

# A Network Perspective of Distribution on the Industrial Markets

## Introduction.

Sophistication of distribution is conditioned by increased customization on the resource level, integration on the activity level and specialization on the actors level (Hulthen & Gadde 2009). Management of contemporary distribution becomes extremely complex task due to environmental dynamism, which leads to inevitable lack of prediction and control. Today there is an urgent need for academic research to systematically investigate aspects of distribution network management.

This **paper aims** to shed light on the distribution on industrial market from the network perspective in order to capture mechanism of coordination, inter-firm cooperation, management and value creation opportunities.

The **research questions** for this study are to investigate how network theory contributes to understanding of the distribution process. The research questions are to be considered as follows:

RQ1: What are the current changes and trends in distribution?

RQ2: What are stimulation and blocking factors for the networks development in Russia? that set limits or create new opportunities for distribution network?

RQ3: What is the mechanism of distribution network operation on the emerging markets?

The following **plan** of dissertation was adopted:

1. Distribution on the industrial markets
  - 1.1. Approaches to distribution and functions
  - 1.2. Distribution arrangement on the industrial markets
  - 1.3. Distribution networks
2. Distribution networks in Russia
  - 2.1. Networks on the industrial markets
  - 2.2. History path dependence in distribution: case of Russia
  - 2.3. Stimulating and blocking factors for network development in Russia
3. Distribution network management
  - 3.1. Case study and business context analysis – distribution in chemical industry
  - 3.2. Mechanism of interaction in chemical distribution network
  - 3.3. Managerial implication

## Research methods

The present research is based on the industrial network approach, which is about relationships and links that connect actors, activities and resources (Hakansson & Johanson, 1992).

The preliminarily theoretical part was based on the literature review to understand the current level of knowledge and research in the areas concerning: distribution, business networks, stochastic theory, business relationships, IMP approach to b2b marketing, complex-self adaptive systems.

Conceptual model of network mechanism was elaborated. Graph theory and mathematical methods are used for estimation of distribution network dimensions and to capture the mechanism of interactions.

To test the research hypotheses and the conceptual model the appropriate methods of data collection were used.

Data collection was based on the qualitative methods, such as case study and structured interviews. The empirical part of the paper presents an embedded case study, which implies an integrated detail examination of a single example of a class of phenomena. (Yin,2003). In-depth single case often provides better theoretical insights than multiple-case research (Dyer and Wilkins 1991). Case study is used by researchers on the network approach as a dominant method (Forsgren 1989; Axelsson& Johanson 1992; Gadde& Hakansson 1993). Following the methodology (Eisenhardt & Graebner 2007; Flyvbjerg 2006) the case of the Russian distribution company in chemical industry is explored. Russia as an economy in transition provides a unique opportunity to investigate changing and adapting network structures, stakeholder interaction and relationship constellations.

For verification of results the additional survey of eight chemical distributors was held on the International chemical exhibition in Expocentr in Moscow. The structured interviews were based on the questioner, which allowed validate the representativeness of the studied case.

## Distribution on the industrial markets

Firstly, it is important to understand the recent trends and changes in the contemporary distribution. The term of distribution was introduced in the business organization theory at the beginning of 20th century by pioneer in distribution study - Samuel Sparling. He has pointed out three general classes of business activities: extracting, manufacturing and distributive (Sparling,1906). The table below traces the further distribution research focus biases to different aspects.

Table 1. Evolutionary trends on a distribution research\*

Time period	Dominant theory	Approach	Focus	Unit of analysis	Major references	Comments
1900 - 1950	Historical School of Economics	Functionalists	Functions and flows	Whole system	Sparling (1906) Shaw (1912) Clark (1923)	<ul style="list-style-type: none"> <li>▪ Distribution arrangement</li> <li>▪ Functions</li> </ul>
1950 - 1970	Neoclassical economics	Functionalists / Managerial	Costs	System/ Company	Alderson (1957) Bucklin (1965,1966)	<ul style="list-style-type: none"> <li>▪ Distribution strategies</li> <li>▪ Postponement-speculation principle</li> <li>▪ Vertical marketing</li> <li>▪ Systems</li> </ul>
1970 - present	Social psychology and political science	Managerial	Power and conflict	Dyad	Stern (1969) Stern,Reve (1980) Brown,Day 1981) Gaski (1984) Dant, Schul (1992)	<ul style="list-style-type: none"> <li>▪ Behavioural</li> <li>▪ Channel leader</li> </ul>
	New institutional theory/Transaction cost economics	Managerial	Transactions	Dyad	Heide (1994) Wathne,Heide (2004) Dawyer,Oh (1988) Williamson(1973,1975)	<ul style="list-style-type: none"> <li>▪ Transaction costs</li> <li>▪ Governance structure</li> <li>▪ Satisfaction, fairness, trust</li> <li>▪</li> </ul>
	New institutional theory/ New economy	Managerial	Relationships	Network	Iacobucci,Hopkins 1992 Achrol (1983, 1991) Ford ,Gadde (2008) Alderson (1994)	<ul style="list-style-type: none"> <li>▪ Network environment</li> <li>▪ Relationships</li> <li>▪ Interdependences</li> </ul>

Adapted \* Gripsrud, G. (2004), Wilkinson I.(2001), Ford, D. and Gadde, L.-E. (2008)

As it can be seen from the table researchers have suggested that there is an increasing need for business research to shift a focus from traditional dyadic relationships to a larger business context of network relationships in order to understand firms' behaviour and performance (Achrol 1997; Rowley 1997; Gulati 1998).

