



A SOCIAL NETWORK MODEL OF SUPPLY CHAIN MANAGEMENT IN FORMAL AND INFORMAL INTER-FIRM ENGAGEMENT

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ABSTRACT. Background: This research looks into the different effects of firms' network structural positions in an upstream supply network upon the firms' level of relational capital outcomes. Previous research has largely focus on the context of decentralized network structure. However, the supply network is a centralized network because of the existence of the focal firm. The existence of the focal firm may influence the impact of relational capital outcomes.

Methods: The objective of this research is to determine the type of network structural positions required to obtain reasonable relational capital outcome in upstream supply network.

Results and conclusions: This study found that, network structural positions i.e. betweenness centrality contributed to firms' level of relational capital influence. In conclusion, firms, embedded in upstream supply network benefits differently in terms of relational capital through different degree of embeddedness. Firms' resources should be re-aligned to match the benefits with the different network structural positions.

Key words: Supply Chain Management; Network Studies; Inter-Organizational Relations; Social Capital; Supply Chain Complexity.

INTRODUCTION

The last decades have seen an increase in managerial concern regarding the complexity of the supply chain, more specifically the upstream supply network. The upstream supply network refers to the firms that reside in the upstream flow of the supply network. The upstream supply network has become more complex due to the increase interactions and interrelations among the suppliers' firms as well as the number of the firms. These firms which are the suppliers of materials and services to the focal firms are connected or involved with each other directly or indirectly through the supply of materials to the focal firms or manufacturer.

One of the main strategies of managing these inherent complexities that is often adopted by supply chain managers includes reductionist approach. The traditional reductionist arguments state that firms opted for the removal from the complex upstream supply chain of partners who are not meeting the performance requirements of the supply chain in an attempt to manage the complexity arising from extensive inter-firm relationships [Choi, Kim 2008]. These strategies may prove to be effective in the short term, but may negatively impact the focal firms in the long run. These negative effects may emerge as firms' involvement in a network of inter-firm relation, creates an important element of intangible capital, which is the relational social capital. This involvement among the firms in the upstream supply network is essentially the firm embeddedness in the upstream supply

network structure. However, recent arguments suggest that simply removing these underperforming firms may not be the best way, as firms may remove partners who are resourceful or more influential, but these characteristics are not visible through good accounting measures. In this vein, Cockburn and Henderson [1998] in addition to Putnam [1993; 2000] posited that approaches that value and appreciate these complex inter-firm relations may be better alternatives. This is because, firms have been found to benefit through embeddedness with other firms in a network structure.

Network embeddedness constitutes an important element that Putnam [1992] identifies as being the relational capital [Cousins et al. 2001]. Cousins et al. [2006] stated that relational capital was the configuration of relationships within the network structure, as well as with the broader network structure of the firm. It has been documented that the level of embeddedness increases relational capital from the interactions [Cousins et al. 2006]. More specifically, organizational researchers have confirmed that organizational involvement in a decentralized network structure impacts upon organizational relational capital outcomes such as the level of influence [Gulati, Gargiulo, 1999; Podolny, Page, 1998]. Thus, a firm's embeddedness in the network structure may produce relational capital that may then have the potential to generate other benefits such as reduced costs and greater flexibility [Reagans, Zuckerman, McEvily 2004].

The upstream supply network is essentially a centralized network structure. It is a centralized structure through the existence of the focal firm that monitors and administers transactions in the upstream supply chain for the production of the finished goods and services. This centralized coordination often involves a focal firm or manufacturer, typically operating in the center of the transformation process [Choi, Krause 2006]. Since relational capital outcomes emerge through interactions in a free flow, decentralized, network structure [Gulati, Gargiulo 1999; Podolny, Page 1998], application of the integrated network to the issues of centralized upstream supply network complexity may require deeper understanding

of the impact of the centralized network structure. This research raised this concern following the argument of Putnam [1992] which posited that relational capital emerged largely in a decentralized network structure. This is because; a centralized coordination such as the focal firm in the upstream supply network may introduce effects unknown, or remove potential benefits to the firms in the upstream supply network. For example, since the central coordinator (i.e. the focal firm), is often the most powerful firm in the supply base having arms-length control that monitors actions of the network member, it is also a profit-driven entity with the most investment in the supply network. Occasionally albeit unintended, a Machiavellian portrayal may affect the level of relational capital among the firms in the centralized network structure. In addition, the centralized nature of network governance has been found to reduce the horizontal connection which is prominent for the creation of relational capital in a network structure [Poppo, Zenger 2002]. Since these horizontal connections are significant for generating the relational capital posited by Putnam [1992], a key question would be: will firm involvement or embeddedness in the centralized upstream supply network produce the same relational capital outcomes?

