



# The development of the concept of supply chain management as an example of the evolution of logistics

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## Abstract

The global economy is undergoing faster and faster transformations. Certainly, logistics belongs to one of the most rapidly changing areas, including supply chain management. A modern and perspective supply chain is becoming more and more integrated, works under time pressure and carries out tasks on ever greater distances so that the delivery was made in accordance with the expectations of the customer. To achieve the goal, it uses the latest technology advances and the latest technologies. The knowledge of the latest and prospective concepts and solutions and their correct implementation to support activities within the supply chain becomes one of the essential elements of gaining success in current and future market conditions. The ability to see contemporary needs as well as conditions for implementation of logistic activities, building organizational culture focused on innovativeness, changes in how to approach and resolve problems essential for the functioning of supply chain creates the prospect of achieving a market success on a much broader basis than just using the experience of the know-how of the competition. The essential challenges facing not only supply chain but the whole logistics are: reconfiguration, integration and optimisation of whole logistics network, changes in the location of its components, transport planning in terms of tactical and operational levels, and inventory management. The reorganisation of the logistics and the supply chain is connected with a concept of "value chain", which was created in recent years, and which accounts for a strategic set of instruments to achieve competitive advantage. This article is devoted to all those problems, the abilities to see them in present and future challenges and use them to build modern supply chain, adequate for current needs and requirements.

**Keywords:** logistics, supply chain, supply chain management, evolution of logistics

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## Introduction

Since the beginning of the 70s of the 20<sup>th</sup> century, we have been witnessing, in a relatively short period of time, the creation of a variety of concepts and methods of management (Lichtarski 1998: 10). This resulted from exogenous and endogenous impulses (e.g. increase in customer requirements, growing competition, changes in the information tech

nologies and telecommunications, the transformation on the labour market, moving away from a functional approach to the "process thinking", etc.) and the related imperative of efficiency and flexibility of the company (Lichtarski 2007: 321). Modern logistics has to generate such capabilities, which will allow to effectively implement the tasks placed before it in current and prospective conditions. The completion of indicated goals has resulted in

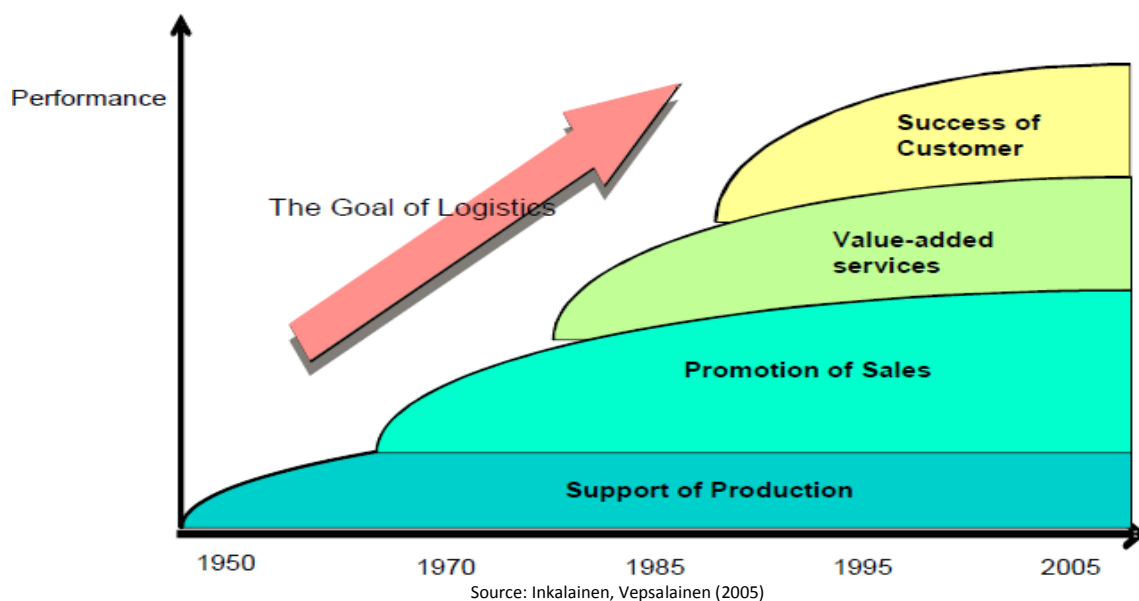
implementing a variety of modern concepts and methods of management in logistics. Their selection is accompanied by taking into account development and integration tendencies of logistics as well as building logistics for the needs and vision of the 21<sup>st</sup> century. The supply chain plays special and a very important role in this modern concept of logistics matched to the needs of the 21<sup>st</sup> century. The aim of this article is to provide an overview of current and future developments and challenges regarding the evolution of the concept of supply chain management.

