents the normative aspect of social capital and points to the possession of multiple strong ties based on trust and social norms as the source of success of an individual. The two other concepts form a structural stream of the theory of social capital, and their attention is turned towards network constraints, which are a consequence of its structure. The structural aspect of social capital constitutes an objective element of the network and responds to the question what members of the network do. Instead, the normative approach refers to feelings, thereby acting as a subjective element of social capital (van Deth, 2003).

The structural concepts of network are of particular interest in the context of social network analysis. The strength of weak ties theory (Granovetter, 1973) differentiates between the so-called strong and weak ties of the individual, seeing a chance particularly in the latter ones. Strong ties are responsible for relations in closed communities (family, friends), but it is

the weak ties that contribute to the success of the individual due to access to new information and resources not accessible in the closed network. R. Burt (1992) expressed a view consistent with this approach, pointing to the limitations of closed networks. R. Burt attributed key importance to structural holes forming loose links that connect different social groups, enabling the flow of information among them.

Based on the above concepts, social network analysis allows for assessing the position of a specific company. The embeddedness of external relationships with other organisations in a network has significant implications for the firm's performance (Gulati, Nohria and Zaheer, 2000). This approach may suggest an association with the concept of assessment of the company's position in a sector, yet, both the objective and methods of such assessment vary fundamentally. The analysis of the company's position in the network is aimed at determining the degree of separation from an advantaged position in the network facilitating access to information resources that are of best quality in terms of access time, diversity and uniqueness versus information obtained by other networked companies. However, as argued above, the concept of advantaged position in the network is not unambiguous. Such position can result from multiple strong ties or from maintaining weak distant ties and a relatively moderate number of strong ties. The first situation ensures confidence of exchange partners and their higher propensity to make specific investments in relationships and lower transaction costs. The second approach protects the company against the danger of being closed in networks of strong ties that lead to restricted access to new, unique information resources. The firm's advantage is, to a large extent, decided by access to unique and rare knowledge resources as compared to the knowledge acquired by other networked entities.

Research results fail to unequivocally resolve as to whether either of these methods of building the company's social capital is superior to the other. The results of sociological studies show that the success of individuals depends on a high level of bridging capital, corresponding to weak ties, and on a relatively average level of bonding capital, represented by strong ties (Sabatini, 2005). Also, some studies on corporate networks indicate that the strength of weak ties approach is more justified (Burt, 2004; McEvily and Zaheer, 1999). However, despite the significance of weak ties, research also points to a direct and positive correlation between the firm's profits and the number of direct links (Haunschild and Beckman, 1998). Firms with a greater number of links, especially in an increasingly uncertain environment, perform better in terms of sales growth and return on equity (ROE) (Nicholson, Alexander and Kiel, 2004). Also, studies point to the mediatory character of position in the network in relation to the impact of innovativeness on the firm's performance (e.g. Zaheer and Bell, 2005).

The strength of weak ties theory is reinforced by the concept of structural holes (Burt, 1992), according to which the advantaged position in

 DOI 10.7172/1644-9584.64.2

a network is taken by the entity which acts as an intermediary between unrelated parties. The entity benefits from filling in the structural hole in a twofold manner: it has access to rare information (not accessible to all) and has the ability to control the flow of such information within the network. The concept of structural holes and strong weak ties stresses the importance of nonredundancy of relations. The increase in the number of links alone, without boosting diversity, does not always lead to success. Keeping numerous but unproductive contacts entails not only limited access to unique knowledge resources but also excessive costs of maintaining relations.

Although the links alone, without flows or relations of an appropriate quality, do not guarantee positive results and the development of social capital, the literature emphases the important structural role of social capital. Both strong and loose links of companies form their relational resources. In the studies on structural network relations among companies, special attention is brought to the importance of bridging capital, represented by weak ties, in accessing new information and knowledge, and of its impact on innovativeness. This branch of the network theory is of particular significance for strategic management. It is primarily applicable in determining the company's position in the network with regard to access to information, knowledge, and other resources, as well as in defining the potential for controlling flows of certain resources.