LITERATURE REVIEW

Granovetter [1985] advanced the concept of embeddedness as an effort by which to explain economic behavior of an organization. According to Granovetter [1985], embeddedness refers to the level of involvement of a firm in the network of inter-relations. A firm's levels of involvement have an impact upon its actions or behavior in the network. Granovetter [1985] posited that transactions between actors in a network are embedded in a social context economic decisions and outcomes are affected not only by the actor's isolated relations with other individuals or firms in the network but also by the structure of the overall network of relations within which the actor resides. Economic behaviors are embedded in the network of relations that provide the context for economic processes [Granovetter 1985]. As every behavior materializes through some form of

outcome, almost all economic processes are presumed to be embedded in the networks of relations. Thus organizational performance is influenced by the pattern of embeddedness of the organization in the network. Since in the upstream supply network, firm embeddedness relate to the degree of the interaction that a firm may has with other firms in the network which are a direct reflection of the firm degree of inter connectivity with others in a network. Hence, one may conclude that organization performance in the supply network may also be influenced by the organization embeddedness pattern such as its centrality and connection [Scott 1998] with other organizations in the supply network [Mueller 2000]. This is because, structurally, supply network is virtually formed by the connectivity or links between firms where the integration progressively forms the ultimate structure, which is the supply network itself. The relationship is also known in the literature as the buyer-supplier relationship [Beamon, 1999]. According to Choi and Kim [2010], a buyer-supplier relationship represents a dyad, or two nodes and one link, in network terms. Each node can be conceptualized as an actor performing activities for generating value Choi [2008]. The firms need resources from its supplier organization, and the supplier needs contracts and payments from the buyer. On top of that the firms also interact with each other to share information regarding market opportunities and new threats [Choi 2008]. As a consequence, these phenomena create a link and form a dyad or a buyer-supplier relationship. Because a firm in the supply network often has links to other firms, the firm is then impliedly linked to the new indirectly connected organizations. Similarly, with the supplier organization, this will also bring to the dyad their links with other organizations either directly or indirectly [Lamming et al., 2000]. Conclusively, a buyer-supplier relationship is not only a dyad. It is also part of a network that has come to bear on individual nodes to the relationship through each other's extended business relationships. This form of inter-firm relations or connectivity created the complexity in the supply network structure.

Despite the increase recognition of the importance and applicability of network embeddedness perspective to buyer-supplier

relationships, researchers still address the relational dynamics of buyer-supplier relationships from variety of firm-level analysis, rather than the network perspective [Carter, Ellram, Tate 2007], using various theoretical approaches such as resource-based view of the firm [Cao, Zhang 2011; Holweg, Pil 2008; Ordanini, Rubera 2008; Zsidisin, Ellram, Ogden 2011], transaction cost economics [Cao, Zhang 2011; Cheung, Myers, Mentzer 2010] and relational view of the firm [Sanders, Autry, Gligor 2011]. The level of analysis in much of such existing literature still centres on the isolated dyadic ties between buyer-supplier organizations. However, no firm is an island [Gibbons, Holden, Powell 2009], rather they are embedded in larger network structure of interconnected firms [Choi, Kim 2008]. Furthermore, with the advent of supply network as the prevalent structure of buyer-supplier relationship rather than the chain metaphor [Harland et al. 2001; Lamming et al. 2000], it is imperative in the context of this study to take the perspective of buyer-supplier relationship to the embeddedness context within which the buyer-supplier interaction took place. As many scholars have posited, the actions and performance of an organization can be more explained by examining the relationship in which the organization is embedded in [Ahuja, 2000; Gulati, 1999; Zaheer, Bell 2005]. Thus, this research adopts the perspective of network embeddedness in its effort to deepen the understanding of the impacts of the relational dynamics on the performance of the organizations.

Although there has been increase number of research regarding firms embeddedness in network, however, the literature is silent about the relationship between organizational embeddedness and organizational social capital in a centrally governed supply network that is a network governs by a strong focal organization which enforces and monitors the supply and demand of materials by other sub organizations in the network. Network scholars have found a strong relationship between organizational embeddedness in network structure and organizational social capital in a decentralized network form of organization [Wasserman, Galaskiewicz 1994, Ter Wal, Boschma 2009, Chang 2003a,

McEvily, Zaheer 1999, Ahuja 2000, Anderson et al. 1994, Provan et al. 2007, Galaskiewicz, Marsden 1978, Johnson, Mareva 2002, Haibin, 2004, Breschi, Lissoni 2005, Hite et al. 2005].

In this research, although no doubt organizational social capital emerged in network forms of organizations, we argue that the presence of a central actor or dominant power such as the focal organization in a supply network, may change the pattern of inter connectivity and ties among organizations in the network hence the impact to the organizational social performance. At the minimum, the flow of information may have to go through the central actors before it can be disseminated to other actors in the network. Furthermore, the formal power of the central organization may add new perspectives to the informal, social control mechanism operating in the network.

HYPOTHESIS

In this study, the researcher argues that contract ties, information-sharing ties, referral made ties and referral received ties constitute networks among firms in the centralized upstream supply network structure. The researcher further explains the important characteristics of these and clarifies how and why these ties or inter-firm relations constitute the networks. First, inter-firm relations such as: contract ties, information-sharing ties, referral made ties, and referral received ties are conduits of information [Srividasan 1999]. Ahuja [2000] stated that inter-firm relations could also function as the communication channels between firms and their partners. For instance, it was found by McEvily and Zaheer [1999] that relevant advice obtained by managers from their colleagues in other firms is instrumental in developing the capabilities and innovation of the respective firms. Wasserman and Faust [1994] stated that a network was made up of a finite set of actors and relations. The authors added that the relations between the actors defined the actors of the network. In the following networks, namely: contract tie, information-sharing tie, referral made tie and referral received tie; actors are the firms. Similarly, the relations are, specifically: contract, information-sharing,

referral made, and referral received, all of which exist in the upstream supply chain.