### Supply Chain Management

In many other areas of our social and economic life permanent changes take place due to

the dynamics of economic development. It is followed by connecting the present with the future as well as creating new currents and directions of development. However, this requires, on the one hand, intellectual courage in building new concepts and solutions, indicating a new philosophy of thinking and functioning, and, on the other hand, very rational and deliberate actions based on knowledge and experience. All these activities are burdened with pressure of time. In particular, this refers to logistics, where we must not put off until tomorrow decisions (transformations) which need to be taken today. Modern logistics is perceived globally and, similarly to science, is constantly expanding its borders to effectively adapt to global trends and strategies (Fig. 1).

Figure 1. Changing Mission of Logistics/SCM



Permanently increasing complexity of processes and logistics activities resulting from global expansion causes the need for, inter alia, preparing individual solutions for a wide variety of circumstances that are generated in heterogeneous parts of the world, constant improving chains and logistics channels, the need to broaden the range of products and not only to see but to take into account changeable and very different customer demand. The following factors to be taken into account are most often indicated.

Logistics of the 21<sup>st</sup> century is a great challenge not only due to increasing complexity but mainly because of the need to find new innovative solutions that meet today's expectations and requirements. Achievement of competitive advantage arises primarily from the ability to master complexity and focus on the most important issues.

Modern logistics is a comprehensive and integrated approach to problems and logistics operations. To give an example, let's take an average maritime transaction, the implementation of which requires the agreement of 20

partners, signing more than 25 documents, transfer of more than 200 different data and cooperation of public and private sector entities. There is not one simple solution, one wonderful technology for regulating or setting a procedure that would solve the problem. Moreover, even the best solutions very quickly become outdated and needs reorganizing, changing and adapting to new, con-

stantly changing conditions. On the other hand, the implementation of new solutions takes time, which is often too long to keep up with the changes. Therefore, today, on increasingly competitive markets, the winners are those who are able to anticipate and predict changes and trends and early enough (in advance) adapt to them their supply chains.

Figure 2. Key elements of the supply chain



Source: Zubrod (1998: 14)

As results from presented concepts a very important element of modern logistics are concepts and scenarios of its development based on scientific grounds (Fig. 2). Prospective conditions, visions and concepts for the development of logistics have been presented in, inter alia, the study "Excellence in logistics" drawn up by the European Logistics Association (ELA) and AT Kearney (ELA/A.T. Kearney 2004, 2007, 2009). In the context of the directions of change in logistics some relevant conclusions should be indicated, which were included in the study "Global Logistics 2015 +" developed by DB Schenker and the Technical University of Berlin (Schenker 2014). Attention should also be paid to the studies by Capgemini conducted since 2005 and published in the report „2016 The Future Value Chain” issued by GCI, supplemented with further studies the report „Succeeding In a Volatile Market. 2018 The Future Value Chain” in 2008 (Global Commerce Initiative 2008, 2008a). An example of one of the recent studies on the vision of development of logistics is "Logistics of year 2050" developed by DHL (E-logistyka.pl 2012). This study is the result of

research carried out in collaboration with a group of 42 recognized experts. The result of the study is a comprehensive collection of five reliable forecasts for the future. The study indicated how different the world might be in 2050 in terms of degree of globalization, the scope of economic and social development, the dominant technological standards and environmental conditions. It describes five long-term scenarios of life in 2050, all sharing one common element: an essential transformation of the meaning of logistics, its role, significance and tasks. According to most scenarios, the general demand for this type of services will grow, however, detailed expectations for logistics providers and related challenges vary depending on the forecast. Logistics scenarios differ in the scope of the adopted time horizon, the degree of generality and precision. Experts and the authors in this area often make a of them. For example, P. Blaik points to such concepts as [Blaik 2010a: 21-43]:

- scenarios for the future of the external environment, logistics and structures of

the system of flows according to Göpfert (2006, 2006a),

- vision of logistics in 2015 according to Th. Hueck (2001),
- scenarios of the market space for logistics services in 2025.

However, generally, it should be pointed out that the above mentioned and other studies within this area do not only define the recent and future trends in logistics, but also indicate the most important conditions determining the development of logistics.

The presented documents suggest that the key factors affecting the future logistic solutions include: changes in consumer buying behavior and greater use of modern technology in information and physical flows. The following factors are indicated (Global Commerce Initiative 2006, 2008, 2008a):

- increase in consumer knowledge and computer skills, including, in particular, the rise of his skills in the use of the Internet,
- multimedia access to extensive information on products,
- personalized approach to the consumer,
- offering along with the product a wide range of services to facilitate access to them,
- increase in the quality of both products and services.

Special attention is paid to three interrelated challenges:

1. An essential element is to develop new ways of cooperation, including sustainable changes in the field of culture, economic cooperation and planning new activities, and using economic effects.
2. By building an appropriate culture of companies partnered to create the basis for better and more effective exchange of information: the report stresses that "it is best to manage increasingly complex supply chains with transparency (Global Commerce Initiative 2006)."
3. Only open environment of collaboration can generate the appropriate changes and flexibility for future value chains and effectively take into account the impact on the physical flow of goods, energy price

changes, changes in population density and other external forces.