Control is also the main focus of attention of theories relating to power (the power theory) and its distribution in exchange networks, which can serve as the basis for analysing networks of companies and their position. Useful in this respect are, first and foremost, the social exchange theory of K. Cook and R. Emerson (1978) and the resource dependence theory of J. Pfeffer and G. Salancik (1978), which see the sources of power in the structural context of the network. It should be noted that these theories explain the studied phenomena on the basis of models other than the aforementioned ones. The theories concentrated around the social capital theory are mainly focused on information flow models, wherein a better position is held by the entity with access to fast and non-redundant information. In turn, the strength theories are explained based on power models, in which the flow of resources from one firm to another usually leads to the weakening of the power and control of the latter. In power models, the company's dependency of others is a function of availability of alternatives for accessing specific resources. The more numerous options for sources of indispensable resources, the greater the firm's power. Inasmuch as in the flow models the advantaged position means connections with key network participants in terms of possessed resources, in the power models good positioning bestowing strength translates into possible connections but with entities that are weaker as regards resources held. The stronger the firm on which the company depends, the weaker its position. Hence, in the

power models, it is not the accumulation or early reception of resources that underlies a favourable position of a company, as is the case in the flow models. Reception of resources from neighbouring nodes means an increase in their power over the receiving node. One way of building up the strength of a given entity can be by forming alliances with other firms based on ties of solidarity, which should significantly weaken the position of the stronger entity. The power theory, therefore, perceives networks in terms of a political game and negotiating power. Given the development of the resource approach, growing importance of cooperation among companies, and heightened significance of relational control replacing structural control, this network approach is currently far less common in research in management (Olsen, Prenkert, Hoholm and Harrison, 2014) than the above-presented structural analyses of information flows. However, recent years have been showing an increasing interest among researchers in the resource dependence theory (Pfeffer and Salancik, 1978) in the network perspective.

The second type of theories associated with the application of social network analysis embraces theories of networks, which deal with antecedents of network ownership, including the structure they adopt. This stream comprises complex models of full networks. An important parameter of complex networks is the probability of each edge connecting to a new node. Of particular interest in this respect are the so-called small-world networks (Milgram, 1967; Watts and Strogatz, 1998)[3] and the scale-free networks (Barabási and Bonabeau, 2003). The small-world model is a type of graph in which most nodes are not direct neighbours of one another, but can be reached from any point by a small number of steps. In the social sense, the small world reflects the network where participants are linked by a relatively short chain of acquaintances, and their circles of acquaintances strongly overlap. On the other hand, the scale-free model is created by adding new nodes to the existing nodes in the small-world model in a specific way – according to the probability based on the degree of vertices. New nodes are added predominantly to vertices with a large number of links. As a consequence, the scale-free network contains few nodes with a tremendous number of links and multiple nodes with a small number of links. These networks are, therefore, resistant to accidental "failures", but exceptionally vulnerable to coordinated attacks. In the social perspective, they are networks dominated by a relatively small number of participants connected by relations with many other network participants who do not have other relations.

The analysis of the entire network is particularly important in the case of efforts to determine the macro- and micro-economic conditions of the activity of entities concerned, including companies. Owing to the use of structural analysis tools, it is possible to determine the density, centrality,

 DOI 10.7172/1644-9584.64.2

and stability of the network. The results of the analysis enable the identification of not only the most central entities in the network but also the pattern of network structure determining the flow of information as well as the diffusion of knowledge and management practices. The theories of networks are quite often used in respect of corporate networks in different countries or regions of the world, designated by capital ties and relationships between members of the management and supervisory bodies[4]. It is a particularly important finding, confirmed by numerous study results, that corporate structures of many countries are consistent with the small-world model (e.g. Kogut and Walker, 2001; Davis, You and Baker, 2003; Conyon and Muldoon, 2008; Sankar, Asokan and Kumar, 2015; Sankowska and Siudak, 2016). This is indicative of a relative universality and durability of the small-world model in the context of corporate networks. Based on the foregoing, a specific manner of communication and flow of information can be assumed. The structure of corporate networks, consistent with the small-world model, definitely facilitates rapid diffusion of information due to relatively short average access paths. This means that a relatively small number of intermediaries suffices to disseminate information and knowledge among firms, although the reasons for and the course of the phenomenon itself may not be so obvious in view of the complexity of the network. Moreover, it is worthwhile stressing that access to information in the network with a small-world structure is not democratic and depends on the position of the company (Uzzi, Amaral and Reed-Tsochas, 2007).

