

## Intensity of Network Relationships: Towards Conceptualization and Operationalization

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The paper content is embedded in the network paradigm and concerns the intensity of network relationships. The aim of the paper is to conceptualize and initially operationalize the construct “intensity of network relationships”. The aim has been realized through answering the following research questions: (1) How to identify and explore a set of network relationships of a single organization? (2) How to conceptualize and operationalize the extent to which an organization (node organization, network member) is involved or entangled in the inter-organizational network analysed from the ego-network perspective? The conceptualization and operationalization of the construct have been developed by means of a deepened literature study as well as initial case studies performed by the authors. The paper is organized as follows. The first section presents the essence, origins, and perspectives of researching inter-organizational networks. The construct called intensity of network relationships is conceptualized in the second section. Then, the dimensions of network relationship intensity and its operationalization proposal are highlighted. Finally, some conclusions, limitations, and research directions are formulated.

**Keywords:** inter-organizational networks, inter-firm relationships, network ties.

### Intensywność powiązań sieciowych – w kierunku konceptualizacji i operacjonalizacji

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Artykuł mieści się w nurcie badań nad sieciami międzyorganizacyjnymi i dotyczy intensywności powiązań sieciowych. Celem artykułu jest konceptualizacja i próba operacjonalizacji konstrukt „intensywność powiązań sieciowych”. Cel został zrealizowany poprzez próbę odpowiedzi na następujące pytania badawcze: (1) Jak identyfikować i badać sieć powiązań międzyorganizacyjnych pojedynczej organizacji? (2) W jaki sposób ująć i zmierzyć stopień zaangażowania czy uwikłania danej organizacji (organizacja węzłowa, członek sieci) w sieć międzyorganizacyjną? Konceptualizacji i operacjonalizacji omawianego konstrukt dokonano poprzez pogłębione studia literatury i wstępne studia przypadków przeprowadzone przez autorów. Na początku zaprezentowano istotę sieci międzyorganizacyjnych i przywołano wybrane

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wyniki badań w tym obszarze. Następnie przedstawiono konceptualizację konstruktów – jego ogólny zarys i istotę, a w ostatniej części artykułu wyróżniono wymiary intensywności powiązań sieciowych wraz z próbą wskazania na sposoby ich badania. W zakończeniu sformułowano konkluzje, a także wskazano ograniczenia przeprowadzonej analizy i kierunki dalszych badań.

**Słowa kluczowe:** sieci międzyorganizacyjne, relacje międzyorganizacyjne, powiązania sieciowe.

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## 1. Introduction

Inter-organizational networks (IONs) are presently one of the main research fields in management science (Oliver and Ebers, 1998). The interest in network relationships resulted in the emergence of a new “network” paradigm (Borgatti and Foster, 2003; Czakon, 2011), which reflects inter-organizational networks as the base to describe the enterprises reality, gives a wider perspective for analyzing business phenomena, and allows for enhancing the state of the art (e.g. Brass, Galaskiewicz, Greve and Tsai, 2004; Parkhe, Wasserman and Ralston, 2006). Inter-organizational networks are becoming extremely popular in management practice, especially in high-velocity industries, i.e.: IT, aerospace, biotechnology, as well as industries with complex technologies and large scale, i.e.: automotive industry or construction. According to the representatives of strategic management field, IONs are regarded as one of the main sources of competitive advantage (Gulati, Nohria and Zaheer, 2000; Niemczyk, 2013).

The aim of the paper is to contribute to conceptualize and operationalize the construct “intensity of network relationships” with regard to a set of relationships constituted within an ego network. The aim has been realized through answering the following research questions: (1) How to identify and explore a set of network relationships of a single organization? (2) How to conceptualize and operationalize the extent to which an organization (node organization, network member) is involved or entangled in the inter-organizational network analysed from the ego-network perspective? The conceptualization and operationalization of the construct have been developed by means of a deepened literature study as well as initial case studies performed by the authors that appeared as the inspiration for the concept presented.

The paper is organized as follows. The first section presents the essence, origins, and perspectives of researching inter-organizational networks. The conceptualization of the construct called intensity of network relationships has been made in the second section. Then, the dimensions of network relationship intensity and its operationalization proposal have been highlighted. Finally, some conclusions, limitations, and research directions have been formulated.

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## 2. Inter-Organizational Networks – Essence, Origins, and Research Perspectives

An inter-organizational network is defined as two or more organizations, legally separated and independent, yet connected to each other by sustained relationships, having common goals and complementary resources (Powell, 1990; Thorelli, 1986). It has long been known that focusing attention on a single company does not allow to understand all business processes (Johnston, 1981), therefore the functioning of inter-organizational networks is currently one of the most debated issues in management science. It is worth explaining why inter-organizational networks exist, and why a single organization enters particular IONs. There seem to be several reasons for that.

