

MODELS AS TOOLS OF ANALYSIS OF A NETWORK ORGANISATION

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Abstract. The paper presents models which may be applied as tools of analysis of a network organisation. The starting point of the discussion is defining the following terms: supply chain and network organisation. Further parts of the paper present basic assumptions analysis of a network organisation. Then the study characterises the best known models utilised in analysis of a network organisation. The purpose of the article is to define the notion and the essence of network organizations and to present the models used for their analysis.

Keywords: management, network organisation, analysis.

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1. Introduction

The evolution of management follows along with the changes in the conditions of competition resulting from globalisation processes and the growing IT introduction to business operations. Shaping the flows of products and the accompanying information using the principles, the methods and the techniques of logistic management has become a key problem of management in a contemporary enterprise. The pursuit of the full use of the potential of an enterprise requires the extension of the cooperation with the issues of improvement of financial flows and other areas of functioning of an enterprise (Witkowski 2003). Such possibilities are provided by the concept of a network organisation. Effective functioning of such an organisation is a result of integration and coordination of various areas of functioning of a network organisation, such as: research-development works, logistics, marketing, production management or finance management.

Hence, network organisations set new requirements concerning the strategy and the method of its formulation. In order to meet these requirements, changes are necessary in the traditional understanding of the strategic management process. In this case strategic management does not apply to solely to particular enterprises but their entire network. This means that to ensure proper operation of such an organisation it is necessary to look at the essence and the role of the strategic management process in a new way.

Management of a network organisation is not simple. Mere observation of the flows within such a network and adoption of a thesis claiming it is necessary to cooperate do not result in integrity or high effectiveness. Such results can be achieved no sooner than as a result of a prepared management strategy implemented in a network organisation (Ciesielski, Długosz 2010; Ciesielski 2007).

2. Supply chain and network organisation

A supply chain means a sequence of activities performed subsequently by different organizations from the beginning of the process of creation of value for the final user (Ciesielski 2005). The supply chain can be defined by identifying the product, the customer and/or distribution channels as well as markets in the geographic meaning (Bolsdorf, Rosenbaum 2003; Łobesko 2010).

Cooperation regarding various operating functions of the enterprises forming the supply chains may ensue in them. This cooperation inherently includes supply and distribution, but also may apply to marketing, research and development or production. If partners manage real and information flows (logistics) together we are dealing with a supply network (Ciesielski 2005; Bowersox, Closs, Cooper 2010; Harrisom, van Holk 2010).

As a result of changes in the conditions of competition resulting from globalisation processes the term supply chain has evolved. As a result of this evolution the term supply chain has become very ambiguous and imprecise (Witkowski 2003).

Most often the supply chain is described based on the following criteria (Witkowski 2003):

- 1) entitative structure,
- 2) object of the flow,
- 3) objectives, functional scope and area of cooperation of participating entities.

Taking into account the objective, the subjective and the functional scope of cooperation between the members of a supply chain, it can be defined as enterprises collaborating in various functional fields: mining, production, trade, service-oriented enterprises and their customers between which flow streams of products, information and funds (Witkowski 2003).

The conditions for construction of a supply chain have been created primarily as a result of changes in the approach to the manner of implementation of tasks of logistic enterprises. As a result of globalisation of manufacturing processes strategic importance of logistics which resulted in integration of logistic systems of enterprises has increased.

Two basic stages of this integration may be identified (Blaik 2010; Blaik, Matwiejczuk 2009):

- 1) integration within an enterprise providing the basis for creation of an integrated logistic system of the enterprise;
- 2) external integration encompassing the entire logistic chain from the source of supply to the final recipient.

The literature on the subject does not agree on specific procedures used to achieve higher levels of cooperation (Poirier 1999; Simchi-Levi, Kamiński, Simchi-Levi 2000; Blaik, Matwiejczuk 2005; Rutkowski 1999). However, there is a fundamental conformity of views claiming that this process begins with introduction of logistic improvements in partners' enterprises, then a programme of development of the chain of suppliers is developed to achieve the highest level of collaboration in the form of a network organisation in the end (Witkowski 2003).

It should be assumed that a network organisation consists of entities implementing the processes of temporal-spatial transformation of material goods, harmonised by the management subsystem. These activities may be harmonised in time and space by provision of integration and coordination (Fey 1989).

Being an anticipative form of harmonisation of activities, integration means consolidation of cooperating elements into one whole in order to achieve synergy. In the supply network established as a result of the process of integration, functional and hierarchical relations occur (Stabryła 1984).

