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EMBEDDEDNESS INTO BUSINESS NETWORKS IN TRANSPORT AND LOGISTICS SECTOR

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Abstract. In this paper, an empirical research of business networking in transport and logistics sector is presented with the aim to explore the embeddedness into inter-firm and intra-firm business networks. The research comprises identification of the mode of networking (inter-firm or intra-firm networking), the level of participation in global networks; analysis of network attributes. The empirical research was constructed as a case study of the companies operating in the USA, the U.K and Lithuania to analyse their networking from different perspectives (structural, relational and usage) and compare the modes of interaction. Empirical research found the evidence that more similarities than differences between the inter-firm and intra-firm types of networking have been identified, which leads to conclusion that similar networking practices could be interchangeably adapted in both types of the networks.

Keywords: intra-firm, inter-firm, networking, business networks.
JEL classification: L-23, L-91

Introduction

During the past two decades the networking phenomena and embeddedness into business networks have attracted much scientific attention. On the other hand, this field still lacks commonly accepted research methodologies and empirical evidence to the theories from business practise, especially on application of the theory in particular business sectors. Some widely spread concepts have gained general acceptance, without their empirical exploration. In a growing number of recent studies the impact of relational embeddedness on inter-organisational outcomes is discussed by examining reciprocal helping relations (Hansen, 1999), as well as impact on execution-oriented and

innovation-oriented task performance (Moran, 2005) and ease of knowledge transfer (Argote *et al.*, 2003).

It is assumed that different types of networks (production and distribution, business and social, horizontal and vertical) can exist simultaneously in the same expanded business network and that these networks are interrelated. The concept of embeddedness becomes the core issue in network research (Halinen, 1998). Embeddedness is approached by scholars to analyse relationships among partners and is found to be related with the firm's future capability to develop overtime through adaptation and trust (Gulati, 1998; Hansen, 1999; Uzzi and Lancaster 2003; McEvily and Marcus, 2005; Khoja and Maranville, 2009). Increasing consensus in the academic literature that a firm's embeddedness in a network of inter-firm relations matters for its performance (Gilsing, *et al.*, 2008), makes empirical research in this field even more important. The assumption that there is a necessity to recognise the ability of the networks to build and construct new networks on new purposed actions has been one of the key points making networking research valuable for analysis of competitiveness and life cycle of the company (Castels 2000, Vilkas and Bučaitė-Vilkė, 2009).

This paper deals with the transport and logistics sector, which is claimed to be a pioneering field for networking practices. The research presented aims to find empirical evidence of the networking theory while exploring the level of the transfer of inter-firm networking practices into intra-firm and *vice versa*.

The empirical research has been encompassing the following tasks:

- to identify and explore the mode (internal and external networking) predominant in the companies researched/surveyed.
- to explore the level of the networking through analysing the scope of the actions performed.
- to explore the peculiarities of companies' networking in structural, relational, usage dimensions in order to get an insight whether the networking practices are homogeneous or the companies behave differently in intra and versus inter-firm networks.
- to find evidence that companies embedded into inter-firm networks tend to apply the same practise for internal networking.

Embeddedness into transport and logistics business networks

The inter-firm networks of the firm are understood as a set of firm's relationships, both *horizontal* and *vertical*, with other organisations – suppliers, customers, competitors, entrepreneurs (Stuart and Sorenson, 2007) or other entities. Intra-firm networks are a set of formal and/or informal collaborative or learning relationships among business nodes/units of the same legal entity (Achrol and Kotler, 1999, Nugaras and Radzevičienė, 2009). Under this arrangement, each business unit has a sufficient degree of freedom to make most of its own resource allocation decisions while still working in close cooperation with its affiliated business units (Khoja and Maranville 2009). Both inter-firm and intra-firm relations can include relationships across industries and countries (Gulati, *et al.* 2000; Nugaras and Radzevičienė, 2009).