In this study, the researcher argues that, among the firms that are embedded in the centralized upstream supply network; some will obtain more relational capital compared to other firms as a result of this embeddedness. Thus, the level of relational capital influence will depend upon the network structural positions of the firms in both formal and informal inter-firm relations. The network structural positions namely: betweenness centrality. In this research, the researcher posited that firm embeddedness based on this network structural position implies a firm level of relational capital outcomes in the upstream supply network structure.

Centrality relates to the coreness of a firm position in a network of inter-firm relationships [Freeman 1979]. By coreness is meant central location of the firms in the network. Network analysts relate centrality with control and power as function of certain relational characteristics [Hanneman, Riddle 2005]. Centrality can be measured as characteristics of the overall network in which it is called centralization. Centrality can also be measured at the actor level property. Centralization index ranges from 0 to 1, provides a measure of variation around a central tendency, similarly to the standard deviation [Knoke, Kuklinski 1982; Knoke, Yang 2008]. The measures of centralization commonly applied in the social network research is the betweenness centrality.

The betweenness centrality concept measures the degree to which a firm in the centralized upstream supply network is located between the path connecting two or more firms [Freeman 1979; Wasserman, Faust 1994; Scott 1998].

Betweenness centrality index refers to the extent to which an actor is located in a bridging position between actors of a network. For example, let us suppose actor B is located in a betweenness centrality position between actor A and C in a triad network [Freeman 1979]. Because of the bridging position of the actor, betweenness centrality is also an indication of an actor's brokerage

power in the network. Betweenness centrality index is defined as:

$$\text{Betweenness Centrality} = \frac{\sum_{j>k} g_{jk}(ni)/G_{jk}}{(g-1)(g-2)/2}$$

Where g_{jk} and $g_{jk}(ni)$ are the minimum ties needed for linking actor, i and actor j in the network of g nodes. Index score of zero shows that an actor is not occupying any bridging position in the network of g actors, while an index score of one indicates that the actor is in a bridging position among all the network actors ([Wasserman, Faust 1994]. Ibarra [1993] stated that, actors that occupy this brokerage position often possessed the advantage as the broker for the flow of information among the network actors. Hence, taking away a node betweenness centrality index may result in the network becoming disconnected through the indirect connections.

Influence is the indirect measure of firm power [Freeman 1979]. For example, Oliver and Montgomery [1996], using data from in person interviews with the directors of 20 organizations in Oregon, found that the organization with the greatest influence within the system is the one that has the best ability to allocate funds.

Power can be derived in an inter-firm relationship from the resources that a firm may hold in its inventory. Resource control can alleviate a firm's influence over others. Emerson [1962] found that a firm may have influence upon other firms when these firms rely upon it for the resources that they need for operations. It follows that the more other firms rely upon one firm for resources, the more powerful or influential the resourceful firm will be perceived in the network [Hager, Galaskiewicz, Larson 2004].

Resource dependency theory argues that firm centrality in inter-firm relationships can be the result of frequency of interactions or exchanges that take place among firms in the network. Furthermore, firm centrality also

functions as a gate-keeper of resources which increases the influence of the firm in the network structure.

Aligned with previous works [Farmer, Rodkin 1996; Freeman 1979; Galaskiewicz, Bielefeld, Myron 2006; Ibarra 1993; Mehra, Kilduff, Brass 2001; Nahapiet, Ghoshal 1998], the researchers posited that influential or powerful firms tend to be located at the centre of a network. Consequently, the researcher posited that, in the context of the centralized upstream supply network structure:

Hypothesis: Firm's embeddedness following their betweenness centrality position in the centralized upstream supply network through different inter-firm relations impact the level of influence that the firm may acquire from other network members.

METHODOLOGY

Align with the objectives of this study; the design and methodology of are based on the theoretical and analytical framework of the Social Network Analysis (SNA). For this study, an upstream supply network of a small maritime industry seemed to be an ideal setting. A supply network in the maritime industry is a material-intensive enterprise. Much of the activities and activities are highly dynamics and are widely dispersed throughout the network. Materials and information flow are transferred through interactions among different firms. Because firms in supply network operate in an environment of high degree of complexity [Bozarth et al. 2009] and uncertainty [Wilding 1998a], these firms seek an edge through connections or interactions with the members of the network.