Integration by means of functional relations is related to the division of labour and applies to material flows. Hierarchical integration is concerned with information streams being part of the management process. Functional integration runs in two directions: horizontal (economic) and vertical (technical) (Fey 1989).

The impulse causing horizontal integration processes are orders received from customers. The essence of this integration is agreeing all activities necessary to complete a given order as part of the supply chain. Vertical integration processes are related to the product creation process.

To make a network organisation more flexible it is often necessary to integrate the horizontal and the vertical flows (lateral integration). This applies primarily to planning, regulating and control tasks implemented within the management system.

Continuous or replicable agreement of processes is implemented by coordination. In contrast to integration, coordination is an ex-post type of harmonisation (Hubner 1984).

Coordination under a network organisation consists in orientation of its particular elements and the relations between them in accordance with its imperative goals. The demand for coordination actions increases along with the growth in degree of the specialisation of its particular components. The level of this demand depends on the type of interdependencies between particular elements of such a system.

Three types of interdependencies may be identified at this moment (Stoner, Freeman, Gilbert 2011):

- 1) summing – the chain links perform their tasks independently, the success of the whole depends on the effects of the actions made by each of them,
- 2) sequential – one link of the chain must take an action before another link can begin its,
- 3) mutual – cooperation of links.

In the case of a network organisation the present interdependencies are mutual interdependencies within the management system as well as sequential interdependencies in the case of operating systems.

Coordination is implemented as part of the execution of the function of the management system. Efficient and economically effective flow of raw materials, materials for production, finished products aimed at achievement of customer satisfaction (supplier, intermediary, final customer) and profits of particular enterprises (maximisation of long-term profits), should result from correct functioning of such a system.

Establishment of a network organisation is also the effect of implementation of the strategy of internationalisation of activities in enterprises. During this process the enterprise may pursue one of the following strategies (Ciesielski 2005):

- 1) ethnocentric consisting in export of the product to markets with similar requirements as the native market of the enterprise,
- 2) polycentric characterises by adaptation of the products to the requirements of particular local markets,
- 3) global assuming a broad homogenisation of the world market,
- 4) dual, consisting in determining the scope of homogenisation of the world market while taking account of diverse requirements of the local markets.

Each of these strategies determines the quantity, the structure and the configurations of a network organisation affecting the strategic planning process. This process includes two basic phases: strategic analysis and designing strategies.

Strategies of particular partners of the network organization in the supplier-recipient relations can be brought down to the CCC paradigm (Ciesielski 2005). This paradigm assumes that such strategy can be described using three parameters:

- 1) cooperation,
- 2) competition,
- 3) control understood as the desire to gain control over the partner.

Strategies between the supplier and the recipient are defined using strategic alliances. The essence of such strategic alliance can be identified as a long-term cooperation contract concluded between two or more enterprises in order to connect, exchange and/or integrate specific resources for partners to achieve the assumed objective (Hung 1992).

Strategic alliances between partners in a network organisation can be perceived as a coalition of two organisations established to achieve the strategic objective favourable for both partners (Murray, Mahon 1993). The essence of such strategic alliance consists in joining partners with complementary resources with each other (Romanowska 1997). It can be assumed that in relations between the supplier and the recipient we are dealing both with partnership and dominance (Ciesielski 2005). The dualist nature of these relationships results from the pressure exerted by stronger partners on weaker partners resulting from their bargaining power. In extreme cases it may lead to desintegration of a network organisation in accordance with the previously accepted paradigm of a

partner strategy. According to the already stated paradigm, strategic alliances in relations between the supplier and the recipient, although classified into non-competitive alliances (Garrette, Dussauge 1996), involve the risk of occurrence of a conflict.

Non-competitive alliances include: vertical partnership, international joint venture enterprises as well as intersectoral agreements. Vertical partnership concerns enterprises from neighbouring sectors within the value chain (supplier-recipient relation). International joint venture enterprises are agreements between partners, one of which has a product and the other access to a given market. The rarest form of alliances found in a network organisation are intersectoral agreements. They join partners operating in different sectors. The purpose of these alliances is to diversify the operations of a enterprise participating in a given network organization.

3. Analysis of network organisations

The starting point for conducting a strategic analysis of a network organisation will consist of a scheme of assessment of functioning of the supply chain (Fig. 1) (Ciesielski, Długosz 2010; Ciesielski 2009).