One of the major modifications of distribution is a shift away from mass-distribution towards individualized solutions in relation to particular customers (Wilson & Daniel, 2007) or shift from standardisation to customization (Lampel & Mintzberg, 1996). This is primarily an outcome of evolvments in the resource layer, where the importance of large-scale operations has been reduced. Flexible manufacturing systems have shortened production lead-times in the same way as efficient logistics have made in distribution. Just-in-time delivery is one example of enhanced customization. These arrangements are built on tight synchronization and increased interdependency among activities. Another effect of reduced lead-times and improvements in information exchange is an increased attention to build-to-order production (Gunasekaran & Ngai, 2005). These arrangements also call for extensive coordination of activities since buffers in terms of inventories will be reduced. Customization calls for variety of distribution solutions, and for suppliers design of 'multi-channels' has become an important strategic issue (Weinberg et al., 2007). Actors involved in these arrangements tend to be specialized in various ways in order to play a particular role in bridging the distribution gap. So, following the ARA model (activities-resources-actors) there are changes in three network layers: increased customization in the resource level, growth of interdependency in the activity level, higher specialization in the actor layer. Present day distribution becomes **"network-like"**.

Distributor coordinates the network, through combining of complementary resources of network participants and enhancing activity links with supplier, buyer and other supporting actors such as logistic service, and consequently reaching performance related goals. (Ghauri & Lorentz 2010)

The recent managerial approach implies to investigate relationships and interactions in distribution network. (Gadde & Hulthen 2009; Mattsson 2002; Gadde, Hulthen & Dubois 2000) Distribution process in industrial markets is seen from a relationship perspective, relationship being defined as mutually oriented interaction between two reciprocally committed parties (Håkansson & Snehota 1995). From our point of view, the network approach is in line with the main trend of the recent decades manifesting itself in growing number of network-type distribution chains, a kind of "webs of capabilities embedded in an extended enterprise" (Narus & Anderson 1996). Firms increasingly depend on the resources controlled by other actors and thereby are "able to combine resources in new ways, gain additional resources, and dispose of superfluous resources" (Wilson & Daniel 2007). Such distribution practice allows tailoring to individual end-user requirements (Gadde & Ford 2008).

### **Distribution in Russia**

Russia as an economy in transition provides a unique opportunity to investigate changing and adapting network structures, stakeholder interaction and relationship constellations. The nature of the relationships in Russia analyzed recently in a couple of papers (e.g. Davis et al, 1994; Johanson 2007; Smirnova, Kousch, 2007; Tretyak & Sheresheva 2005; Ghauri & Lorentz 2010; Smirnova et.al. 2011) The emerging Russian economy has some specifics, including instability of the market, lack of information on potential partners, higher propensity to opportunistic behavior (Ford et al. 2006; Johanson 2007; Halinen & Salmi 1996).

In order to analyze **path dependence**, we have pointed out and described four main stages in the history of industrial distribution channels in Russia which correlate with the drastic changes in economic and social environment.

Distribution in Russia is characterized by some trends including shift in distribution channels' structure, internalization, cutting number of distributors, and growing role of information infrastructure (Sheresheva & Kolesnik 2010).

Further analysis is addressing the factors that set limits or create new opportunities for distribution network compatibility in the changing emerging market.

### Historical path dependence

We have pointed out and described four main stages in the history of industrial distribution channels in Russia which correlate with the drastic changes in economic and social environment.

*Table 2. Industrial distribution chains evolution in Russia.*

	Type of relations	Basis of relations	Management
<i>Pre – revolutionary</i> (1800 – 1918)	Merchants relationships. Slow transport speed, lack of communication, greater risks due to the opportunistic partner's behavior.	Interpersonal relations and trust were of major importance.	Price oriented management and monarchy regulation
<i>Soviet period</i> (1918 – 1991)	Strictly determined structure of relations	Hierarchy, central planning allocation functions, including allocation of resources. Strong Informal relations	Managed by government
<i>Perestroika</i> (1991-1998)	Chaotic market relations, unstable political and economic environment	Single transactions dominance. A lot of “fly-by-night companies” established in 1990s purchased and distributed goods without any commitment.	Price oriented management
<i>Modern period</i> (after 1998)	Long term relations	Flexible network relations, information and communications technology	Coordinated by focal agent

*Pre –revolutionary* (1800 – 1918) – merchants relationships in business. This period is characterized by slow speed of transport and lack of communication, greater risks due to the opportunistic partner's behavior, so interpersonal relations and trust were of major importance.