Embeddeness to horizontal and vertical; internal and external networks could be adapted to the organisational practices of both large multinational companies (Ghoshal, and Bartlett, 2005) and SMEs as well. There are two dimensions that characterise embeddedness among business partners- (1) relational embeddedness (Gulati, 1998; Uzzi, 1999) and (2) structural embeddedness (Burt, 1992). Relational embeddedness stresses the role of direct cohesive ties as a mechanism for gaining fine-grained information (Gulati, 1998). Structural embeddedness, on the other hand, is the informational positioning of the partners in the relationship (Argote et al., 2003, Rindfleisch and Moorman, 2001).

Networks are continuously developing towards more advanced forms with not only vertical but also horizontal integration. The transport and logistics sector companies are the pioneering ones in using vertical networking model which evolved from buyer and seller relations with a means of transport as a key integrator in the vertical networks. The vertical networking theory is mostly applicable in the value delivering function in the goods market, and it is also an object of investigation of researchers marketing channels looking at the effects of the overall set of ties that bind firms together (Golfetto, *et al.*, 2007).

Although the theory of horizontal networking has been known almost for a decade, we still lack empirical evidence of how the transport and logistics sector is able to apply new forms of networking e.g. in clusters and multimodal logistic chains.

Expanded horizontal networks are often based on *coopetitive* relationship consisting of two diametrically different logics of interaction. Network actors are involved in a relationship that on the one hand consists of hostility due to conflicting interests and on the other hand consists of friendliness due to common interests (Luo, *et al.*, 2006; Lado, 1997; Gnyawali and Madhavan, 2001).

Theoretical framework of the *service value networks* has been also important/used for the empirical research presented in his paper. Particularly, research of Basole and Rouse (2008), who identify five types of actors in the service value network: consumers, service providers, tier 1 and 2 enablers, and auxiliary enablers. The value in a service value network is created through a complex set of B2B, B2C, and C2C relationships, and influenced by the social, technological, economic and political context in which it is embedded.

One of the new issues to be explored in theory and in empirical research is profit sharing among collaborative firms. Stein and Ginevičius (2010) argue that functioning of collaborative business is based on the compatibility of the collaborative business members' interests and suggests formula for the profit-sharing mechanism.

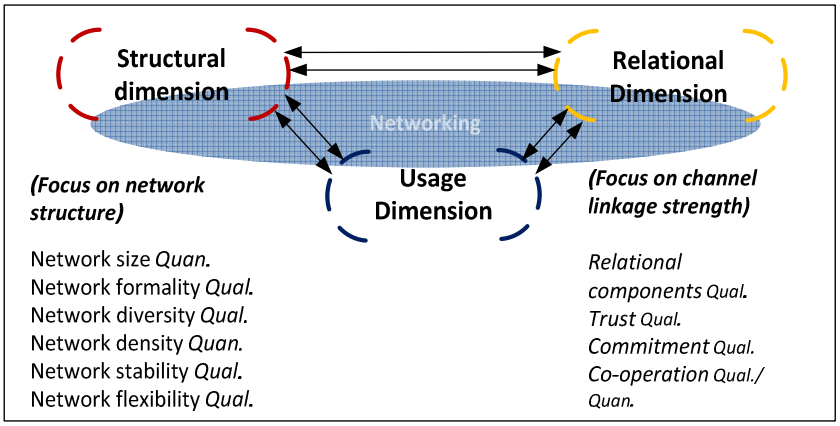
The theoretical framework presented above served to elaborate the hypothesis for the empirical research and to identify major issues to be tackled/explored. In this particular paper the major findings are presented, which are derived/coming from the comparison of the empirical inter-firm networking to intra-firm networks in order to identify how different networking modes are blended in business practice of the logistics and transport companies.

Research methodology

In this research, embeddedness in the networks have been analysed taking into consideration 3 different company selection criteria: (1) participation in inter-firm or intra-firm networking; (2) level of participation in global networks, (3) three-dimensional structure for different networks' attributes analysis.

Theoretical model proposed by Carson, *et al.* (2004) has been applied as a framework (Fig. 1). The case study approach has been chosen in order to investigate the questions "how and why". To combine the results from the inter-firm and intra-firm networking, a survey based on a semi-structured questionnaire was conducted.