The research site of this study is located in the country Malaysia. The researcher profiles different supply networks critically to determine the most suitable network for study. One of the networks, here labelled as APMHQ-1 supply network, was found to be the appropriate site for this exploration. The top level managements were approached for possible participations in the study. After several communication about the goal of this

study and the potentials benefits for the APMMHQ-1 supply network, positive commitments were received from the top managements to participate and granting participations to this study. In network studies, all the actors that are located within the naturally occurring boundaries are included for analysis. Consequently, network studies do not use samples as in the conventional sense, rather, it seek to include all of the actors in some population or populations [Hanneman and Riddle 2005]. Defining and locating the boundaries of a network is utmost important in a network study. To identify and define the target population within the APMMHQ-1 upstream supply network for RHIB, for this study, the author combines the realist and the nominalist approach.

A survey instrument was used to collect majority of the information needed for this study. Surveys and questionnaire are traditional tools to help network researchers to obtain data on inter-organizational relationships (Wasserman and Faust, 1994). Leading network researcher such as Galaskiewicz and Marsden (1978), Knoke and Kuklinski (1982), Burt (2004), and Borgatti and Li (2009a) established the credibility of this technique for the collection of network data on inter-organizational transactions such as information transfer, resource transfer and joint activities. Survey is suitable for this type of study because it allows the researcher to tap into the participants' subjective perceptions of interactions rather than objective measure of interactions, which many situations are hard to get access to for confidentiality reasons (Diani, 2002). The survey instrument used in this study followed standard survey design features such as asking general information questions at the beginning, followed by more specific questions, and lastly the most probing questions at the end. The survey questionnaire consisted of closed ended questions and open ended questions. In general the questionnaire were framed following the standard of Choi and Hong (2002), Provan and Milward (1995), Stone (2001), Corteville and Sun (2009) and Cross and Parker (2004).

For data analysis, the researcher performed exploratory social network analysis (visual analysis) of buyer-supplier organizations

network by exploring the network maps and the network structural measures. For this purpose, this research adopted a spring-embedding visualization method in the UCINET program whereby a network layout is computed using force directed algorithm. More specifically, the algorithm place nodes based on node repulsion and equal edge length bias. When so configured, the placement of nodes in the sociogram is based on forcing the nodes apart and tending to select placements that lead to equal edge lengths (i.e., equal length lines between nodes). This particular layout has the advantage of detecting network centrality patterning [Polites, Watson 2008]. For these routines, this research applied the network imaging software within the UCINET [Borgatti et al. 2002] i.e. the NetDraw, which is equipped with sophisticated visualization techniques. Visual representation of supply networks can provide useful direction for researchers, and starting point to developed subsequent quantitative analyses [Choi, Hong 2002b].

FINDINGS AND DISCUSSION

Exploratory Network Analysis: Visual Analysis of Social Network Influence Network Map and Betweenness Centrality. In Figure 1, the researcher found that the influential firms of the network are also the nodes or firms having the highest embeddedness scores and the highest influence scores. For example, APMMHQ-1 is observed to be highly influential with an influence score of 20 and also highly embedded in the contract tie based on betweenness centrality, as indicated by the large node size. In addition to that, the periphery network members are also the less influential among the firms. For example, PMKURAU-9, DMKLIIGGI-15, and PMMRSNG-17 are among the less influential firms which also possessed low embeddedness scores based on betweenness centrality in contract tie.

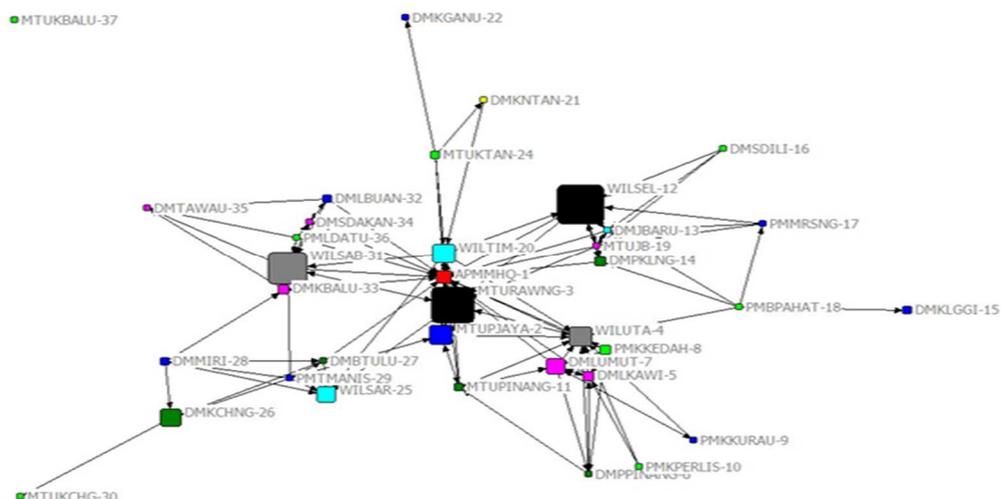


Fig. 4. Influence Network and Firm Embeddedness Based On Betweenness Centrality in Referral Received Tie
Rys. 4. Sieć wpływów i zależności w oparciu o wskaźnik centralizacji gniazda sieci w modelu referencyjnym wejściowym

DISCUSSION

The exploratory gave interesting insight into the implication of firm embeddedness upon its relational capital outcomes in a centralized upstream supply network structure. The objective of this section is to discuss the findings of this study and how it contributes to theory and practice. This study draws attention to firms' embeddedness or involvement in the various types of relationships in a centralized upstream supply network and the underlying impacts of this embeddedness. More specifically, the researcher examined the relationship between a firm's level of embeddedness, based on its network structural positions in the centralized upstream supply network and the relational capital influence.

