

THE MEANING OF THE SUPPLY CHAIN VIRTUALIZATION FOR THE FUNCTIONING OF LOGISTICS COMPANIES

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Abstract:

The subject of this paper is describing what the virtualization of supply chains means for the functioning of logistics companies. Attention shall be paid to what virtualization is and how it is used with respect to logistics, but also, what are the advantages of its application in supply chains.

Keywords: Logistics, virtualization, supply chain, virtual organization, ERP, virtual supply chain

1. INTRODUCTION - DISCUSSING THE MOST SIGNIFICANT TERMS

1.1 Supply chains

The basic notion associated with the discussed topic is the supply chain. Generally, the term „supply chain management” has first been used in the 80s of the XX century, so the concept referring to it can be regarded as relatively new. This chain is defined in many ways. For e.g. M. Christopher claimed that it is a network of organizations engaged through associations with suppliers and clients, in various processes and actions which create a particular value in the form of products and services supplied to end consumers [8].

Whereas, P. K. Banchi wrote that the supply chain consists of networks of facilities and contractors that supply raw material and components, subsequently process them into semi-products and sub-assemblies, further use them for the production of end products and finally render their consumption possible to the end consumers [8].

In both definitions provided above it has been indicated that the supply chain is a sort of network that consists of all entities engaged in creating products and services for clients, and particularly suppliers, manufacturers and distributors.

It is necessary to further add that M. Brzozowska stressed that initially, the term „supply chain” was understood as a simple combination of companies that cooperate and exchange goods for the purpose of satisfying their clients’ needs. Gradually however, this definition has become extended by the opinion that supply chains are integrally associated not only with material flow, but also information flow which is necessary to offer particular clients products or services complying with their requirements. The flow of such information concerns for e.g. providing suppliers with information on the amounts of raw material necessary to carry out the production and its delivery time by producers [3].

1.2. Virtualization and virtual organization

The term „virtualization” originates from the word *virtus*, *virtutis*, which means fluency, courage, bravery or fitness, as also *virtualis*, which means effective. In ancient times this word was strongly associated with philosophy and referred to exercising authority and power even if the individual wasn’t physically present in a

particular place. Currently however, virtualization is tightly connected with IT and particularly cyberspace which is a digital reality and which is created by means of the Internet [10].

Generally, virtualization consists in generating reality by means of computers and the Internet and the coexistence of this reality with what is real. This way, virtualization can mean the ability to act and achieve particular target, but it refers to the unreal. It consists of any information and the organization of its flow, as also the knowledge base [10].

Virtualization can also be treated as a kind of delocalization of business Activity, so a transfer of those elements of the company's functioning which have till now occurred in the real world and which have had a physical dimension, to the Digital world in the form of data stored and processed in IT systems. This way, virtualization makes it possible for companies to present their products or deliver services in Any time and place, which is achieved by means of multimedia systems [1].

Virtualization is also associated with the functioning of virtual organizations and for this reason this term also needs to be explained. According to J. Kisielnicki, this organization constitutes a model of the functioning of a company, which includes the voluntary connection of resources remaining to the disposal of the cooperating companies. It is supposed to lead to the performance of a common venture which should bring particular companies benefits larger than if the venture was to be performed traditionally [6]. This definition thus discusses the synergy effect which leads to the fact that companies integrally cooperating achieve significantly larger benefits than if they were to act individually. It is undoubtedly one of the most significant features of virtual organizations.

It is important to add that the subject literature often defines virtual organization also as:

- Virtual corporation,
- Modular corporation,
- Virtual company,
- Chain organization [2].

1.3. Virtual supply chains

One of the most important definitions of virtual supply chains has been proposed by Mary Beth Watson-Manheim. She claimed that the chain is a network which includes single companies concentrated on performing one target (venture). This definition thus combines notions concerning supply chains and virtual organization [4].

According to another definition, the virtual supply chain is considered to be a global supply chain that functions within a dynamic network of companies engaged in many various relations, and the functioning of this chain is based on the existence of three mutually associated elements, which are:

- Information and Communications Technologies ,
- The competence of the main participants of the performed venture,
- The competence of the participants who deal with carrying out specialist tasks with respect to this venture [5].