First, disintegration of the value chain in contemporary economic activity resulting from increasing specialisation and technological changes plays a pivotal role. There is a change in the business model, and the popularity of outsourcing has prompted the business to abandon the functioning model of covering as many elements of the value chain as possible and move towards the models which assume the activity within selected value chain constituents, with an element of cross-organizational coordination or without it (Prahalad and Hamel, 1990).

Second, this phenomenon is associated with the tendency to minimize the costs of internal coordination and obtain the benefits of specialization. Creating relatively long-lasting inter-organizational relationships results in lowering the level of transaction costs (Williamson, 2008).

Third, IONs may reduce or eliminate the uncertainties and risks of purely market transactions while avoiding the costs that would be incurred through vertical integration (Williams, 2005). In industries where the knowledge base is complex and expanding, IONs facilitate the transfer of knowledge between organizations. The membership of a given ION may give firms competitive advantages over competitors outside the networks (Gulati, 1995) and support risk management (e.g. Szczepański and Światowiec-Szczepańska, 2012). When organizations become embedded in an ION, tacit and proprietary know-how is exchanged and firms create economic opportunity for each other more freely than they would if their relationships were limited to market or hierarchical transactions (Uzzi, 1997).

Fourth, according to Oliver (1990), there are six contingencies affecting the formation of relationships between organizations: (1) to meet legal and political requirements (necessity), (2) to reduce uncertainty in their environments (stability), (3) to economize on transactions (efficiency), (4) to pursue common or complementary goals (reciprocity), (5) to gain credibility and respectability through association (institutional), and (6) to preserve their autonomy (asymmetry).

Finally, network formation may be also driven by multiple interdependent social processes unfolding simultaneously (Kim, Howard, Pahnke and

Boeker, 2016). Networks may emerge through a process whereby actors seek partners with specific characteristics or in response to opportunities made available by their partners' mutual behaviours (Park and Luo, 2001), leading to changes in the network structure (Contractor, Wasserman and Faust, 2006). Alternatively, network ties may result from locally emergent structures in which relationships among actors are influenced by the presence or absence of other ties in the network (Zaheer and Soda, 2009). Since a coherent theory of inter-organizational networks has not been established yet, the research on inter-organizational networks is still being conducted from different perspectives (Zaheer, Gözübüyük and Milanov, 2010).

While the first perspective focuses on the inter-organizational network as a whole, the second approach concentrates on studying inter-organizational networks from the perspective of a single company, i.e. the so-called ego networks that are considered only through the prism of a single company, or a node connected with a number of others through relationships, however, they may not be interconnected by any relationships between one another. This lack of mutual ties does not exclude the possibility of including them into one network (Gomes-Casseras, 1994).

Admittedly, the ego network therefore opens up the possibility to identify and study different roles within the network as well as the impact of ego network distinctive structures, composition, and shape on organizational elements such as strategy and structure.

Consequently, the paper content stems from the ego-network perspective so as to contribute to the analysis of intensity of network relationships, and its potential influence on organizational components.

### **3. Network Relationship Intensity – Towards Construct Conceptualization**

Inter-organizational network relationships (ties) defined as the interaction between organisations including the exchange of information, material or/and energy and mutual partners commitment (Czakon, 2005) reveal three key features: continuous interaction, interdependence, and infiniteness (Ratajczak-Mrozek, 2009).

Moreover, inter-organizational relationships may involve formal ties (i.e. classic bilateral trade agreements, in force or renewed over a long period of time), informal (i.e. family relationships, friendships, etc.), and indirect ones (a form of “support” in a business activity, but without the buyer-seller ratio) (Adler and Kwon, 2002; Ojala 2009). Nonetheless, although social capital may be considered as the concept measuring the strength of relationships in ego networks (e.g. Dyer and Singh, 1998; Dyer and Nobeoka, 2000; Gargiulo and Benassi, 1999; Nahapiet and Ghoshal, 1998), it has not attracted primary attention with regard to inter-organizational relationships

as it refers at most to social networks developed by individuals (Bourdieu, 1993; Coleman, 1998), even if it facilitates a collective action.