In the context of a centralized upstream supply network inter-firm relationship, it can be seen that related parties in the network of relationships encounter conflicts through goal incongruence and suspicions of asset abuse. Similarly, where a party considers it has been unfairly treated by another party, there will be a higher chance of a more complex supply

network resulting from these inter-firm relationships. Organizational study scholars such as Powell [1996] and Putnam [1998] have proposed the adoption of a network form of organizational governance. They posit that this is an acceptable means to the inter-firm relations complexity as it can create numerous relational capital outcomes, such as influence. Further, it can also contribute to an increase of competitive advantage and economic performance in the context of decentralized network structure to the firms embedded in the network structure.

Consequently, the researcher addressed the issue of inter-firm relationships in the centralized upstream supply network by investigating the pattern of firm embeddedness through its network structural positions in the four types of inter-firm relations. It was evident to the exploratory network analysis of the network maps and network embeddedness measures that firm embeddedness in the centralized upstream supply network was related to the degree of formality of the network tie.

The first argument relates to the pattern of embeddedness of firms based on the types of

network relations. In the context of the centralized upstream supply network structure, firms were found to be more embedded or involved in network relations that require fewer formal coordination approaches than in the network relations that were formally managed through terms and regulations. An example of this is the contract tie, as evidenced through the increased level of connectivity among firms shown in Figure 1(contract tie network map), Figure 2 (information-sharing tie network map), Figure 3 (referral made tie network maps) and Figure 4 (referral received tie network map). The results of the exploratory network analysis conformed to similar findings in the literature. For example, Polanyi [1957] posited that the embeddedness of economic actions was supplemented by market approach in the post-industrial societies. In addition, Granovetter [1985] reiterated this position in his study, wherein the author posited that all economic actions were embedded in networks of social relations. Following that, Uzzi [1997] found that in the apparel business, although contracts govern the transactions between firms, the author found that firms rely most upon the web of social exchanges. The finding of the exploratory network analysis adds to the views of Polanyi [1957], Granovetter [1985] and Uzzi [1997]. Similar to these authors, this study found that, at least in the APMMHQ-1 upstream supply network for RHIB; formal coordinative relations (such as the contract tie) only represent a small part of the actual interaction that exists in the upstream supply network structure. It was also determined that the other (or maybe the larger) portion of the network economic action is transmitted through a network of social relations.

The finding also reveals that firm embeddedness in the contract ties, information-sharing and referrals ties respectively have no effect upon the level of reputation. In this case, the findings of Osman [2013] contradict other earlier findings in the literature, such as those by Burt [1995] and Anderson [1999]. Osman [2013] argued that the effect of embeddedness on reputation may be disrupted by the spill-over effects (Anderson 1999) that firms may experience through their connections to firms with bad rapport in the network structure. Although spill-over effects

are not tested in this study (potentially for future research), the consequences of how firms with bad history may spill over to other network members to whom they are connected are well-known in the literature. Consequently, caution must be taken when forging new partnerships or collaborations. Histories of performance and actions of the potential partners must be factored in before decisions of collaborations are forged. In addition, the centralized nature of the upstream supply network may alter the effects on relational capital outcomes, as found in the studies of Burt [1995] and Anderson [1999].

CONCLUSION AND RECOMMENDATION

This study contributes to the extant body of relational capital, strategy and network literature. The relationship between inter-firm relations and relational capital has long been studied, but the empirical proof of a relationship in the context of a centralized network of relations was limited [Provan 2004]. With the advancement of globalization, the upstream supply network has become more complex over the years. As the upstream supply network has become more complex, focal firms tend to monitor and administer the transactions and activities in the network, thereby creating a centralized network structure. Although Putnam [1990] argues that relational capital exists in a network structure of relations, the context of this research mainly focuses on the decentralized network structure. Choi [2008] made a number of propositions regarding several benefits that occur when firms are embedded in the centralized upstream supply network structure. This includes understanding which firms can be influential and relied upon for resources. They warn the readers against dismissing partners in the centralized upstream supply network structure, based on accounting measures, when these firms are actually more influential and reliable with regard to their resources and connections.

Relational capital exists in networks of inter-firm relations, such as in the centralized upstream supply network structure [Putnam 1999]. Being related to other firms in the upstream supply network is beneficial to firms

subject to their holistic understanding of their embeddedness in the network structure. The inter-firm relations in the upstream supply network structure not only emerged from the formal administrative, but were also initiated through other webs of social exchanges. Among the firms that are embedded in the centralized upstream supply chain, some will gain more benefits compared to others as a result of firm embeddedness or involvement based on the respective network structural positions.