*Soviet period* (1918 1990) - strictly determinate relations, hierarchy managed by government. Distribution chains in the USSR were strictly managed by government. Under central planning, the state performed the allocation functions, including allocation of resources. Over the post-Soviet decades distribution chains were at first badly destroyed.

*Perestroika* (1990– 2000) - period of reformation, chaotic market relations and single transactions dominance. Collapse of the centralized supply chain system managing by government has split industrial integrity. During the first post-Soviet decade demand exceeded supply in almost all segments of Russian market. In the highly uncertain and unstable political and economic environment, long-term relations were almost impossible. A lot of “fly-by-night companies” established in 1990s purchased and distributed goods without any commitment.

*Modern period* (after 2000) - period of distribution business networks formation, long-term relations emerge. During the last decade the basic economic infrastructure had been formed and then distribution chains restored step by step. Due to information and communications technology (ICT) intensively spread in Moscow and then in other regions of Russia, building of inter-firm networks became less costly, and a number of sustainable distribution networks started to grow. It is precisely this last decade developments that will be the main focus of our research based on the data on chemical distribution channels of western part of Russian Federation.

Basing on historical and cultural path dependence analysis we can point out the following distribution network development drivers.

Group	Factors	Implication
Geographical factors	- Huge territory	
Social	- dominance of vertical relationships	
	- predomination of masculinity	
	- atomization of individuals in society (Medvedev, 2011)	
	- low level of mutual trust	
	- fear of governmental institutions - social network cooperation allow to increase their influence on government	
Economic factors	- increase of trade with Chinese producers, which steam to work via intermediate, but not open offices	
	- globalization of markets	
	- high temps of in country economic growth	
	- poor development of transformational and logistics infrastructure	
Political factors	- low level of proprietary rights dependence	
	- hierarchical structure of society	

Accumulating researches on networks the following positive and negative aspects of network interfirm relationships can be pointed out.

- increase of trust leads to the reduce of transaction costs and uncertainty, unpredictability
- awareness about each other primary needs stimulates higher adaptability and so efficiency
- joint interaction experience increase innovations due to the reduction of routine procedures
- Intensiveness of information flow expand new opportunities – access to new markets, new marketing techniques and technologies
- long-term volunteer and free-will relationships provide flexibility to changing consumer demands
- relationships creates access to the resources owned and controlled by other market agents
- reduction of operational cost of distribution and production
- strategic partnerships could substitute challenging, resources-consuming, risking processes of merger and acquisition

Negative sides of network interactions:

- increase of monopoly and decrease of competition on the market

- reduce of short term efficiency in the adapting period, which is important for complementing of individual and group goals
- decrease of network efficiency, communication and decision making due to the overexpansion
- increase of interdependencies, limitation of activities and lost of independency
- decrease of flexibility in management due to the close personal contacts and collective decision making
- increase of risks due to the excessive dependence from managers and staff turnover
- diffusion of firms borders due to the complexity of network connections and interactions
- increase of costs for support and development of relationships, which could be not efficient
- increase of risk to loose strategically important information in case of network disintegration and opportunistic behavior of network participants
- low legal protection of participants

Such wide row of argument for and against can be used by researchers and managers in their work. Definitely each business situation is unique, so it is extremely important to adopt implications according to the situations.

In order to make better managerial implication for the above research we have made SWOT analysis (Hill & Westbrook 1997). It can be used by managers in order to elaborate the strategy of product distribution. Such table of SWOT analysis can be used as by producers, who are looking for distributors, or by distributors looking for the development strategies.

#### SWOT analysis of network organizational form of distribution

	Strengths	Weaknesses
<b>Internal</b>	<ul style="list-style-type: none"> <li>- sensitive distribution system, which is coordinated by network broker</li> <li>- accumulation of market knowledge</li> <li>- work experience with proved market players</li> <li>- use of distributors brand name</li> <li>- network of social contacts</li> </ul>	<ul style="list-style-type: none"> <li>- замыкание сети на самой себе и отсутствие дальнейшего развития</li> <li>- lock of the network</li> <li>-</li> </ul>
	Opportunities	Threats
<b>External</b>	<ul style="list-style-type: none"> <li>- additional steadiness in the turbulent environment, especially during crisis</li> <li>- creation of cooperative brand</li> <li>- extension of market share</li> <li>- ability somehow to control market via horizontal relationships and integration</li> <li>- ability to use network brand cooperatively created by network participants*</li> <li>- total increase of trust within market players</li> </ul>	<ul style="list-style-type: none"> <li>- loose of balance in case of network agent exit</li> <li>- possibility of disagreements and conflicts because of contradictions in goals</li> <li>- possible conflicts because of inclusion of competitors onto one network</li> <li>- limitation of network agents activity due to the dominance of other agents</li> </ul>