Other researchers (e.g. Benton and Maloni, 2005; de Wit and Meyer, 2010) analyze inter-organizational relationships in terms of power and position in a network as different types of “systems of forces”: *mutual independence*, *mutual dependence*, *unbalanced independence*, *unbalanced dependence*. For instance, Doz and Hamel (1998) argue that network partners usually do not define “fair exchange” in the same way, namely through cooperation aiming at obtaining a more advantageous position in relation to the network partners. Inter-firm cooperation is a phenomenon extensively explored as one of major factors contributing to the firm’s growth and performance (e.g. Lavie, 2007; Stuart, 2000). Taking into account the perfect co-specialization, i.e. the situation in which necessary equivalent exchange between the partners exists, there would be no desire to increase the impact on other network partners. Undoubtedly, situations in which imperfect co-specialization occurs are much more common. Consequently, the node enterprise, contributing the most desirable elements to the exchange (e.g. retail demand), may exert impact on other nodes.

Taking into considerations the ego-network perspective, the most salient questions are as follows: how intensive are network relationships of a given company, and to what extent is the company involved in that network? Embedding that problem in social and business networks, some authors (e.g. Granovetter, 1973; Jack, 2005; Kontinen and Ojala, 2011; McFadyen, Semadeni and Cannella, 2009; Michelfelder and Kratzer, 2013) suggest incorporating the construct called the strength of network ties, which can be described by assigning them two states: strong or weak. According to Granovetter (1973), the strength of relationships (in social networks) depends on: a) the amount of time spent together, b) emotional intensity, c) reciprocal exchange, and d) intimacy. The combination of these hallmarks determines the strength of particular relationships. As for the organizational level of analysis, many followers present similar approaches (e.g. Gulati and Higgins, 2003). What is important, yet simultaneously controversial, according to that approach, each relationship should be analyzed separately. Although the idea of the inter-organizational relationship strength seems to be useful in exploring network involvement, some doubts still remain unexplained.

First, the strength of relationships is not directly dependent on the number of relationships with business partners – theoretically, we can encounter a company with a low number of strong relationships (few key partners), and on the other hand, a company with a high number of weak relationships. In terms of the entangled network, the level of dependence on the network could be equal in both cases, or even higher in the second one. A very large number of partners may have huge impact on a particular company. Interestingly, in comparison to the findings in the field of social

psychology, we can see that a large number of people with whom one does not have strong relationships (even anonymous) may have strong impact on ones' attitudes and behaviour (e.g. Betz et al., 1996; Chaiklin, 2011; Karpacz, 2014; Wood, 2000).

Second, the relationship strength does not depend directly on the scope of co-operation and type of inter-firm connections. It makes a difference whether related organizations are just doing simple trades or conducting common projects for other companies, co-operating in R&D area, sharing resources, etc. In that context, an inter-organizational co-operation could be more or less extensive and tight. Additionally, it seems to be crucial how co-operation in the network has been organized: vertical (particular organizations execute sequent stages of value chain), concentric (particular members deliver products or services to one integrator), horizontal (members perform similar tasks, deliver similar products or services, operate on the same market and could be potential competitors), conglomerate connections (all members perform independent tasks and operate on different markets).

Hence, the substitutability of network members and the possibility and easiness of abandoning the network should be taken into consideration while analysing intensity of inter-organizational ties and dependence on the network.

Concluding the presented considerations, we can state that so as to describe the set of inter-organizational relationships and network involvement more extensively and appropriately, it is required to work out a multidimensional construct that would be much more complex than the relationship strength adapted from social networks.

#### **4. Operationalization of Network Relationship Intensity – Preliminary Proposal**

The construct proposed to investigate a set of inter-organizational ties is called intensity of network relationships. Nonetheless, it is crucial to distinguish intensity of network relationships from network density. While density focuses rather on the number of nodes and the number of ties linking organizations involved in the network (e.g. Niemczyk, Organa and Piórkowska, 2012), intensity additionally refers to the frequency of interactions among network members within a certain period of time (e.g. Tichy, Tushman and Fomburn, 1979), scope of co-operation, degree of network constituents variability (Yang, Lin and Peng, 2011), degree of resource exploitation in these relationships (Chien and Peng, 2005), and to other deepened characteristics of inter-organizational ties. Moreover, considering inter-organizational networks from the ties intensity perspective converts the analysis level from the network towards the relationship (Strużyna, Stańczyk-Hugiet and Piórkowska, 2015).

In accordance with extensive literature studies (e.g. Chien and Peng, 2005; Cho and Kim, 2015; Granovetter, 1973; Gullati and Garigulo, 1999; Jack, 2005; Kontinen and Ojala, 2011; McFadyen et al., 2009; Michelfelder and Kratzer, 2013; Tichy et al., 1979; Yang et al., 2011) and initial idiographic inductive case studies (Eckstein, 1975; Verba, 1967) performed in a few small and medium enterprises operating in different industries, it may be concluded that the intensity of relationships between the company and its network partners (not interpersonal ones), analyzed from the ego-network perspective, constitutes a combination of the following factors:

- the frequency of interactions with partners from the network,
- the scope of co-operation with other network members,
- the value of network exchange (e.g. revenues) (benefits obtained in the network as opposed to those attained outside the network),
- the type of network (in terms of relationship direction: vertical vs. horizontal (concentric, conglomerate),
- replaceability of particular network nodes, and network exit barriers.