The diagram of assessment of functioning of the supply chain indicates the need for the entities forming the network organization to carry out a analysis. This should provide the basis for development of common strategic objectives taking account of both the interests of its particular participants as well as the interests of the whole network organisation. When pursuing the objectives defined this way the entities should be construct functional strategies as well as formulate detailed programmes.

An ideal network organisation should make it possible to postpone decisions on production and deliveries made on the basis of the information on the demand, allow them to offer their customers a diverse product offer as well as minimise the duration of deliveries, inventory and costs (Ciesielski 2007; Fuks, Łupicka 2009).

The analysis of the strategic potential of a supply chain compared to the analysis of the strategic potential of an enterprise is much more complex (Schilke, Goerzen 2010). It should be assumed that this analysis does not apply solely to the assessment of the competitive position of the examined supply chain as compared to other competitive chains, but should also include internal relationships between the partners in three reference structures:

- 1) horizontal – separation of systems outside an integrated supply chain from among the partners' functional systems,
- 2) vertical – separation of systems preceding and following links of the supply chain as part of vertical integration of the partners' activities,
- 3) lateral – separation of systems of links of supply chains penetrating the partners' systems functional.

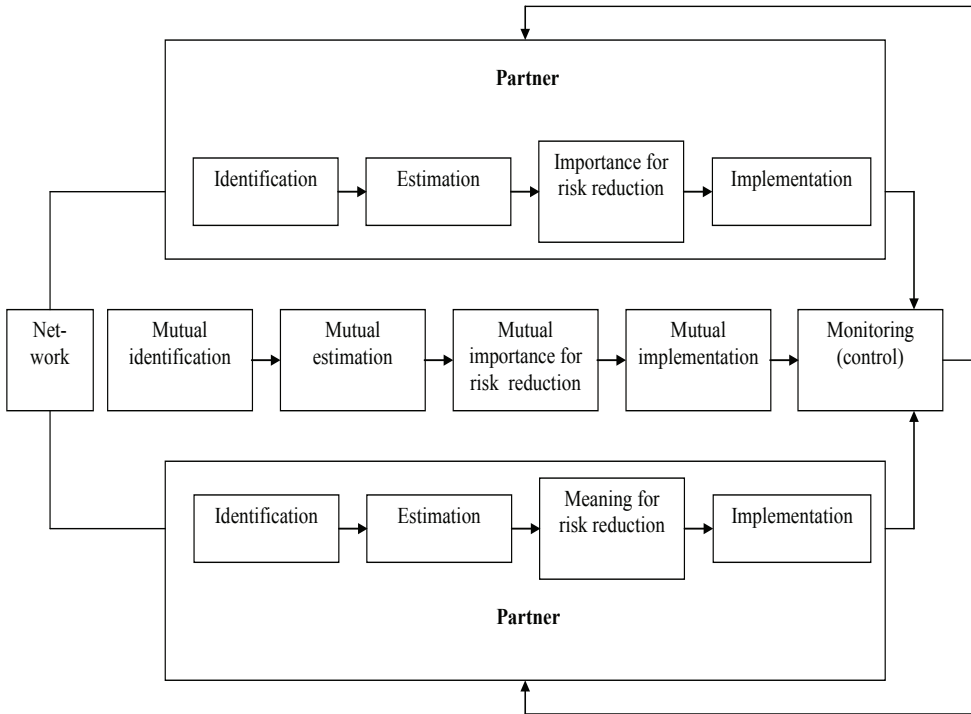


Fig. 1. Diagram of assessment of functioning of the supply chain
(Source: Ciesielski, Długosz 2010)

In the case of a supply chain strategic analyses can be based on commonly known methods. These methods are used to collect and analyse information about the factors determining its strategic situation (Krubski 2003; Lisiński 2004; Oblój 1998).

A analysis conducted while using the proposed methods is supposed to make it possible to design a strategy adequate to the internal and external situation of a supply chain properly (Sroka 2012).

Designing strategies consisting in forming a vision, the mission and strategic objectives of an organisation, identifying significant strategic options as well as devising a strategic plan by confronting the objectives of the organisation with the possibilities of their achievement is supposed to lead to formulation of a supply chain strategy. Also in this case we are dealing with complex relations. The process of formulation of an integrated supply chain strategy consists of two stages.

The first stage is formulation of the strategies of particular partners within the supply chain.

The second stage is concerned with formulation of a supply network strategy being the “result” strategy of particular partners.