2. THE IDEA OF THE SUPPLY CHAIN VIRTUALIZATION

2.1. The idea of the supply chain virtualization

Virtual supply chains have started to occur and develop mainly in the 80s and 90s of the XX century. It resulted from a number of various factors, which according to D. Biniasz and I. Pisz have undergone an intense

technological development, globalization processes and the strives of particular business entities for the increase of efficiency [2].

In case of the first factor, it was connected with an intense IT and technology development which concerned software to a large extent, including systems designer to support management, IT and telecommunication networks, mainly the Internet. Thanks to the systems, such as ERP (*Enterprise Resource Planning*, so planning the company's resources) it was made possible to integrate processes occurring within the functioning of companies, which may be achieved thanks to information resources placed in the form of data in particular data bases being part of integrated IT systems. Data integration helps to integrate organization functions and liability which is necessary to use this data, and integration may also take place between two or more companies thanks to other IT systems, such as SCM (*Supply Chain Management*), SEM (*Strategic Enterprise Management*) or CRM (*Customer Relationship Management*) [2].

The development of the supply chain virtualization also resulted from globalization processes, which means processes that led to new networks of associations and dependences occurring between particular markets and companies. Globalization was also supported by the growth of worldwide integration tendencies by means of creating various transnational and trans state connections, relations or political and economic organizations, such as the European Union, collapse of the Soviet block at the beginning of the 90s of the XX century, which on the other hand led to the cancellation of the division of the world into the West and the Communist, as also the cancellation of the borders in global IT networks, which occurred thanks to the Internet [2].

The third factor for the development of the virtual supply chains was the intensified Struve of particular companies for the achievement of efficiency and thus for securing their competition advantage, acquiring new clients, reducing costs and increasing profits. For this purpose, particular entities have started to concentrate on operations connected with eliminating significant costs incurred with its business activity or on the development of key competence and ceasing to compete between employees to the benefit of increasing work efficiency [2].

2.2. Characteristics of virtual supply chains

D. Kisperska-Moroń has included the following to the most significant features of virtual supply chains:

- temporariness - connected with the fact that the chains are created in order to perform a particular venture and upon its completion the structure of the Niven chain undergoes decomposition, so virtual chains break up when the cause of their association disappears; what's important, even during performing a venture, particular participants may take part in other virtual supply chains or create entirely new ones,
- concentration on the client - the creation of virtual supply chains is supposed to constitute a direct answer to the clients' requirements and needs, and the client, being the entity of the virtual organization in this case, may also participate in the operations performed within these chains,
- geographical dispersion - the virtual supply chain may include participants - entities that are located significantly far away, even on different continents; it occurs thanks to the fact that IT systems and the Internet, used on a large scale, provide an effective communication between the participants of the chains,
- intense application of specialist IT technologies,
- the existence of a chain organization structure - it's connected with the fact that usually there are no hierarchical dependencies within the virtual supply chains, and only one participant of these chains plays the role of the coordinator of the operations undertaken within a given venture,

- using the key competence of the chain participants - a company having competences and resources useful for the performance of a venture, such as knowledge, skills, technology or staff, to a large extent decides about their engagement in the said venture and each stage of the virtual supply chain is executed by the participant who has the biggest knowledge and skills in the scope of carrying out tasks connected with this stage,
- voluntary participation of particular cooperants in virtual supply chains [7].

2.3. Tools and forms of virtual supply chains

Virtual supply chains in order to function consist of a number of various tools. These include, first of all, IT systems, so the systems mentioned earlier in this paper ERP, SCM, SEM i CRM. Their place in the virtual supply chain is illustrated by **Figure 1**.