The properties of the small world do not have to be intentional in the network, they are caused by a relatively small share of random links. It should also be noted that no specific node or edge is critical for maintaining the small-world model for a corporate network. The dynamic properties of the small world provide an insight into the sustainability of the domestic structure of firm ownership, which is a rare network in many countries (especially with the dominant role of the continental European model of corporate governance). Despite independent strategies of respective network members and external changes, the dynamics of the small world makes this specific type of network structure continually strive to replicate.

To sum up this part of the discussion, it is worth noting that both in the first perspective (network theories) and in the second one (theories of networks) research focuses on social structures and patterns of relations as well as social consequences of these structures. It is assumed that the actions of individuals and organisations can be explained through their position in the social network. Accordingly, social network analysis is by a number of authors referred to as structural network analysis, treated more as a holistic research approach with the features of a paradigm, and not exclusively as a method of research (Hummon and Carley, 1993; Borgatti and Foster, 2003).

## 4. Concept and Typology of Networks in Strategic Management

From the point of view of the strategic management theory, the fundamental breakdown of networks results from the ability to control network members. This criterion taken into account, at least two ways of perceiving the network are considered in management literature (Thompson, 2003). The first approach treats networks as a form of organisational coordination, constituting an indirect mechanism of exchange between the market and hierarchy, while in the second one networks are recognised as a separate conceptual category, a phenomenon in itself. The first of the approaches attempts to prove that in the conditions of globalisation, hypercompetition, and turbulent environment, both dichotomous forms – market and hierarchy – are experiencing inefficiencies (Miles and Snow, 1992; Powell, 1990), and their place is taken by a new form of coordination – a network organisation that combines the flexibility of the market with the predictability of a traditional hierarchy (Achrol, 1997). In this approach, networks constitute a complex organisational structure resulting from numerous alliances and strategic agreements, resembling a kind of confederation of firms, a loose and at the same time flexible coalition, guided from the "inside". This line of research leads to the discussion on network architecture, strength and trust management, alliance portfolio management, or supply chain management. In this approach to the network, the company's alliance-forming and relational skills, indicating its potential and abilities to form, maintain, and manage a complex of external relations, are becoming crucial. It should, nevertheless, be noted that, in metaorganisations viewed as such, a substitute for formal power in the form of social control is observed to be of paramount importance. The scope of such social control depends, among others, on the degree of "permeability" of network boundaries and the level of internal stratification. The term "network organisation" indicates that the network, just like any organisation, has its boundaries defined by the ability to control (Cyfert, 2012). Hence, this approach points to the ability to manage a network. The basics of managing the network viewed as such can be found, first and foremost, in the transaction cost theory and the resource theory.

A substantially different approach is suggested by the social exchange theory along with Granovetter's embeddedness theory (1985) as well as the business network theory promoted by the IPM research group (Industrial Marketing and Purchasing Group). According to this approach, all economic behaviours, including the exchange, are embedded in a social context. The merger of business ties with social ones generates an embedded logic of exchange, which is different from the transactional logic (Uzzi, 1999, 1996). Thus viewed, the network is a phenomenon in itself, is emergent in its nature and results from diverse interactions among many entities. Significant limitations are discerned in this perspective on the ability to

 DOI 10.7172/1644-9584.64.2

control the network, define its boundaries, and treat it as a centrally managed organisation. According to this approach, "everyone in a network is not the architect of his own fortune, but of each others" (Ford, Gadde, Håkansson and Snehota, 2003, p. 32).