Fig. 1. Research dimensions (Carson, *et al.* 2004)



The main research questions explored are: how networking improves the characteristics of company performance; how moving from the network periphery to the centre improves performance of the company, what is the stage of networking in the Lithuanian transport and logistics; how inter-firm and intra-firm networking differs in structural, relational and usage dimensions. In order to compare the results of different companies, Likert scale questions were used.

The empirical research was performed during the period from August 2009 to April 2010. Experts from 4 international companies and 2 local (Lithuanian) companies participated in the in-depth interview. The investigation included 2 companies participating in an inter-firm network and 4 companies participating in an intra-firm networking, 4 companies in Lithuania, 1 in the USA, and 1 in the U.K.

a) *DHL* is a global market leader in the logistics industry providing international express, air and ocean freight, road and rail transportation and contract logistics services (DHL, 2010). *Its Lithuanian branch is analysed.*
b) *Kuehne + Nagel* is a global leader in international forwarding, it delivers integrated solutions across the supply chain, and ranks among the top three worldwide contract logistics providers (Kuehne + Nagel 2010). *Its branches in New York and Lithuania are analysed.*

c) *The Mott MacDonald Group (analysed branch in the U.K.)* is a management, engineering and development consultancy company serving public and private sectors worldwide, it has implemented global projects in the transport and logistics sector and has been working in various transport and logistics networks (Mott MacDonald Group 2010).
d) *AD REM* is one of the largest Lithuanian logistics, transport and warehousing group of companies. AD REM services: international and local road, rail, air, sea transportation and forwarding services, warehousing and distribution, import – export terminal, bonded warehouses services, customs brokerage, cargo insurance, and third-party logistics (3PL). Member of the World Freight Network (AD REM 2010).
e) *Remil* – provides freight forwarding on the peat moss export and load delivery to customers. Company is the main transporter of the Company DURPETA production. (Remil 2010) Is not a member any formalised networks.

The findings of empirical research

Structural dimension of networking

Network size and maturity: the surveyed companies are different in size, global coverage, and the size of the network (Table 1). All global companies have more than 10 years networking experience, global coverage and more than 100 members in the network, and are defined as mature networks.

Table 1. The profiles of the surveyed companies

Name of the company	Location of the company/ researched subsidiary	Global coverage	Predominant network type	Number of employees in the company	Size of the network
DHL	Global/Lithuanian	220	Intra-firm	≈ 300,000	≈ 650
Kuehne + Nagel	Global a. USA/New York b. LT/Vilnius	100	Intra-firm	≈ 55,000	≈ 900
Mott MacDonald	Global/UK-Holborn	120	Intra-firm	≈ 14,000	150
Adrem	Local/ Lithuania-Vilnius	1	Inter-firm	≈ 250	≈ 85
Remil	Local/Lithuania-Kaunas	1	Inter-firm	≈ 30	≈ 30

Understanding the importance of networking maturity in the company was evaluated by correlation matrix. The correlation matrix compares the similarity of the companies' attitudes when evaluating particular issues. Correlation analysis of all answers is based on the results of the structured part of the in-depth interview (Table 2). The higher correlation values are identified in Kuehne+ Nagel USA in comparison to

all other companies with correlation average (r = 0, 3489) with standard deviation of (sd = 0,202304).

Table 2. Correlation matrix of the values of the attitudes

	Kuehne + Nagel USA	**Kuehne + Nagel LT**	**Mott MacDonald**	**DHL**	**Adrem**	**Remil**
Kuehne + Nagel USA	1					
Kuehne + Nagel LT	0,3437	1				
Mott MacDonald	0,4500	-0,0193	1			
DHL	0,3236	-0,0303	0,3629	1		
Adrem	0,5170	0,0215	0,3374	0,3565	1	
Remil	0,1102	-0,0079	0,1368	-0,0349	0,4606	1
Average	0,3489	-0,0090	0,2790	0,1608	0,4606	

For further analysis the ANOVA matrix tool was used with hypothesis H0 – the mean of the answers from different companies (A and B) is the same and the companies could be considered as similar; H1- companies are not similar. The test confidence level is (α=0,05). The test results are presented in Table 3.