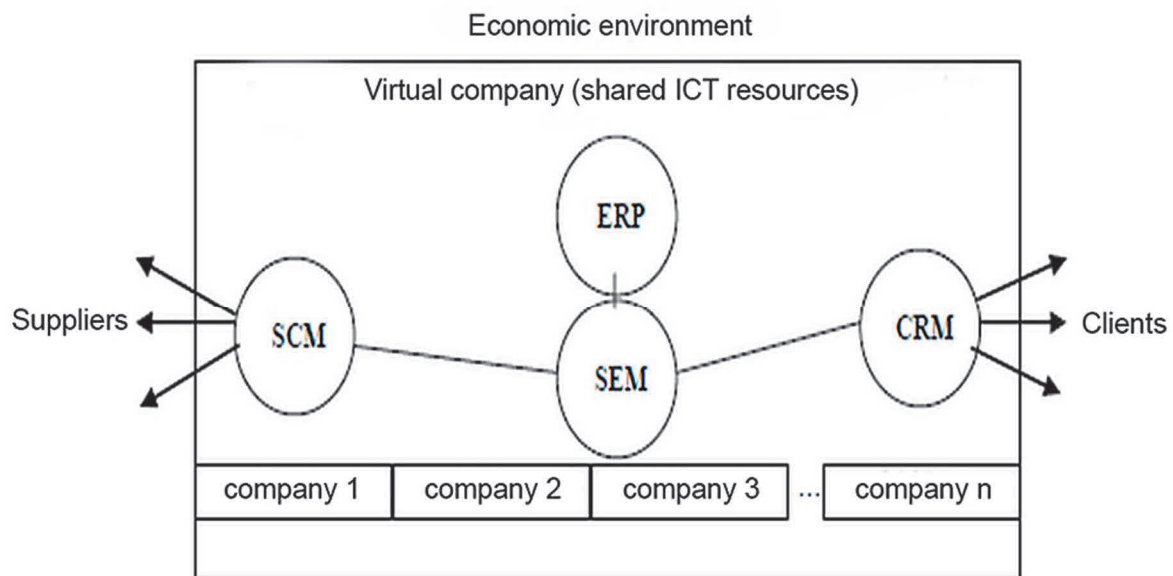


Figure 1 IT systems occurring in virtual supply chains

The SCM system SCM contributes to building and strengthening proper relations with suppliers, the ERP and SEM systems integrate operations undertaken by particular participants of the supply chains, whereas the CRM system is responsible for the adequate level of customer service.

It has been mentioned that one of the participants within the virtual supply chains accepts the role of the coordinator. The coordinator's basic tasks include:

- Constant control over operations undertaken within particular elements of the chain,
- Maintaining constant contact with clients,
- Acquisition of new counterparties for the performance of the venture,
- Constant extension of the logistic network,
- Adding demands for particular products or services [11].

The coordinator's duties can be fulfilled by the virtual logistics center. His place in the virtual supply chain is illustrated by **Figure 2**.