In addition, this research has tested and confirmed the presence of relational capital outcomes in the context of a centralized network structure. This refers, at least, to the relational capital influence in the context of a centralized upstream supply network structure. Organizational network researchers such as Putnam [1993] and Uzzi [1997] have examined cooperation in naturally-occurring horizontal network or decentralized network structures. Supply network, in its original form, is related to a managed organization network or centralized network, as initial formations are motivated by the needs of the focal firm to manage and administer the transactions of materials based on certain agreements. The difference between the naturally-occurring decentralized network structure and centralized network can be described as the bottom-up and top-down approach of cooperation. The top-down approach is facilitated by formal criteria. As this study's analysis indicates, cooperation is not totally antagonistic towards formal control. For instance, a high density index of the network structure of the informal information-sharing ties compared to the formal contract network indicates the high connectivity of firms in the information-sharing network rather than the contract network. The intensity of ties may represent the adaptability of cooperation in the centralized upstream supply network. These findings reaffirm the contention that even the formal, hierarchical institutions do not impede cooperation activities between the firms in the network and consequently, the creation of relational capital [Ostrom, Walker 2000]. In other words, this study's finding suggests that stocks of relational capital do exist in the context of a centralized network structure, even though the hierarchical network

has been considered as an impediment to growth.

In conclusion, by considering the overall implications of our study, we may conclude that complexity is not all bad. Managers need to consider their firm's existing embeddedness in order to exploit the competitive advantage of supply network inter-organizational relationships. Firms that fail to understand the underpinnings of these relationships stand to face more difficulties within the network itself. For this reason managers that intend to obtain competitive advantage from the network must engage with other partners more effectively. No doubt, some firms are at an adequate standing, while others are struggling in some areas. The framework of this study can be applied by managers who are committed in engaging other network members.

REFERENCES

- Beamon B., 1999b. Measuring supply chain performance. *International Journal of Operations & Production Management*, 19(3), 275-292.
- Benjamin B.A., Podolny J.M., 1999. Status, quality, and social order in the California wine industry. *Administrative science quarterly*, 44(3), 563-589.
- Borgatti S., Li X., 2009. On Social Network Analysis In a Supply Chain Context. *Journal of Supply Chain Management*, 45(2), 5-22.
- Borgatti S.P., Jones C., Everett, M.G., 1998. Network measures of social capital'. *Semantic Pajek Networks Software*, 21(2), 27-36.
- Bozarth C.C., Warsing D.P., Flynn B.B., Flynn E.J., 2009. The impact of supply chain complexity on manufacturing plant performance. [doi: DOI: 10.1016/j.jom.2008.07.003]. *Journal of Operations Management*, 27(1), 78-93.
- Brookes N., Singh A., 2008. *Social Networks and Supply Chains*.
- Burt R.S., 1995. *Structural holes: The social structure of competition*: Harvard Univ Pr.

- Burt R.S., 2001. Structural holes versus network closure as social capital. *Social capital: Theory and research*, 31-56.
- Carmeli A., Tishler A., 2004. The relationships between intangible organizational elements and organizational performance. *Strategic Management Journal*, 25(13), 1257-1278.
- Carmeli A., Tishler A., 2005. Perceived organizational reputation and organizational performance: an empirical investigation of industrial enterprises. *Corporate Reputation Review*, 8(1), 13-30.
- Carrington P.J., Scott J., Wasserman S., 2005. *Models and methods in social network analysis*: Cambridge Univ Pr.
- Ebbers J.J., Wijnberg N.M., 2010. Disentangling the effects of reputation and network position on the evolution of alliance networks. *Strategic Organization*, 8(3), 255.
- Fombrun C.J., 1996. *Reputation*: Harvard Business School Press.
- Fombrun C.J., 2008. *Reputation: Realizing value from the corporate image*: Harvard Business School Press.
- Freel 2003. Sectoral patterns of small firm innovation, networking and proximity. [doi: DOI: 10.1016/S0048-7333(02)00084-7]. *Research policy*, 32(5), 751-770.
- Freeman L.C., 1979. Centrality in social networks conceptual clarification. *Social Networks*, 1(3), 215-239.
- Fritsch M., Kauffeld-Monz M., 2010. The impact of network structure on knowledge transfer: an application of social network analysis in the context of regional innovation networks. *The Annals of Regional Science*, 44(1), 21-38.
- Galaskiewicz J., Marsden P.V., 1978. Interorganizational resource networks: Formal patterns of overlap. [doi: DOI: 10.1016/0049-089X(78)90006-6]. *Social Science Research*, 7(2), 89-107.
- Gnyawali D.R., Madhavan R., 2001. Cooperative Networks and Competitive Dynamics: A Structural Embeddedness Perspective. *The Academy of Management Review*, 26(3), 431-445.
- Goins S., Gruca T.S., 2008. Understanding competitive and contagion effects of layoff announcements. *Corporate Reputation Review*, 11(1), 12-34.
- Granovetter M., 1973. The strength of weak ties. *American journal of sociology*, 78(6), 1360-1380.
- Granovetter M., 1985. Economic action and social structure: the problem of embeddedness.
- Gulati R., 1998. Alliances and networks. *Strategic Management Journal*, 19(4), 293-317. doi: 10.1002/(sici)1097-0266(199804)19:4<293::aid-smj982>3.0.co;2-m
- Hager M.A., Galaskiewicz J., Larson J.A., 2004. Structural embeddedness and the liability of newness among nonprofit organizations. *Public Management Review*, 6(2), 159-188.
- Hall L., Bagchi-Sen S., 2002. A study of R&D, innovation, and business performance in the Canadian biotechnology industry. *Technovation*, 22(4), 231-244.
- Haythornthwaite C., 1996. Social network analysis: An approach and technique for the study of information exchange. [doi: DOI: 10.1016/S0740-8188(96)90003-1]. *Library & Information Science Research*, 18(4), 323-342.
- Helm S., Salminen R.T., 2010. Basking in reflected glory: Using customer reference relationships to build reputation in industrial markets. [doi: 10.1016/j.indmarman.2010.02.012]. *Industrial Marketing Management*, 39(5), 737-743.
- Ibarra H., 1993. Network Centrality, Power, and Innovation Involvement: Determinants of Technical and Administrative Roles. *The Academy of Management Journal*, 36(3), 471-501.
- Ingram P., Roberts P.W., 2000. Friendships among competitors in the Sydney hotel industry. *American Journal of Sociology*, 387-423.
- Inkpen A.C., Tsang E.W.K., 2005. Social capital, networks, and knowledge transfer.