All the aforementioned dimensions may vary in their presence in the network; however, it has been envisaged that they influence the intensity of network relationships to the same extent and therefore the weights have not been assigned to particular dimensions. The endeavour to operationalize every dimension of network relationship intensity is presented in Tab. 1.

Dimension	Question type and coding in points: propositions
Frequency of interactions	Questions with ordinary scale (4 items, 5-point Likert type scale) coding from 1.25 to 5 points
Scope of co-operation	Questions with ordinary scale (4 items, 5 items, 5-point Likert type scale) coding from 1 to 5 points
Network exchange value	Questions with ordinary scale (5 items, 5-point Likert type scale) coding from 1 to 5 points
Type of network	Questions with ordinary scale (4 items, 5-point Likert type scale) coding from 1.25 to 5 points
Replaceability of node organizations and exit barriers	Questions with interval scale (5 items, 5-point Likert type scale) coding from 1 to 5 points

Tab. 1. Operationalization of the network relationship intensity construct – preliminary proposal. Source: the authors' own work.

## 5. Conclusions

Undoubtedly, inter-organizational networks constitute one of the most salient and developing research streams in management science. Examining the intensity of inter-organizational networks is very challenging due to their complexity, relationship dynamics, and diversity of inter-organizational networks. Despite current research enhancement in the stream of inter-

organizational networks, research achievements are still not settled and consolidated and structured enough, studies results are difficult to compare and replicate as well as there are still research gaps and methodological concerns.

The representatives of the contingency and system approaches have already emphasized that the environment constitutes one of the factors developing internal organizational constituents and influencing organizational activities and performance (Burns and Stalker, 1961; Lawrence and Lorsch, 1967). Hence, an organization as a part of a given inter-organizational network is under its influence; however, inter-organizational relationship intensity and the degree of embeddedness in the network determining the level of dependence on the network can be different. It is worth stressing that both (a) structural embeddedness describing the network's overall architecture and encompassing the properties of inter-firm ties as a whole, (b) relational embeddedness referring to the quality of dyadic exchanges as well as (c) cognitive embeddedness reflecting the similarity in representations, interpretations, and systems of meaning amongst firms (Simsek, Lubatkin and Floyd, 2003) have a strong impact on inter-relationship intensity.

Consequently, it is extremely important to seek the answers to the following questions: (a) to which extent is a particular company embedded and trapped in the relationships with its collaborators?, and (b) do inter-organizational network partners have impact on internal organizational elements such as organizational strategy and structure (cf. Piórkowska and Lichtarski, 2016; Zakrzewska-Bielawska, 2015) as well as other phenomena like organizational culture or leadership style and to which extent?

Inter-organizational relationships are considered regarding either the type of ties (cooperation, competition, coopetition) or their strength (strong or weak) rather than the position and power in the network. Moreover, the current research results seem to describe that phenomenon partially and contextually; therefore, they do not provide grounds to study inter-organizational relationships comprehensively. That situation motivated the authors of the paper to develop the construct called inter-organizational network intensity consisting of the following dimensions: (1) the frequency of interactions with partners from the network, (2) the scope of co-operation with other network members, (3) the value of network exchange (e.g. revenues), (4) the type of network, (5) replaceability of particular network nodes and network exit barriers. Admittedly, taking into account the diversity of inter-organizational networks, the list of proposed dimensions is not exhaustive and the necessity of modifying them might occur in some cases.

Obviously, the proposal presented reveals some limitations. Specifically, in order to develop the construct, some assumptions had to be made in the process of both conceptualizing and operationalizing the dimensions of inter-organizational relationships. For instance, it was envisaged that every

dimension influences the intensity to the same extent, which was a considerable simplification. However, there were no premises to differentiate the weights at the preliminary stage of the research. Moreover, the study does not involve the problem of relationship life cycle that might influence inter-firm relationship intensity as it reveals that the process of enhancing tie intensity develops over time (e.g. Ring and Van De Ven, 1992) and that the interaction history between exchange partners reflects the context that strongly influences the perceptions, attitudes, and orientations of the parties in an exchange (Jap and Ganesan, 2000).

Concluding, the construct proposed constitutes a starting point in deepened and more extensive examination of inter-organizational relationships. It is planned to verify the research assumptions, conceptualization, and operationalization by means of surveys and a cross-case study as well as to enhance the construct proposed.

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