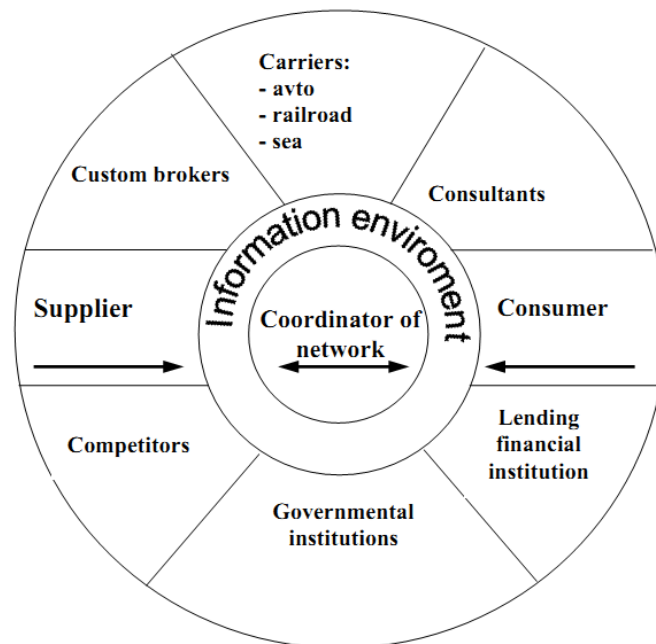
\*Example of cooperative brand can be easily seen in distribution networks. For example world known company LG establish relationships with small local distributor to sell its products, so image of the distributor improved. Or industrial giant Sibur is in partnership with distributor, which is close to consumer.

Such table of SWOT analysis can be used as by producers, who are looking for distributors, or by distributors looking for the development strategies. All above analysis provoke increased interest in mechanism of network interaction.

### **Focal model of distribution network**

The following paragraphs aim to answer the third research question: “What is the mechanism of distribution network operation on the emerging markets?”

Modeling channels of distribution network is helpful in terms of mechanism understanding. The focal concept of the empirical part of research is to analyze network configuration from the managerial point of view. To capture the mechanism three models were elaborated: conceptual visual model, graph network and stochastic model.



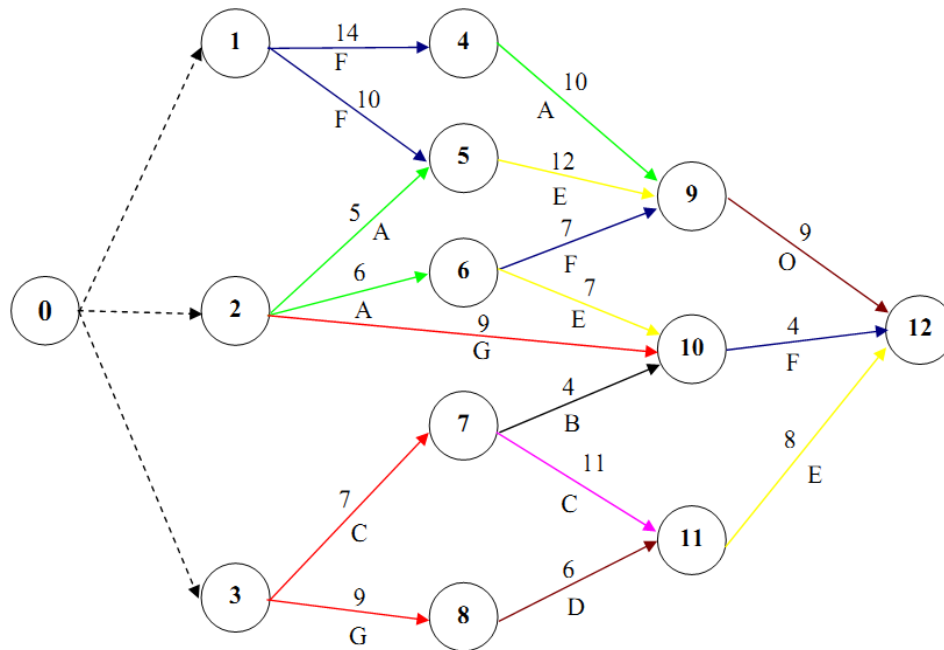
*Picture 1. Conceptual model of international distribution network structure*

In the center of a network there is a broker or coordinator. Other network participant agglomerates around leader and implement their functions in accordance with distributors arrangements.

Using tools of topology and graph theory network structure was visually displayed. Network graph mapped of network’s mechanism of operation and mainstreams of resources flows: information, materials and finances. Such graph allows eliciting managerial centers, which concentrate mainstreams of resources, and consequently play major role in decision making, control and responsibility sharing in the distribution network.

Business networks activities could be efficiently described and analyses by graph methodology. Picture 2 shows interaction process, which could describe qualitative and quantitative network characteristics (Efremov 2008). Nodes or vertices of the network are events of business process. Arches mean functions that agents implement in network.

Marking of arches can give information about latitude, terms, cost of work. Letter indicate agent, who is responsible for implementation of function.