- The Academy of Management Review, 146-165.
- Johnson D., Mareva M., 2002. It's a Small (er) World: The Role of Geography and Networks in Biotechnology Innovation.
- Kilduff M., Tsai W., 2003. *Social networks and organizations: Sage Publications Ltd.*
- Kim Choi T.Y., Yan T., Dooley K., 2010. Structural Investigation of Supply Networks: A Social Network Analysis Approach. [doi: DOI: 10.1016/j.jom.2010.11.001]. *Journal of Operations Management*, 2010.
- Podolny J.M., 1993a. A status-based model of market competition. *The American Journal of Sociology*, 98(4), 829-872.
- Podolny J.M., 1993b. A status-based model of market competition. *American Journal of Sociology*, 829-872.
- Ponomariov B.L., Boardman P.C., 2010. Influencing scientists' collaboration and productivity patterns through new institutions: University research centers and scientific and technical human capital. [doi: 10.1016/j.respol.2010.02.013]. *Research Policy*, 39(5), 613-624.
- Powell W.W., Koput K.W., Smith-Doerr L., Owen-Smith J., 1999. Network position and firm performance: Organizational returns to collaboration in the biotechnology industry. *Research in the Sociology of Organizations*, 16(1), 129-159.
- Provan K.G., 1993. Embeddedness, interdependence, and opportunism in organizational supplier-buyer networks. *Journal of Management*, 19(4), 841-856.
- Purohit D., Srivastava J., 2001. Effect of manufacturer reputation, retailer reputation, and product warranty on consumer judgments of product quality: A cue diagnosticity framework. *Journal of Consumer Psychology*, 10(3), 123-134.
- Putnam R.D., 1993. The prosperous community: social capital and public life. *The American Prospect*, 13(4), 35-42.
- Rao P., 2002. Greening the supply chain: a new initiative in South East Asia. *International Journal of Operations & Production Management*, 22(6), 632-655.
- Romo F.P., Schwartz M., 1995. The Structural Embeddedness of Business Decisions: The Migration of Manufacturing Plants in New York State, 1960 to 1985. *American sociological review*, 60(6), 874-907.
- Roy S., Sivakumar K., Wilkinson I. F., 2004. Innovation Generation in Supply Chain Relationships: A Conceptual Model and Research Propositions. *Journal of the Academy of Marketing Science*, 32(1), 61-79. doi: 10.1177/0092070303255470
- Scott J.P., 2000. *Social Network Analysis: A Handbook: SAGE Publications.*
- Shan W., Walker G., Kogut B., 1994. Interfirm cooperation and startup innovation in the biotechnology industry. *Strategic Management Journal*, 15(5), 387-394.
- Shrum W., Wuthnow R., 1988. Reputational status of organizations in technical systems. *American Journal of Sociology*, 882-912.
- Simsek Z., Lubatkin M.H., Floyd S.W., 2003. Inter-Firm Networks and Entrepreneurial Behavior: A Structural Embeddedness Perspective. [doi: 10.1016/S0149-2063(03)00018-7]. *Journal of Management*, 29(3), 427-442.
- Sivadasan S., Efstathiou J., Shirazi R., Alves J., Frizelle G., Calinescu A., 1999. Information complexity as a determining factor in the evolution of the supply chain'.
- Stuart T.E., Hoang H., Hybels R.C., 1999. Interorganizational endorsements and the performance of entrepreneurial ventures. *Administrative science quarterly*, 315-349.
- Tsai W., 2001. Knowledge Transfer in Intraorganizational Networks: Effects of Network Position and Absorptive Capacity on Business Unit Innovation and Performance. *The Academy of Management Journal*, 44(5), 996-1004.
- Uzzi B., 1996. The sources and consequences of embeddedness for the economic performance of organizations: The network effect. *American sociological review*, 61(4), 674-698.
- Uzzi B., 1997. Social Structure and Competition in Interfirm Networks: The Paradox of Embeddedness. *Administrative science quarterly*, 42(1), 35-67.
-

Vachon S., Klassen R., 2002. An exploratory investigation of the effects of supply chain complexity on delivery performance. *IEEE Transactions on Engineering Management*, 49(3).