Table 3. ANOVA matrix similarity analysis

	Ku.+ Na. USA	**Ku. + Na. LT**	**Mott MacDonald**	**DHL**	**Adrem**	**Remil**
Kuehne + Nagel USA	1					
Kuehne + Nagel LT	similar	1				
Mott MacDonald	similar	not	1			
DHL	not	not	not	1		
Adrem	not	not	not	similar	1	
Remil	not	not	not	similar	similar	1

According to the data in Table 4, three groups of players could be identified: (1) global networking players (Kuehne+Nagel USA and Mott MacDonald); (2) the Lithuanian companies (DHL, Adrem, Remil); (3) intra-firm network companies (Kuehne + Nagel USA and Kuehne + Nagel LT). From the correlation and ANOVA matrices several conclusions could be drawn: even if networks have correlation from (r= 0,3374) to (r=0,5170), this does not mean that networks are similar to each other; it means that they have some similar features that correlate. Also the specificity of national (Lithuanian) background makes companies similar in their understanding of and performing in the networks.

Network formality and flexibility was assessed according to operation and communication functions. The transport and logistics sector is based on fixed, standardised operations (av=6,7), this is especially true for intra-firm networks (Mott MacDonald, Kuehne+Nagel USA, Kuehne+Nagel LT).

Inter-firm networks can faster and better adapt to changing environment and have an easier innovation process, but it involves higher risk. In the inter-firm networks no

common goals or results are set: the structure and formality of interaction depend on the interaction between two nods.

There is a semi-formal (value=5) system in DHL: products are formalised to ensure the same quality of the services and unity of the brand, and the lower standardisation of operations and communications ensures a possibility to adapt to cultural differences, as well as local features of the subsidiary (Fig. 1). In intra-firm networks strict goals and results are set by the headquarters. More flexibility could increase the performance efficiency, but it does not contribute to low risk-taking philosophy of a general network.

Network management: it is worth to emphasise the answers that describe different management efforts (Fig. 2). As in this case inter-firm networks are smaller and therefore less complex, less management efforts are needed. From the in-depth interview it is clear that smaller companies do not consider network management as a necessity or an important function. The importance of the role of organising the networks was emphasised. In the case of a larger Lithuanian company, the management of a network is delegated to the headquarters of a formally established inter-firm network, thus networking functions are concentrated on the control of financial transaction flows. The more developed networks, the higher values reflecting the assessment of the network management importance.

Some networks have a binary management model, their network members are jointed in regional units, and there is a separate network for development and coordination of products, another network is also managed on the regional basis with the headquarters, but as the products are not so strictly specified, there is no separate product management.

Fig. 2. Network formality

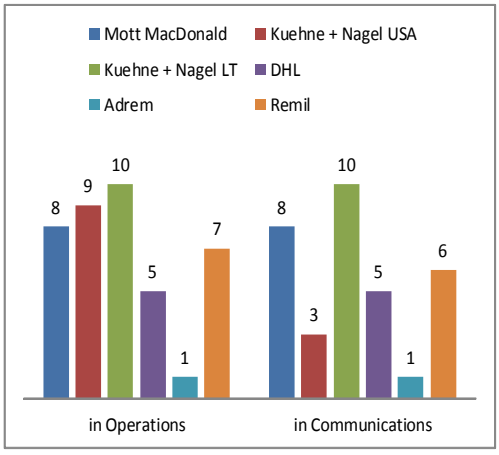
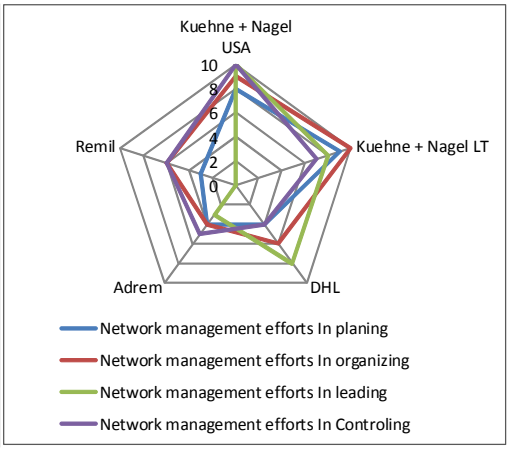