The presented concepts of the network differ fundamentally in terms of the companies' ability to influence the network. The first approach suggests that active behaviours are possible, while the second one points to significant restrictions on the ability to control the network, which "behaves" in accordance with the dynamic rules governing the global behaviour of the system (Watts, 1999). The presented interpretation of the network phenomenon in the management theory is similar to the approach put forward in literature, whereby networks can be perceived "as structures describing a specific form of operation, or rather cooperation, of private and/(or) public entities, or as forms that are new structures created by the said entities in pursuing a common goal" (Niemczyk, Stańczyk-Hugiet and Jasiński, 2012, p. 9).

Studies on both these approaches to the network are substantiated in the context of inter-organisational research in management sciences. Quite importantly, both types of network can be considered and studied within the frame of the social network theory. Aside from obvious differences in the research scope of both types of network, worthy of note is the form of membership in the network and the possibilities of restricting it. In the instance of strategic (organisational) networks, we more often deal with closed networks than in the case of business networks, which usually represent open networks with boundaries determined arbitrarily for purposes of analysis.

## 5. Types of Network Ties of the Company

Corporate ties can be considered according to various criteria of a hierarchical nature. Most generally, they can be divided into continuous and discrete (non-continuous) ties (Borgatti and Li, 2009). Continuous ties are characterised by a specific duration over time. On the other hand, discrete ties are based on a series of separate events that may be counted up. Continuous ties are a result of the occurrence of similarities or social relations. In turn, non-continuous ties can have a nature of interactions or flows. The four named categories of ties can be analysed at the level of the entire firm (institutional ties) and in the form of personal relations of its members (personal ties). Numerous studies point to the significance of both types of ties in the processes of information flow and knowledge transfer. It seems, therefore, that research on the company's relations with the environment should deal with both the ties of employees of respective companies, especially of managerial staff, as well as institutional ties, in which the company fulfils the role of an entity. Tab. 2 proposes a typology of ties as broken down into categories and types of entities involved.

Ties resulting from similarities may be viewed as pro-social. They stand for co-membership in groups or co-location in space. Although quite often not all members know each other, it can be expected that different kinds of stronger ties are more likely to be established among "similar" individuals over time. In the case of companies, ties of this type result from co-membership in trade or commercial associations, co-location in industrial districts or special economic zones, etc. Analogous ties can bind firm employees in the form of co-membership in specific organisations, joint participation in conferences or seminars, etc.

Ties based on social relations refer to continuously existing ties such as kinship relations or role-based relations, e.g. being someone's friend or boss. They may also be cognitive-affective relations like "I know him" or "I trust him". In the corporate context, continuous social relations can be exemplified by capital or contractual ties, e.g. co-ownership, joint ventures, distribution agreements. In this perspective, competition between respective companies in a particular market can also be considered as a specific social relation of a cognitive-affective nature. Companies' social relations arising from their social embeddedness constitute the main interface between inter-organisational studies and research on knowledge management. In relationships at the individual level, this type of ties is found for instance in friendship between employees of different firms, in the area described, among others, in the literature on procurement and company sales management.

The next category of relations, i.e. interactions, differs from social relations in that they consist of individual events that can be counted up over a period of time. Interactions may be exemplified by meetings, phone calls,

| **Type of ties** | **Continuous ties** | | **Non-continuous ties** | |
|---|---|---|---|---|
| **Categories** | **Ties based on similarity** | **Ties based on social relation** | **Ties based on interaction** | **Ties based on flow** |
| Subcategories/ Examples | – Co-location (physical distance)<br>– Co-membership<br>– Shared attributes | – Kinship<br>– Social roles<br>– Cognitive-affective relation | – Meetings<br>– Correspondence<br>– Emails<br>– Sale and purchase transactions | – Tangible flows (materials, goods)<br>– Intangible flows (information, ideas) |
| Company as entity | Memberships in trade associations, etc. | JV, alliance, distribution agreements, own shares | Sale of products, Competition moves | Technology transfers, Cash flow |
| Company employee as entity | Interlocking directorates[4], Memberships of management board members, etc. | Friendship relations | Employees of firm A go bowling with employees of firm B | Employees of firm A transfer information to employees of firm B |