4. Models used in analysis of a network organisation

Usually a model is defined as some projection or some pattern. Sometimes a model is identified with some very broadly understood methods of actions (Findeisen 1985). As a result, models are presentations of states, objects or events. Their simplicity compared to reality results from the fact that they take account of the properties of reality important in a given case (Ackoff 1969). This means that the model is something which describes the nature or the behaviour of a certain original entity. This description is made using words, numbers, symbols, diagrams, charts or objects looking or behaving like the original.

The basic relation occurring between the original and the model is the relation of similarity. This relation may take a form of isomorphism or homomorphism. Isomorphy means that any part and each relation between these parts of the original entity corresponds to one and only part as well as one and only relation in the model. On the other hand, when the model does not include all the features of the original entity, we may say that it has a homomorphic nature. This means that the relevance of the original entity and the model is irreversible. In this context, the model is only an approximation, simplification of the original entity.

The image most often used in scientific research is a homomorphic image of the entire object, but an isomorphic image of the examined characteristics of the entire object.

The basic cognitive functions of models include (Kozłmiński 1976):

- 1) the descriptive function,
- 2) the function of explanation of reality,
- 3) the function of prediction of future occurrences,
- 4) the heuristic function,
- 5) the designing function.

In scientific research models serve as cognitive operators. On the one hand, they provide images of reality, on the other hand, they allow scientists to conduct experiments.

The models most often used in management are functional, prognostic, selective and strategic models (Czermiński 1982).

The functional model explains the occurrence of characteristics of some element, indicating, at the same time, which role it plays in sustaining or changing the condition or the structure of an object it is an integral part of.

Prognostic models are used to predict the future conditions of an object based on known interactions and dependencies.

Selective models are a tool used to choose possible decision-making options.

Strategic models are used to predict the behaviour of the objects and assess the future effects of made decisions. This type of models are utilised in the strategic analysis of a network organisation.

The most well-known models of strategic analysis, network organisations include the following models (Ciesielski, Długosz 2010):

- 1) Cox,
- 2) Saunders,
- 3) Kraljic,
- 4) Olsen and Ellram models.

The Cox model is used to examine the correctness of relations between the manufacturer and the suppliers in a supply chain. This model assumes that products offered by suppliers may contribute to the establishment of the manufacturer's core competences.

The Cox model includes five possible relations between the supplier and the manufacturer (Ciesielski, Długosz 2010; Hines 2004):

- 1) the supplier is merely the manufacturer's subcontractor;
- 2) the manufacturer chooses the suppliers and maintains contact with a privileged group of suppliers;
- 3) the manufacturer uses a single supplier to reduce transaction costs;
- 4) the suppliers maintain partner-like relations with each other;
- 5) the supplier enters into a strategic alliance with the manufacturer.

In the case of routine competences the manufacturer is able to ensure themselves a strong advantage in their relations with the supplier by subcontracting or giving the supplier privileges. On the other hand, in the case of partnership as well as a strategic alliance we are dealing with the supplier's competences the recipient does not have at their disposal. This entails the phenomenon of supplementation of competences, thanks to which both the supplier and the manufacturer gain benefits. This cooperation may result in deepening the mutual dependences by establishing a merger between the partners. This process applies to the core competences (Hines 2004).

Contrary to M. E. Porter's value chain model the Saunders model describes a supply chain while taking account of the factors of the macroenvironment and the competitive environment (Fig. 2).

This model provides the possibility to apply other aforementioned methods of analysis of the macroenvironment and the competitive environment as tools in this method. Due to the fact that in this model we are dealing with a system of external and internal factors, we can also apply the SWOT analysis as an auxiliary measure. Due to its clarity and synthetic nature, this model may provide a basis for the methodology of strategic analysis of network organisation.

Political and economical factors				
Technological factors	Supply	Competition	Demand	Cultural factors
		Supply chain		
		Competition		
Global factors				

Fig. 2. Saunders model (Source: Hines 2004)

The Kraljic model is used to examine the relations that should connect the manufacturer and the supplier. In this model the type of relations depends on the type of the product manufactured by the supplier. The basis for identifying the type of the product consists of two criteria: the risk associated with the supplier and the impact of the supplied product on the manufacturer's financial result. The level of risks connected with the supplier is defined with regard to the level of their concentration and the consequences resulting from resignation from cooperation. The impact of the product on the financial result is assessed based on the analysis of the scale of turnover, the level of reduction in costs as well as the share of this product the impact of the product on in generation of value added of an enterprise (Fig. 3) (Ciesielski, Długosz 2010; Hines 2004).