Fig. 3. Management of networks



Network growth and stability: strategic network development depends on how the network growth is considered. The analysis indicates that increase in the turnover is highly considered as network growth (av=. 9,2 in a scale from 1 to 10) (Fig. 3). All

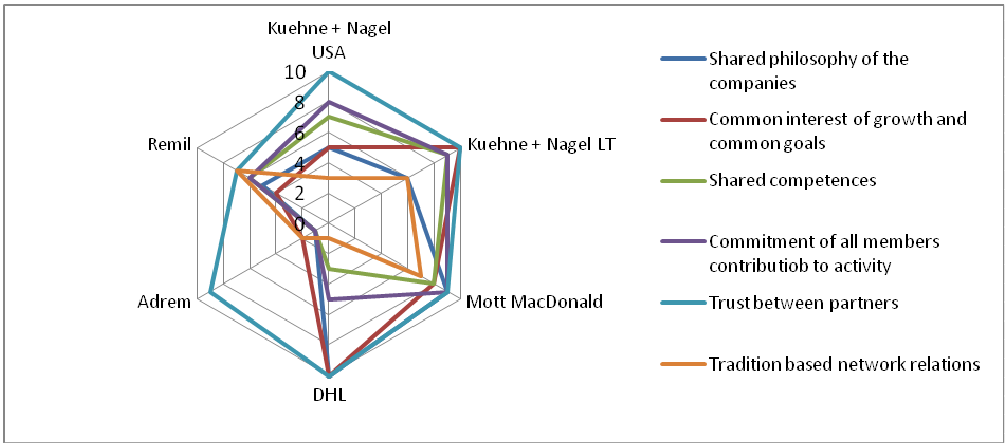
participants of the research were more likely to agree that the increase in a number of network nods not necessarily affects better performance of the network (av=5,6). Aggregated answers to open questions showed that the matured (global) network growth is a few nods per year (opening new offices in the new destinations and countries), the main idea to keep stable structures. Immature networks change constantly and rapidly, there are no stable structures and communications.

4 growth attributes were analysed: the most relevant factor for the companies was increase in the turnover of network members, the second one was more intense relations between the network members, while increase in the amount of members in the network and general extensions of business relations were less important factors.

Relational dimension of networking

Trust was considered as the most important factor in networking with average evaluation of 9.2 from 10. Inter-firm networking gives a possibility to choose partners. Intra-firms are forced to cooperate with internal partners even if they do not trust them (Fig. 4). Trust between nods in inter-firm networks depends on gate-keepers and their social interaction. Partners are chosen on the basis of trust and could be changed. In the intra-firm networks, corporate communication is organised to support the commitment. The personnel of different nods are forced to participate in formal regular meetings to exchange information and to support their commitment. In the analysed companies, joint performance is based on the level of social interaction without special supported activities.

Fig. 4. Importance of relations



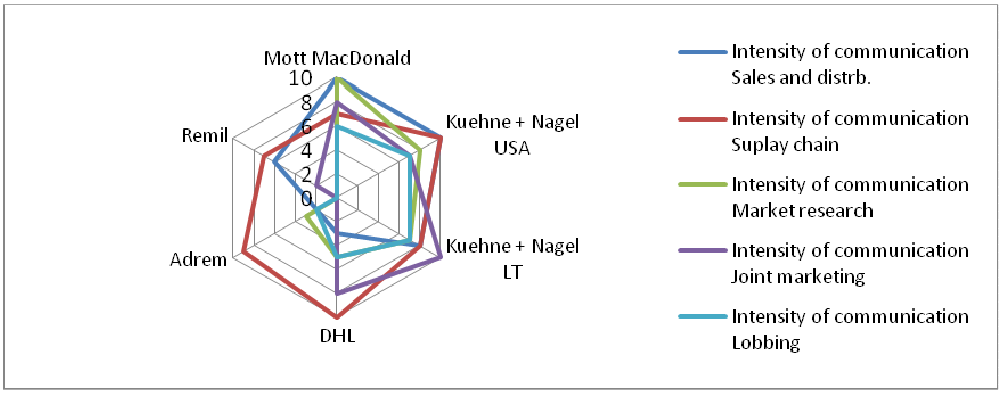
Dependence on different relational attributes is presented by the correlation matrix (Table 4). There are many parameters with strong correlation that amplifies a hypothesis that they could be interrelated.