Picture 2. Process of business interaction in network

The graph on the picture 3 describes the real distribution network. Data collection was based on case study of a company on Russian market. Case company is the distributor of wide range of chemicals for production (polymers, rubber, paints, inorganic components). The Joint Stock Company started its operations in 2000. For 10 years the distribution network of the company has been expanded to 10 divisions: Moscow, Saint-Petersburg, Tambov, Volgograd, Kazan, Yekaterinburg, Yaroslavl, Ivanovo, Rostov-on-Don, Perm, Minsk (Belarus). The wholesaler has got annual turnover about 50 million USD and more than 100 employees.

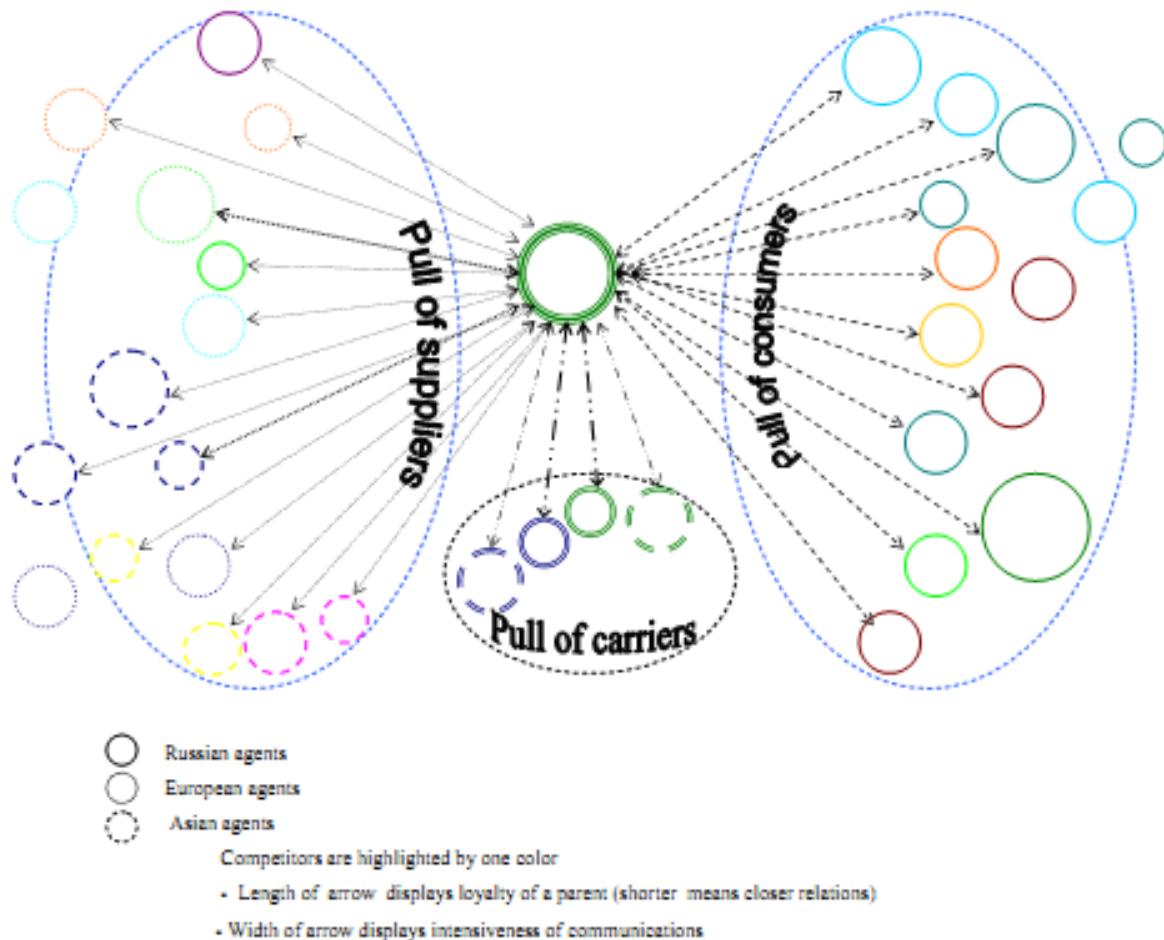
The company puts strategic emphasis on provision of a wide range of chemicals for small and medium producers, which are the target market.

Company had established relationships with suppliers from all over the world. Actually, the middleman coordinates three chain types:

- 1) Russian – purchasing of goods from domestic producers.
- 2) European - purchasing of goods from the European suppliers: Belgium, Germany, Italy, Switzerland.
- 3) Asian - purchasing of goods of Asian origin: China, Taiwan, South Korea, India.

More detail information about case and channels could be found in the IMP paper. (Sheresheva & Kolesnik 2010)





Picture 3. Distribution network graph

It is seen that network is concentrated around the focal distributor. The distributor accumulates numerous contacts with consumers and suppliers. One of the main functions of him is to indicate consumer's needs and to fulfill them.