Impact of a product on the manufacturer's financial result	big	"Levers"	Strategic products
	small	Standard products	"Bottlenecks"
		low	high
		Risk associated with suppliers	

Fig. 3. Kraljic model (Source: Ciesielski, Długosz 2010; Hines 2004)

Four groups of products have been defined based on those criteria: standard products, bottlenecks, lever product and strategic products. Each of those products requires a different strategy of dealing with the supplier (Table 1).

Table 1. Strategies for various purchasing groups (Source: Bendkowski, Radziejowska 2005; Ciesielski, Długosz 2010)

Groups of products	Manufacturer's strategy	Instruments of implementation of the strategy
standard	<i>Dual, single sourcing</i> <i>Outsourcing/integrated supplier</i> Joint purchases/cooperation	Simplification of execution of the order Limitation in the number of suppliers pursuit of standardisation
“bottlenecks”	<i>Multiple sourcing</i>	Checking the suppliers Formation of security stocks Monitoring the market Search for substitutes
“levers”	<i>Global sourcing</i> <i>Multiple sourcing</i> Joint purchases/cooperation <i>Just-in-time sourcing</i>	Using bargaining power Reduction in the number of suppliers Continuous assessment of suppliers Logistic cooperation with the suppliers
strategic	Partnership <i>Single sourcing</i> <i>Modular sourcing</i>	Precise forecasts of the demand Market research Long-term contracts with suppliers Risk analysis

Standard products must be standardised and their suppliers consolidated, which may significantly increase the manufacturer's bargaining power.

In the case of “bottlenecks” the manufacturer's bargaining position compared to the supplier is very weak. This allows the supplier to impose the manufacturer a high margin and dictate the terms of the deliveries. To reduce the level of risk associated with the delivery of those products, the manufacturer should possess adequately large stocks and have prepared plans of action in the event of emergencies.

“Levers” include raw materials and low processed products offered by a large number of suppliers. This means that the manufacturer's bargaining position compared to the supplier is very strong. Due to the competition between the suppliers, it is possible to get low prices for the offered products. The tools the manufacturer should use include: tenders and auctions as well as constant monitoring of the situation on the supply market.

On the other hand, strategic products are supplied in large quantities and their parameters are special and adapted to the needs of a given manufacturer. Any disturbance in the deliveries of those products may cause very high losses. In the case of strategic products we are dealing with a very strong bargaining position of the supplier. To reduce the risk associated with these products it is recommended that the manufacturer should start closely cooperate with the supplier. This includes the supplier's involvement in the process of designing and development of the product as well as the technology used to manufacture it. Such type of cooperation may become a source of competitive advantage, both to the manufacturer and the supplier.

The Olsen and Ellram model is a modification of the Karlic's concept. In this model purchases of products have been specified using the criterion of their strategic importance and the degree of complexity of the purchase management process (Olsen, Ellram 1997).

The strategic importance of a product is assessed based on the following factors:

- 1) the manufacturer's product and technological competencies;
- 2) economic factors (volume, value of purchases and their contribution into the profit brought by finished goods);
- 3) the supplier's image in the eyes of the customers.

The assessment of the degree of complexity of the process of purchase management is influenced by the following (Ciesielski, Długosz 2010; Olsen, Ellram 1997):

- 1) product characteristics (exceptionality, complexity);
- 2) situation on the supplier market (number of suppliers, their relative market share, their share in the manufacturer's purchases);
- 3) uncertainty and risk related to purchase transactions (technological risk, supplier's behaviour) (Fig. 4).

Degree of complexity of purchase process	big	"Levers"	Strategic products
	small	Standard products	"Bottlenecks"
		low	high
		Strategic importance of a product	

Fig. 4. Olsen and Ellram portfolio purchase model
(Source: Olsen, Ellram 1997; Ciesielski, Długosz 2010)

The authors of the abovementioned concept suggest similar actions as in the Kraljic model with regard to particular product groups.

5. Conclusions

Based on the abovementioned deliberations we can ascertain that it is possible to conduct a analysis of network organisations using the presented models. This analysis should be referred to the participating strategies of particular partners participating in the network. The latter reference also applies to the analysis of relationships between those partners in a network organisation. These relationships are a combination of competition, cooperation and control in the relations with partners and must take account of the distribution of tender forces within those relations.

Preparation of a consistent concept of strategic planning in a network organisation will allow the researchers to penetrate the essence of those extremely complicated dependencies. It will also make it possible to draw up a consistent system of strategies of a network organisation. An important issue, as complex as planning strategies, is its implementation and execution both in the entire supply network and its particular participants.

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