*Tab. 2. Typology of company's ties by network entity. Source: the author's own work (based on Borgatti and Halgin, 2011; Borgatti, Mehra, Brass and Labianca, 2009).*

 DOI 10.7172/1644-9584.64.2

emails, or sale and purchase transactions. It is often assumed in empirical analyses that interactions imply the existence of relations of different types. For example, the number of emails between two persons represents the strength of some kind of social relation between them. It is at the same time assumed that social relations facilitate interactions; therefore, to some extent, while measuring one we measure the other. Frequent and diverse interactions take place between companies, both in collective and individual dimensions. In the collective dimension, an obvious type of interaction is trade in the form of concrete transactions or interactions like response to competitors' moves. Firm members interact as well, for instance when they play sports.

The final category under discussion consists of flows which concentrate on the content transferred between entities, e.g. ideas, money, or goods. Flows relate to transfers of materials and ideas from firm to firm, both at the level of the company and at the level of individual employees. The first case can be exemplified by the transfer of technology, while the second one by information leak by specific employees or through espionage. The flows are the consequences of other kinds of ties – physical access, personal relationships, interactions, etc. – and are frequently considered as the most important type of connection. However, they are rarely measured in practice. They are more often assumed to exist based on observed interactions or social relations. Such approach is particularly widespread in research on transfer of intangible resources, including knowledge and know-how. The transfer of knowledge itself is rarely measured, it is most frequently identified with the frequency of communication or with the strength of affective relation, and these attributes of ties are measured in the social network analysis and serve as a proxy of knowledge transfer.

It is worthwhile noting that numerous types of relationships exist simultaneously among various kinds of companies. The complexity of these relationships is the fundamental methodical concern of research on inter-organisational ties, and the solution can be sought in social network analysis. One way of conducting the analysis is by considering various types of ties separately as functioning at different levels of relations or as separate networks based on the same "actors". Hence, given a specific set of entities, separate networks, possibly correlated, can be studied. Networks can have differing structures and logic, as well as managerial implications. Another method of analysing complex networks is by closing all types of relations in each double tie.

## 6. Criticism and Controversies Surrounding Social Network Analysis

Despite its rising popularity, social network analysis is not void of criticism. SNA is most frequently criticised for the lack of a coherent network theory accompanied by a predominantly descriptive nature of the approach.

Moreover, SNA is quite often identified with a research method comprising a set of unrelated statistical tools and techniques (Hwang, 2008) rather than with a homogeneous theoretical approach. Not all scholars consider the aforementioned criticism as substantiated. According to Borgatti and Halgin (2011), the role of a primary network theory is fulfilled by the strength of weak ties theory and the structural hole theory. These academics recognise the entire Granovetter's embeddedness theory as a network theory. It is the view of the above authors that these theories relentlessly inspire network researchers in social sciences.

Likewise, S. Wasserman and K. Faust (1997) disagree with the criticism of SNA and argue that it is improper to view social network analysis as a set of analytical procedures in isolation from the main theoretical and empirical aspects of social research. The network methodology, according to these authors, developed through the work of theorists from various disciplines in which they combined empirical data with the theories they recognised. Hence, SNA is firmly established, both in socially important phenomena and in theoretical concepts as well. The advancement of mathematical, statistical, and computational methods is, therefore, an effect of the development of process models for testing and explaining empirical phenomena based on the network theory. For this reason, although many of the concepts can be represented mathematically in SNA, the majority of these formulas would be useless if they were not backed up by a specific theory explaining network processes and mechanisms.