Table 4. Correlation matrix on the relational dimension

	Shared philosophy	Common interest of growth and common goals	Shared competences	Commitment of all members contribution	Trust between partners	Tradition based network relations
Shared philosophy	1					
Common interest of growth and common goals	0,8377	1				
Shared competences	0,3628	0,4683	1			
Commitment of all members' contribution	0,5644	0,6048	0,9648	1		
Trust between partners	0,2652	0,5392	0,0741	0,2039	1	
Tradition based network relations	0,1166	0,0903	0,7499	0,6195	-0,5363	1

Communication: one of the qualitative indicators of the network centrality is intensity of communication while performing various functions (Fig. 5). The more functions are performed in higher intensity the more central is the nod. In order to evaluate centrality of the nod a quantitative analysis on the network and all the nods in the same network should be undertaken. The Lithuanian companies do not consider lobbing (av. = 4.5) as an important function of the company activities. Insufficient attention to joint marketing and market research shows that the Lithuanian companies still do not see bigger possibilities created by more integrated networks. Intra-firm networks have constant cooperation in day-to-day activities, and in the developing of new products and services. Advanced intranet and IT support is created in the intra-firm networks to ensure communication support and constant flows of information. In the analysed inter-firm networks, communication systems are not well enough developed.

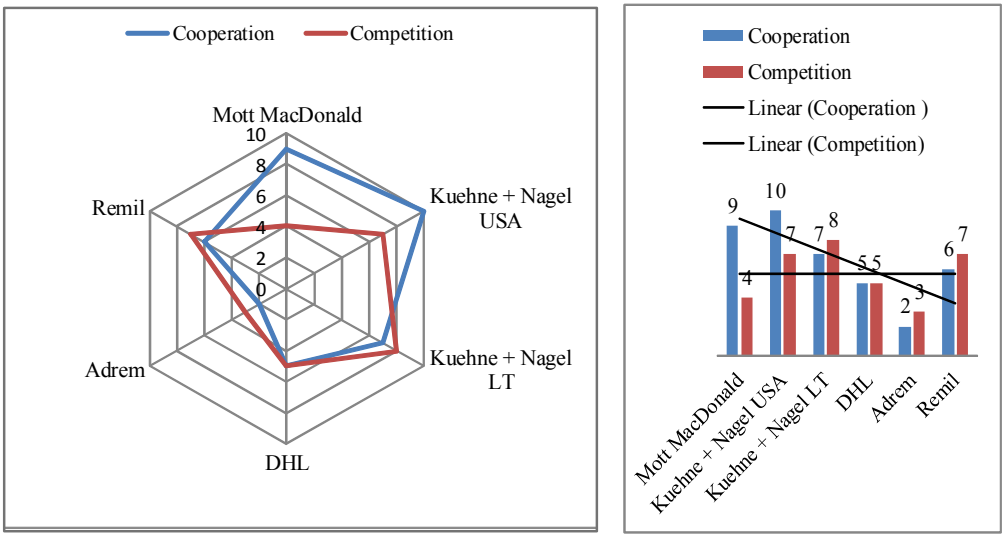
Fig. 5. Network intensity in communication



Cooperation and competition: the analysis of the data comparing cooperation and competition in the analysed firm is given in Fig. 6. From the trend lines, it is seen that in more international networks, cooperation has higher values. Therefore, competition predominates in the Lithuanian companies. However, similar values show that interaction and turbulent business environment companies are forced to use both patterns in their interaction.