Wasserman S., Faust K., 1994. *Social network analysis: Methods and applications*: Cambridge Univ Pr.

Wasserman S., Galaskiewicz J., 1994. *Advances in social network analysis: Research in the social and behavioral sciences*: Sage Publications, Inc.

Yu T., Lester R.H., 2008. Moving Beyond Firm Boundaries: A Social Network Perspective on Reputation Spillover. *Corporate Reputation Review*, 11(1), 94-108.

Zhu Q., Sarkis J., Lai K.-h., 2007. Green supply chain management: pressures, practices and performance within the Chinese automobile industry. [doi: DOI: 10.1016/j.jclepro.2006.05.021]. *Journal of Cleaner Production*, 15(11-12), 1041-1052.

MODEL POWIĄZAŃ SOCJALNYCH W OBRĘBIE ŁAŃCUCHA DOSTAW W PRZYPADKU FORMALNEJ I NIEFORMALNEJ WSPÓŁPRACY BIZNESOWEJ

STRESZCZENIE. Wstęp: Różne efekty wpływu pozycji firm w strukturze powiązań łańcucha dostaw typu upstream na poziom oferowanych przez te firmy jakości obsługi był przedmiotem przeprowadzonych badań. Wcześniejsze badania koncentrowały się głównie na zawartości zdecentralizowanej struktury sieciowej. Jednak łańcuch dostaw jest siecią scentralizowaną z powodu istnienia firmy o największym znaczeniu w obrębie tego łańcucha. Istnienie takiej firmy wpływa na relacje i sposób działania pozostałych firm w łańcuchu.

Metody: Celem pracy było określenie typu pozycji w strukturze sieciowej wymaganej w celu uzyskania zadowalających relacji w obrębie łańcucha dostaw typu upstream.

Wyniki i wnioski: Pozycja w strukturze sieciowej, tj. wartość wskaźnika centralizacji gniazda sieci (betweenness centrality) wpływa na poziom oddziaływania na innych, możliwy do realizacji przez daną firmę. Firmy znajdujące się w strukturze łańcucha dostaw w różny sposób korzystają z możliwości oddziaływań na innych w zależności od ich pozycji w tym łańcuchu. Zasoby firmy powinny być tak dobrane, aby mogła ona czerpać korzyści, znajdując się w różnych pozycjach w obrębie danej struktury sieciowej.

Słowa kluczowe: zarządzanie łańcuchem dostaw, prace nad siecią, stosunki międzyorganizacyjne, kapitał społeczny, kompleksowość łańcucha dostaw.

EIN MODELL FÜR SOZIALE VERBINDUNGEN INNERHALB DER LIEFERKETTE IM FALLE EINER FORMELLEN UND INFORMELLEN BUSINESS-KOOPERATION

ZUSAMMENFASSUNG. Einleitung: Gegenstand der durchgeführten Erforschung war es, unterschiedliche Effekte des Einflusses der Position von Firmen in der Struktur der Verbindungen innerhalb der Lieferkette vom Type upstream auf das Niveau der durch diese Firmen angebotenen Service-Qualität zu ermitteln. Frühere Forschungen konzentrierten sich hauptsächlich auf den Inhalt dezentralisierter Netzwerk-Strukturen. Die Lieferkette stellt jedoch ein zentralisiertes Netzwerk wegen Bestehen einer meist einflussreichen Firma innerhalb der betreffenden Lieferkette dar. Das Vorhandensein einer solchen Firma beeinflusst also interne Verhältnisse und Wirkungsmodelle der anderen, an der Lieferkette beteiligten Firmen.

Methoden: Das Ziel der Arbeit war es, die Art der Position in der Netzwerk-Struktur, die für die Erzielung von zufriedenstellenden Realationen innerhalb der Lieferkette vom Type upstream erforderlich ist, zu bestimmen.

Ergebnisse und Fazit: Die Position in der Netzwerk-Struktur, d.h. der Wert der Zentralisation-Kennziffer des Netzwerk-Nestes (betweenness centrality) beeinflusst das Niveau der möglichen Einwirkung einer Firma auf die anderen Beteiligten. Die in der Netzwerk-Lieferketten befindlichen Firmen nehmen die Möglichkeit der Beeinflussung von anderen, und zwar in Abhängigkeit von ihrem Range in der betreffenden Lieferkette, in Anspruch. Die Ressourcen einer Firma sollten daher so gestaltet sein, dass sie Nutzen schöpfen kann, unabhängig von deren momentan unterschiedlichen Position innerhalb der gegebenen Netzwerk-Struktur.

Codewörter: Management der Lieferkette, Arbeiten am Netzwerk, zwischenorganisationelle Verhältnisse, soziales Kapital, Komplexität der Lieferkette.

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