Another objection against SNA is that the analysis concentrates exclusively on relations and not on their significance for the entities forming them. In other words, SNA focuses on the structure of ties to the exclusion of their content. Particularly harsh criticism is levelled by the proponents of the normative approach in the social capital theory, who underline that the relations themselves, understood as specific flow channels, are useless if there is no spark between the nodes, e.g. trust or other relational standards, for instance reciprocity. The structural network analysis does indeed show significant weaknesses in this aspect. For SNA focuses most often on the very fact of relations (i.e. networks of state) or interactions (i.e. networks of events) among the entities. Inasmuch as in the normative approach the identification of trust leads the researcher to a conclusion as to the existence of specific flows, in the structural aspect of the network the reasoning is reversed – flows testify to a certain subjective state between network members. SNA researchers quite often emphasise that what is the subject of research does not necessarily need to be measured straightforwardly. The way forward lies in approximate measures, such as, for example, the frequency of interaction, which makes the claim on the existence of a particular affective state between network participants more likely to be valid.

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## 7. Conclusion

Social network analysis can be performed at the level of both full networks and at the level of the so-called egocentric networks that comprise a given entity (ego) and a set of entities (alters) forming various types of relations with the central entity and other entities analysed in the network. The choice of the approach implies significant consequences in terms of tools used and analysis results[5]. A common reason for confining attention to the ego network is the conviction that farther ties are not crucial for the studied aspect. Besides, it is by far easier to gather data about the ego network than about the full network. If, however, such a network provides adequate representation for the position of the entity in a larger network structure, it seems that there are few reasons for collecting data about the entire network[6]. Still, the choice of the level of network analysis affects research issues and capabilities as regards the evaluation of the network structure.

Social network analysis is presently an important research approach, which is seen to be evolving continuously through the accumulation of research experience originating from different, often very distant, scientific disciplines. What some view as an advantage of the approach, namely the huge universality as well as the theoretical and methodical capacity of SNA, supporting the development of theories of multiple disciplines, others consider as a weakness, identified with a lack of methodological rigour and unified theoretical framework. For many years, a discussion has been underway in literature on the paradigmatic readiness of social network analysis, and there is still no final decision in this regard. Nevertheless, regardless of the stage of development of the network approach as well as a hardly predictable direction of its further development, it is undoubtedly an attractive research proposal, perfectly meeting the needs of many disciplines. Networks are a supradisciplinary phenomenon as they are associated with the networking of the world and the entry of the society into the era of network economy. The needs of management sciences, including strategic management, do not deviate from this trend. Networks have become a permanent part of the business landscape, and it is becoming necessary to develop the network theory and its research methods.

Social network analysis, attracting like a magnet the most interesting theories that explain network mechanisms, appears to be an appealing proposal for management sciences. Nevertheless, its usefulness for management is conditional not only upon the current theoretical achievements of the network but depends also on the contribution from the researchers from the management discipline, which consists in matching the variables of specific management theories and approaches with social network analysis. The presented analysis of network theories as well as the types of networks and ties points to a huge research potential of social network analysis in

the context of research in strategic management. The universality of the definition of the network and assumptions in SNA is confirmed by the statement (Brass, Galaskiewicz, Greve and Tsai, 2004) that the only limit to the application of social network analysis is a researcher's imagination as regards the conceptualisation of network relations.

## Endnotes

1 The project was financed by the National Science Center on the basis of decision number DEC-2013/11/B/HS4/00461.

2 In this paper, the terms and acronyms: social network analysis, SNA, network approach, and network stream are used interchangeably.

3 The small-world phenomenon, described in literature since the 1960s (Milgram, 1967), has gained an analytical framework thanks to the work by D. Watts and S. Strogatz (1998). The properties of the network are discovered by comparing the observed network with a random network (i.e. a random graph), which has the same number of nodes and the same number of relations per actor on average as the observed network. The developed methodology allows for testing networks in different temporal and spatial systems.

4 Interlocking directorate refers to the practice of the same person serving on management/supervisory bodies of multiple firms. These ties make up a complex network of firms and persons with crucial socio-political and economic consequences.

5 Description of the selection of analysis tools in egocentric and full networks is provided among others in the work of P. Klimas (2015).

6 M. Everett and S. Borgatti found a strong correlation between scores calculated on the basis of the ego network and on the basis of a network as a whole (Everett and Borgatti, 2005).

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