In 4 of the 6 analysed cases the values of cooperation and competition are very similar. It means that a theoretical model of coopetition could be adapted to the development of the companies. The intra-firm network basis naturally provokes to cooperate – it is an advantage for the intra-firm as the network is supported by the company brand and philosophy. Less developed relational dimension and less intensive communication activities of networking are reflected in the lower values of the cooperation and competition factor.

Fig. 6. Coopetition: cooperation and competition



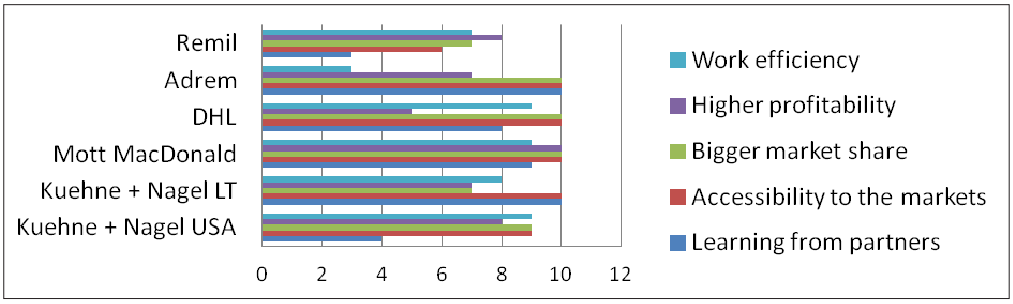
A) B)

Usage dimension of networking

Usage dimension of networks depends directly on the functions performed by the network. In this case networks are created to perform transportation and logistics activities. (Fig. 7). In the transport sector, networking is a core element of business (av = 9,2 and sd = 1,6). Accessibility to the markets is directly related to a bigger market share (av= 8,8; sd= 1,5). All other values are of the same importance.

The impact of attributes related to the usage dimension is presented in Fig. 7. Local advantages and geography of the market are the core features of networks. Intra-firm networks have their offices spread all over the world so as to reach competitive advantage.

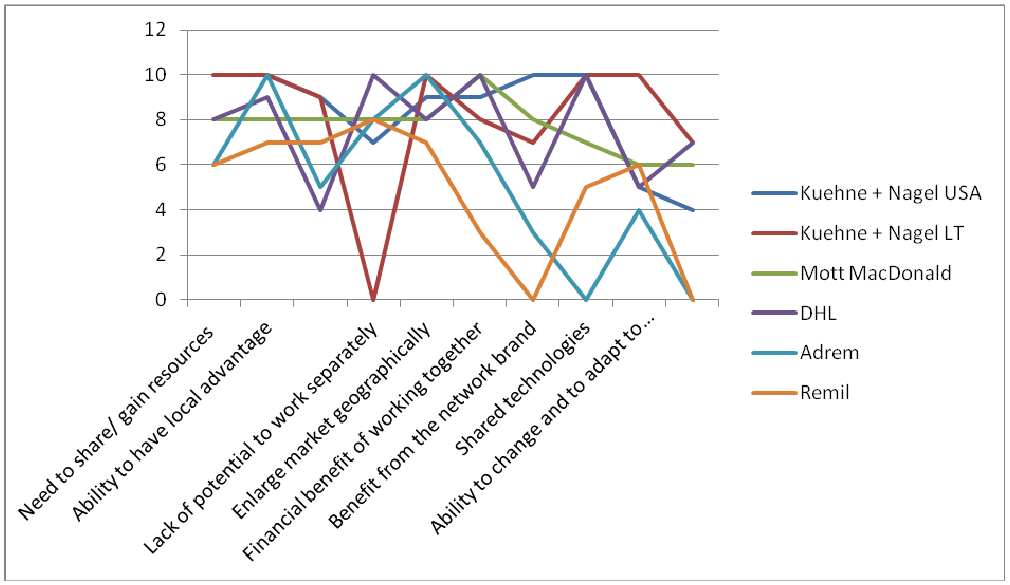
Fig. 7. Network impact on the company



In contrast, smaller firms form inter-firm networks to have the same possibilities through the network of their partners. From the evaluation of the networking attributes, it is obvious that the same network (Kuehne+Nagel USA/LT) is understood differently with some sort of local perspective stressing different attributes of importance. Surprisingly, the impact of networking for the R&D function is underestimated. R&D is closely related to shared technologies (r=0,82), however, as mentioned above, the importance of those attributes, especially in the Lithuanian companies, is not big.