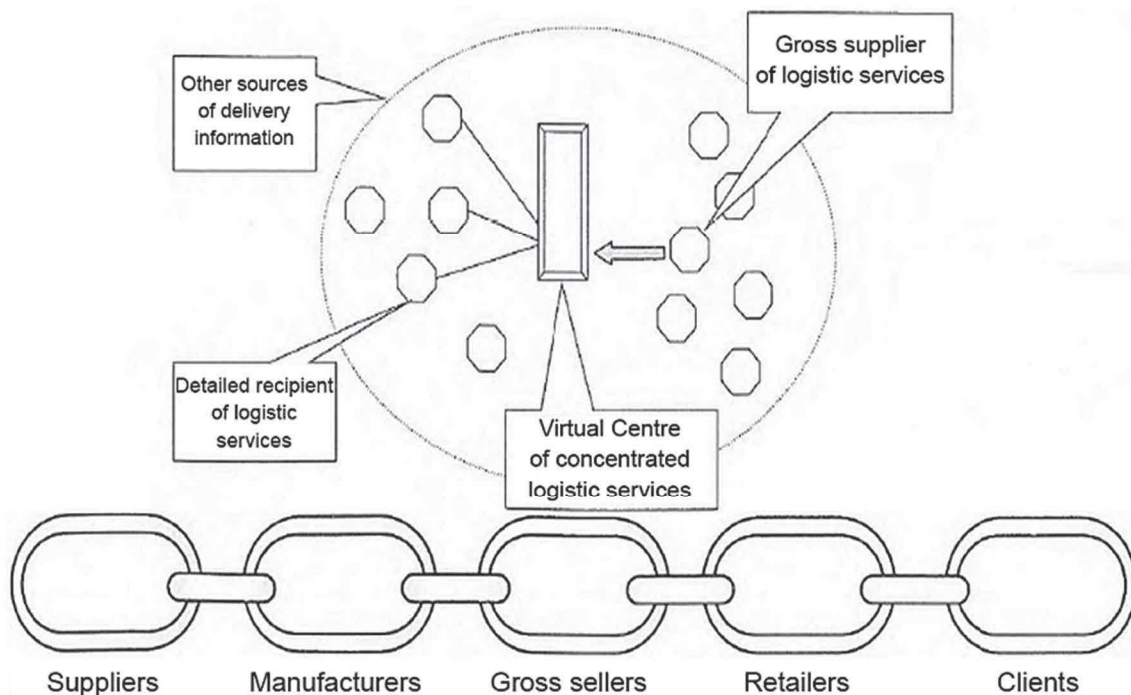


Figure 2 The structure of Cloud Computing

The virtual supply chain tools include, apart from IT systems, various Internet portals, catalogues and electronic repositories, data warehouses, transaction systems, Communications systems, information systems and specialist systems and software, such as digital maps, banking systems or applications for the planning of supply chains [10].

- Virtual supply chains may function within various form types. Generally, they include:
- Virtual education systems, such as Virtual Training Calendar,
- Virtual design organizations (PartNet oraz ARPA Distributed Design of Electronic Systems),
- Distribution centres (San Diego Source),
- Virtual trading organizations (Global Trade Point Network oraz TradeNet World Service),
- Regional centres of economic development (Small Business Administration or Virtual Competence Center for Environmental Issues),
- Virtual manufacturing organizations (European ALFA Project - Global Virtual Enterprise) [2].

3. THE ROLE OF VIRTUALIZATION IN THE DEVELOPMENT OF LOGISTICS COMPANIES

3.1. Strong and weak points of the virtual supply chains

It is to be indicated that the supply chain virtualization results in a number of various implications for companies providing logistic processes, and you can distinguish both positive and negative aspects concerning its implementation. Below an example of the SWOT analysis has been illustrated for a hypothetical virtual organization, which contains the most significant aspects.

Table 1 The SWOT analysis for a hypothetical virtual organization

| STRONG POINTS | WEAK POINTS |
|--|--|
| - high performance flexibility | - the necessity to possess large funds for the purchase of data bases |
| - fast order execution | - the necessity to generate trust between the chain participants |
| - minimization of transaction costs | - the necessity to incorporate incompetent or unreliable organizations |
| - reduction of investments | - difficulties in liability collection from the organization participants |
| - common operational strategy of different organizations | - Lack of formal supervision over transaction execution |
| - bringing into the organization best competence of cooperants | |
| POSSIBILITIES | THREATS |
| - Fast reaction to changes in the environment, including the reaction to the creation of market niches | - low efficiency of technologic equipment in networks |
| - execution of orders despite legal or organizational obstacles | - Lack of legal regulations with respect to the functioning of virtual organizations |
| - applying modern management techniques | - Lack of customer interest in the services offered by the organization |
| - possibility to start cooperation between organizations that could cooperate in other conditions | - resistance of many companies to implement changes in the methods of executing transactions |
| - New customer groups | |
| - Lack of prejudice between the chain participants | |
| - an unlimited information flow | |

As it results from the above table, with respect to the functioning of virtual organizations we can distinguish slightly more weak points and more advantages rather than threats. This causes that organizations constitute an undoubtedly significant factor which can influence the development of many companies, including logistics, as well as that it is justified to consider their meaning for increasing the efficiency of particular companies or for the improvement of their competitive situation is very large.

3.2. Advantages and disadvantages of virtual supply chains

Virtual supply chains have a number of both advantages and disadvantages. The former mainly include:

- Possibilities of particular cooperants' abuses or violations,
- Problems with the identification of employees,
- Possibility of the virtual supply chain transforming into a number of separate contracts concluded by selected partners,
- Loss of the control over partners, connected with authority decentralization within the chain,
- Market immaturity, including the Polish market, to use the solutions offered by virtual organizations,
- Differences in management styles of the particular participants of the chain,
- Differences in referring to the adopted norm and value systems,
- Lack of confidence [2].