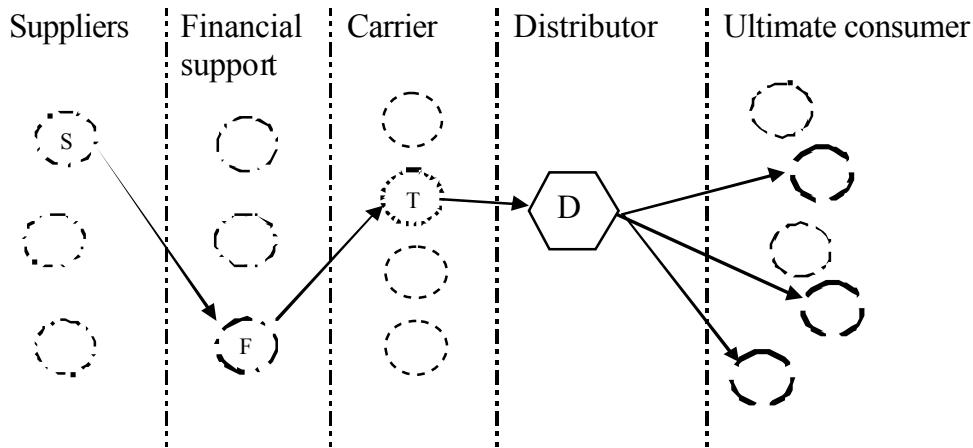
According to the scheme described above at the beginning of research we assumed distribution network as a system managed by distributor. Basing on the approach that distributor coordinates the network, through combining of complementary resources of network actors and enhancing activity links within them, and consequently reaching performance related goals. (Ghauri & Lorentz, 2010)

### Stochastic approach to distribution management

A principal tenet of organizational theory is that structure is related to environment (Aldrich & Zimmer 1986) and organisations that fit their environments will perform better and are more likely to survive than those that do not (Emery & Trist 1965). Burns and Stalker (1961) point out two types of organisations, a mechanistic form using a routine technology (low task and work flow uncertainty) and operate in a homogenous stable environment and organic, those operating a non routine technology (high task and work flow uncertainty) in a heterogeneous unstable environment should use an organic structure. Network as an organic structure is better suited to complex, rapidly changing, and turbulent environments than hierarchical or mechanistic structure (Burns & Stalker 1961; Mintzberg 1979; Miles & Snow 1986).

Deeper understanding of ongoing processes let us make a hypothesis about very high level of uncertainty. Distributor has to be extremely flexible, because future steps can be hardly predicted. So further we consider distribution network management in a stochastic way, when the distributor is optimizing business processes at each decision -making node and switching between network actors. (Sheresheva & Kolesnik 2010).

This approach allows us to get some interesting results in terms of management.



Picture 4. Distributor chooses partners for the supply chain from the pull of actors

Every time it makes choice of partner from the pull of actors, he took into consideration the current situation and tries to optimize the chain. Such a behavior makes the process similar to the Markov chain. Such view allows us to apply time-homogeneous Markov chains approach to explore the partner selection process.

Distributor makes a choice basing on different parameters or factors. For example probabilities of distributors' behavior can be assigned according to prices. In that case actors  $i_1, i_2, \dots, i_N$  offer prices  $a_1, a_2, \dots, a_N$  and  $\xi$  is random variables that adopts the values  $i_1, i_2, \dots, i_N$ . Then probability of choice of actor  $i_k$  (distribution of  $\xi$ ) can be set as

$$P(\xi = i_k) = \frac{(a_k)^{-1}}{\sum_{j=1}^N (a_j)^{-1}}. \quad (1)$$

In terms of Markov chain theory we have vector of starting distribution of probabilities  $\pi^{(0)} = (p(\xi = i_1), \dots, p(\xi = i_N))$

The probabilities of transition are for example

$$Pr(\xi_{n+1} = j | \xi_n = i) = p_{ij} = I(a_j \leq a_i) \times \left( \frac{(a_j)^{-1}}{\sum_{(k: a_k \leq a_i)} (a_k)^{-1}} \right), \quad (2)$$

where  $I(a_j \leq a_i)$  is an indicator function.

Then the one-step transition matrix is given by

$$P_{ij} = \begin{pmatrix} P_{11} & P_{12} & P_{1m} \\ P_{21} & P_{22} & P_{2m} \\ \dots & \dots & \dots \\ P_{m1} & P_{m2} & P_{mm} \end{pmatrix} \quad (3)$$

For better understanding of the issue let us to give an example of transition probability matrix for supply chain with rigid structure. For hierarchically organized chains there is no option for partner choice. So transition probability matrix will have the following meanings:  $p_{ik} = 1$ ;  $p_{ij} = 0, j \neq k$ , if  $i_k$  is our fixed partner.

Matrix of transition probabilities would be the following one

$$P_{(ij)} = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 0 \end{pmatrix}$$

In that case we can easily predict the probability of distributor's choice on each step  $n$ , because it is determined. This matrix shows that probability of choosing of our permanent partner ( $i_2$ ) equals to 100 %. Choice is independent from terms and conditions offered by agents.