It can be seen from Fig. 8 that companies gain the most from enlarging markets geographically and using local advantage also for obtaining financial benefits. In the intra-firm networks shared technologies predominate.

Fig. 8. Network usage benefits



The usage dimension correlation matrix was used to evaluate how deeply the factors are related. A need to share the resources is strongly related to the benefit from the network brand and shared technologies (r= 0,86; 0,83). The values in local advantages

are almost equal to those of geographical market enlargement (r= 0,91). Lack of potential to work separately is strongly negatively correlated with an ability to change and adapt to the changing environment (r= -0,9).

Findings and discussions

Three types of companies were analysed in the empirical research: (1) global networking players; (2) the Lithuanian companies – functioning as nodes of inter-firm networks; (3) intra-firm networked companies. The nods in inter-firm and intra-firm networks analysed are diverse in their functions and size.

Research showed that the main driving force in the intra-firm network is the goal and the corporate culture of the network; in the inter-firm network, instead of common goals common interest between nods is predominant.

Network success is mostly based on the relational and usage dimension. Matured and developed intra-firm networks have higher results in all aspects of the relational dimensions, but the restriction to choose partners independently coexists. Global firms are having stable networks and are benefiting more from the network. Lithuanian firms are still in their developing stage and the role and structure of the network for the company is changing constantly.

The usage dimension of all the networks is concentrated on freight forwarding including all logistical operations. In both types of networks, the facilitation of the efficient supply chain is the core function (vertical network) and companies are using semi-horizontal relations to eliminate location differences as well as to perform the function. Also the usage dimension analysis has shown that benefits from the network (inter and intra) are similar: an impact for the market share, accessibility of the markets and learning from partners are equally important for both inter and intra networks. The predominant benefits from the network to the companies are similar: (1) market access and (2) a bigger market share.

It seems reasonable to complete the research results obtained and presented in this particular paper by further investigations. For example, an important aspect that deserves further exploration in the transport and logistics companies is the coopetition element in the inter-firm networks, influence of networking on profitability and the analysis of learning effects.

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ĮSITRAUKIMAS Į VERSLO TINKLUS TRANSPORTO IR LOGISTIKOS SEKTORIUJE

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Santrauka. Šiame straipsnyje pristatomi transporto ir logistikos sektoriuje atlikto empirinio tyrimo rezultatai. Nagrinėjamas įsitraukimas į tinklus tarp kompanijų (inter-firm) ir į tinklus kompanijų viduje (intra-firm). Tyrimas apima skirtingų inter-firm ir intra-firm tinklų identifikavimą, tiriamas dalyvavimo globaliuose tinkluose lygis, analizuojamos tinklų savybės ir požymiai. Tyrimas atliktas Jungtinėse Amerikos Valstijose, Jungtinėje Karalystėje ir Lietuvoje veikiančiose įmonėse. Taikytas atvejo analizės metodas leido išanalizuoti tinklų veiklos struktūrinę, santykių ir naudojimo perspektyvą, palyginti skirtingas tinklų sąveikos formas. Empiriniu tyrimu rasta įrodymų, kad inter-firm ir intra-firm tinkluose egzistuoja daugiau panašumų nei skirtumų, todėl galima daryti išvadą, kad skirtingos tinklaveikos praktikos galėtų būti pakaitomis taikomos abiejų rūšių tinkluose.

Reikšminiai žodžiai: inter-firm ir intra-firm tinklai, tinklaveika, verslo įmonių tinklai.