Virtual supply chains have a few disadvantages. A large part of them is associated with foreign partners and the possibility of their non-compliance with the provisions of the contracts, their individual initiatives to start

cooperation exclusively with selected participants of the chain, their abuses and frauds or their actions to the detriment of the remaining participants of the virtual organization.

Despite the above, it is worth indicating that currently, in the time of a technology boom, including IT and information, the virtual supply chains create almost enormous opportunities for a number of logistics companies and it is most certain that these companies should take advantage of these opportunities. The previous subchapter already discussed many of them. For e.g. the opportunity to access new customer groups: starting cooperation with entities, in the case of which no cooperation could be possible without the opportunities created by the IT systems and the Internet; in the scope of unlimited information flow, delivery of orders without the existence of particular legal or organizational obstacles.

Moreover, virtual supply chains are becoming extremely useful for the present companies due to many advantages. Generally, there are at least several dozen of advantages and for this reason this paper shall only mention the most significant ones:

- Significant shortening of deadlines for the execution of orders and tasks,
- Division of profits between all participants of the virtual organization,
- Increased process efficiency,
- Division of costs between all participants of the virtual organization,
- Optimization of the production value chain,
- Productivity growth which is the result of the maximum use of the chain participants' competence,
- Increase of the chain fluency and flexibility,
- Increase of motivation and engagement of the employees,
- Fast information flow in case of long distances,
- Effective acquisition of new markets,
- Possibility of off-site work, such as telemarketing,
- No agencies,
- Division of market between all partners,
- extension of possibilities of performing work in the scope of R&D, that is Research and Development [2].

As you can see, there are a lot of advantages resulting from using virtual supply chains, what's important there are more advantages than disadvantages. The above mentioned advantages should also include those that are connected with the fact that creating virtual supply chains leads to additional components, that is virtual customers for logistic services, as also implementation of a new term which is the added value. It is a selective logistic information referring to various aspects connected with the supply chain. This value is executed within virtual supply chains mainly through:

- reduction of time and logistic costs which is achieved thanks to the effective organization of supply processes and which leads to the optimization of the entire supply chain,
- increased possibilities in the scope of collecting and monitoring any kind of need for logistic activity,
- effective monitoring the condition of the supply chain, including for e.g. the condition of the warehouses or logistic infrastructure,
- proper maintenance of logistic systems for electronic documents,
- introducing processed logistic knowledge to the service [11].
- The significant meaning of virtual supply chains for logistics companies is also illustrated by the fact that they contribute to the implementation of many positive changes with respect to the employees. These chains:
- almost force constant investments in human resources which on the other hand contributes to the improvement of efficiency and quality of their work, as also to the increased engagement in the customer service process,

- cause employees to more willingly engage in company management and make the most significant decisions concerning its functioning, including decisions of strategic nature,
- make it possible to base on key competence of the employees thanks to which it is possible to use their knowledge, skills, ideas or information on virtual tools to the maximum,
- make integrated management based on cooperation and harmony between the interior environment and the exterior virtual organization real [2].

4. CONCLUSION

Concluding the paper, it is important to stress that virtualization is a relatively new phenomenon as it started to develop only in the 80s and 90s of the XX century. Despite the above, you may observe increased interest of many economic entities in virtualization, including logistics companies. The reason for this is mainly that virtual supply chains, despite their many disadvantages, also have a lot of advantages and their application may contribute to the achievement of many benefits by the mentioned companies.

Among the advantages, there is first of all the possibility of starting cooperation with companies having registered offices almost all over the world, reduction of risk and costs incurred in connection with running a business, increase of flexibility, fluency and functioning efficiency, the possibility of improving the execution of particular process and tasks, increase of employees' engagement in management processes or fast information flow. Moreover, due to the fact that each of the partners contributes to the virtual organization its best competence and fulfills its duties in the scope of the particular stage of the virtual supply chain with respect to the most useful competence, the synergy effect is achieved which on the other hand increases the effectiveness of the operations conducted by the participants of the chain. Participation in virtual organizations increases the scope of activity and the number of potential customers which simultaneously makes it possible to offer products and services to a larger number of clients. It is important to stress that using virtual supply chains by logistics companies is very much reasonable and necessary.

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