The purpose of our research is to explore distributors' behavior in flexible or network-like structured supply chains. In order to apply Markov chain model, we has to estimate transition probabilities basing on the practical data. For example, there are three transport companies ( $i_1, i_2, i_3$ ) who provide logistic services. In business choice of a carrier depends on a variety of factors which may differ from shipment to shipment. In that case we assume that choice is only price driven. order to eliminate these factors we have made a request for delivery of.

We consider transport rates for delivery of 20 tones of the product from the storehouse of supplier (A) to the store house of distributor (B) from three carriers ( $m=3$ ) given by  $\{3500, 3650, 3700\}$  euro.

According to the formula (3) the initial distribution will be as follows

$$\pi^{(0)} = (0.323 \quad 0.335 \quad 0.341)$$

To be clearer lets give an example of calculation:

$$\pi_1^{(0)} = \frac{3500}{(3500 + 3650 + 3700)} = 0.323$$

One-step matrix of transition probabilities ( $P_{ij}$ ) according to the formula (6) will be the following

$$P_{11} = I(a_j \leq a_i) \times \left( \frac{(a_j)^{-1}}{\sum_{(k: a_k \leq a_i)} (a_k)^{-1}} \right) = \left( \frac{\frac{1}{3500}}{\sum_{a_k \leq 3500} \frac{1}{3500}} \right) = 1$$

For  $P_{12}$  and  $P_{13}$  would be equal to 0 because there is no rates ( $a_k$ ) less than 3500 ( $a_i$ ).

$$P_{21} = I(a_j \leq a_i) \times \left( \frac{(a_j)^{-1}}{\sum_{(k: a_k \leq a_i)} (a_k)^{-1}} \right) = \left( \frac{\frac{1}{3500}}{\sum_{a_k \leq 3650} (a_k)^{-1}} \right) = \left( \frac{\frac{1}{3500}}{\frac{1}{3500} + \frac{1}{3650}} \right) \approx 0.511$$

$$P_{22} = I(a_j \leq a_i) \times \left( \frac{(a_j)^{-1}}{\sum_{(k: a_k \leq a_i)} (a_k)^{-1}} \right) = \left( \frac{\frac{1}{3650}}{\sum_{a_k \leq 3650} \frac{1}{3500} + \frac{1}{3650}} \right) = 0.489$$

Finally we will get the following matrix of transition probabilities

$$(P_{ij}) P_{ij} = \begin{pmatrix} 1 & 0 & 0 \\ 0,511 & 0,489 & 0 \\ 0,351 & 0,327 & 0,322 \end{pmatrix}$$

The matrix shows probability of moving from one partner to another. We see that probability is higher for the transport company with the lower price. But there is always some probability that we will not choose an agent with the best price offer.

The lower row of the matrix shows that all companies may have equal chances. This situation is possible due to several reasons. At first, in our case the price difference is insignificant. Secondly, price may not play the key role in decision making process.

We can try to predict our partner in the future. For example, who will be our partner in five steps? It is important to mention limitation of research: carriers will not change their prices within reviewed period of time. So we raise our matrix of transition probabilities to the power of 5.

$$P_{ij}^{(5)} = \begin{pmatrix} 1 & 0 & 0 \\ 0,518 & 0,482 & 0 \\ 0,351 & 0,327 & 0,322 \end{pmatrix}^5 = \begin{pmatrix} 1 & 0 & 0 \\ 0,97 & 0,03 & 0 \\ 0,95 & 0,05 & 0 \end{pmatrix}$$

Then distribution according to the formula (4) would be following:

$$\pi^{(5)} = \pi^{(0)} \times (P_{ij})^5 = (0.323 \quad 0.335 \quad 0.341) \times \begin{pmatrix} 1 & 0 & 0 \\ 0.97 & 0.03 & 0 \\ 0.95 & 0.05 & 0 \end{pmatrix} \approx (1 \quad 0 \quad 0)$$

The above example shows that focal agent rapidly tends to choose the cheapest partner even in a few numbers of steps. It was just one example of possible application of Markov theory to business field.

## Estimation of trust via Markov chain theory approach

Another way of probability theory application to business networks is unique author proposal. Such important aspect as trust could be estimated by use of Markov approach and theoretical and empirical probabilities.

Indeed behavior of distributor in a network is not solely price driven. In business implicit parameters such as trust and commitment play an important role. So the ultimate decision in distribution network chain is based on implicit and explicit benefits.

Implicit parameters are very difficult for measurement, because it is hard to estimate them directly. Usually method of interview is used for estimation of hidden benefits, as managers evaluate its intuitively. Further we propose an idea how to estimate non-price variables basing on theoretical and empirical probabilities

The further steps of research would find a solution to compute matrix of transition probabilities basing not only on the information about rates but also taking in to consideration trust to the partner. In this regard the special issue is evaluation and formalization of trust.

Let introduce parameter "T", that will be used for designation of non-price variables or implicit costs. We assume that the greater is the value of  $T$ , than it is more trust between partners.

The steps are following:

1. Introduce parameter  $C$ , which shows the relation between price and trust or explicit and implicit parameters.

$$C_i = \frac{T_i}{a_i} \quad (4)$$

2. Calculate empirical transition probabilities matrix ( $\pi_{empir.}$ ) for state  $n$ , basing on practical data of a distribution company.

3. Find out initial probability distribution ( $\pi^0$ ) basing on an interview of managerial stuff of a company.

4. We calculate theoretical transition probabilities  $P_{ij}$ .

5. We propose the following formula for calculation of transition probabilities  $P_{(ij)}$ ,

$$P_{ij} = \frac{NP_j - P_i + 1}{2N - NP_i},$$

which will corresponds to the following demands:

$$1) \sum_{j=1}^N P_{ij} = 1$$

$$2) \sum_{j=1}^N P_{ij} \geq 0$$

$$3) P_{ij} \leq 1 \text{ for } \forall i, j$$

5. According to the proprieties of time-homogeneous Markov chains we can find distribution of probabilities at  $n$  step according to the formula:

$$\pi^{(n)*} = (P_{ij})^n \times \pi^{(0)},$$

where  $\pi^{(n)*}$ ,  $\pi^{(0)}$  - are known, and for  $(P_{ij})^n$  meaning of  $\mathbf{a}$  parameter is known, and meaning of  $\mathbf{T}$  we aim to find. If an equation has a solution, then we can try to find value of trust in the distributors decisions.

So we have proposed step by step approach for estimation of implicit factor's share in a decision making process basing on Markov Chain theory. Further research will explore the idea and finally try to find meaning of  $\mathbf{T}$  parameter.

Further empirical research should be held in order to check and improve the model. Even the existing algorithms of Markov chains are quite complex, further result of research could be rather fruitful.

Of course the approach has got limitations as any mathematical model has. One of the main disadvantages is impossibility to take into consideration numerous environmental facts. For example, we have mentioned that domestic supply chain is strongly influenced by interpersonal relations. So it seems that Markov chain approach would be not appropriate for analysis of such chain. But the model would be rather better for exploration of distribution chain from Asian, where personal relations are weak.

Formalization of the distribution process is valuable in terms of science and management. Once we have elaborated an appropriate mathematical model, we would be able to use incredible possibilities of modern computing machines. Nevertheless there are some limitations for use them in business, because mathematical model hardly can reflect real distribution network.

### **Network as self- adaptive system**

But it was inaccurate to consider distributor as a solely network coordinator. While distributor or other firms may attempt to organize and direct the networks of which they are apart, no firm controls the network as a whole. So distribution network tends to be self-adaptive.

Each network agent is seen as complimenting rather than competing with the other. For example one supplier can provide high quality at the high price for exacting customer; another can make shipment at the shortest time or at the lowest price. Distributor is aware about different characteristics and peculiarities of agents so he searches for the ways to optimize the network activities. Dynamic networks in many industries now operate across national boundaries (Miles & Snow 1986).

Contemporary post neoclassical science considers the reality not like just self-evolution integrity, but also as something unstable, fluctuating, chaotic. Instability of the world does not mean that it could not be investigated. Moreover disequilibrium should not be avoided as something negative or harmful. Imbalance in organization can acts as condition for stable and dynamic development, when enviable elements are excluding and abolishing. Stability is rotated by instability; appearance and destruction of new forms replace each other. Erratically phenomenon could not be controlled the same as social behavior. (Prigogine & Nicolis 1977) Probability, instability and uncertainty are integral part of the present-day management science. The base of strategic management in modern economic conditions is an achievement of sustainable competitive advantage which is supported and developed due to the interaction of independent organizational units. In our research we consider distribution network in a stochastic way, when the agent is optimizing business processes at each decision-making node and is switching between network actors. (Sheresheva & Kolesnik 2010) The advantages of stochastic approach in the study of business network activity are explained by the fact that distribution networks are considered as complex adaptive systems.

Network approach allows managers to look wider on the business contest. Network can be seen as managerial unit, which could strongly facilitate competitiveness of companies in the network.

## Conclusions

The paper presents the research of distribution from the network perspective. The present day distribution is characterized by network-like structure. Contemporary distribution chain is not hierarchically structured anymore. Simultaneously it has to be as flexible as possible in order to adapt quickly to the dynamic business environment and sustainable. So distribution network consist of actors, who are independent by propriety, but interdependent in management. The basis of their cooperation is a reciprocally usage of each other resources. The focal agent of the network coordinates the activities of actors. One of the main tasks of the “chain captain” is to form the chain and to choose appropriate partners for each delivery.

Special view is given to the development of networks in Russia basing on cultural and historical path dependence analysis.

The approaches to network analysis are proposed: conceptual visual model, graph network and stochastic model. Applications of stochastic approach are widely described.

Results of the research can be used by managers as a puzzle part for the complex view of a distribution process.

**Keywords:** distribution, networks, emerging markets

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