Therefore, it can be pointed out that one of the fundamental (basic) elements of the presented concept is the principle of a new quality in cooperation, i.e., an increase in confidence. It shall be also indicated that the final customer is referred to as the focal point around which members of a supply chain will develop modern technologies. He will increasingly decide about the range of manufactured and supplied products. The factor, which in the future will determine the success, will primarily be the skill and ability to understand the customer's needs by the company and the use of the potential which is given by the implementation of new (innovative) technologies to the customer's advantage. The ability to dialogue with the customer will decide on the success of the company.

According to the presented concept, providing the opportunities for development and growth of efficiency in the functioning of companies as links in the supply chain, and thus obtaining an appropriate competitive position will require (Global Commerce Initiative 2006, 2008, 2008a):

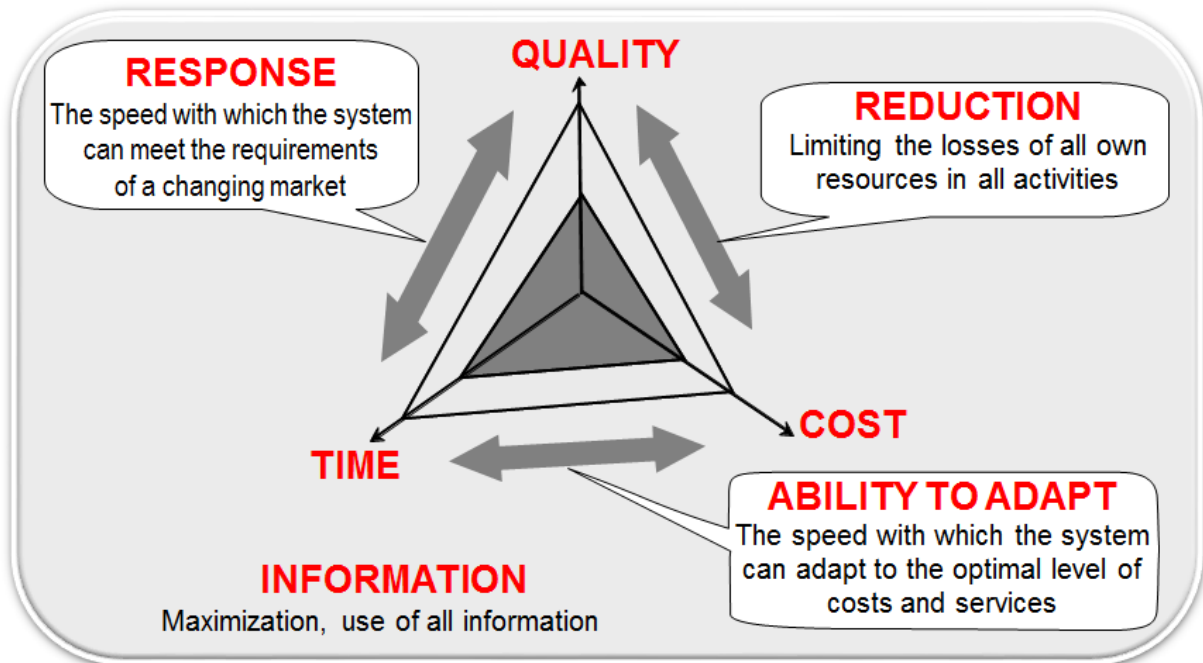
- direct communication - a two-way dialogue with the final customer,
- broader and easier information sharing among partners in the chain,
- changes in the corporate culture,
- appropriate adaptation of strategies and tactics of partners in a supply chain,
- synchronization of production that runs on a signal from the market and accurately integrated with suppliers of materials for production,
- implementation of the concept of sustainable development, taking into account ecological factors, and, especially, reducing environmental pollution,
- even more precise integration of logistics, particularly in the area of consolidated distribution, dynamic route planning with sharing means of transport.

Currently, there are already quite a lot of visions and development scenarios for logistics and its systems. They are of general nature or relate to its systems, e.g., "The White Paper": A plan to create a single European transport

area – striving to achieve competitive and resource efficient transport system (Komisja Europejska 2011), which designates the prospects of transport development by 2030 and some forward-looking concepts by 2050. The

analysis of all these documents, all developed logistics scenarios leads to many important conclusions that become a basis for changes in the functioning of logistics and supply chains.

Figure 3. Supply chain dynamics in the context of traditional measures of performance



Source: ELA/A.T. Kearney (1999)

Experts point to a variety of factors and elements to be taken into account under the prospective supply chains (Fig. 3). However, there is a group of conditions, which is most frequently cited and indicated. Factors identified by E. Gołemska should be included in this group (2012: 14):

- integration of all management functions, including logistics management, both in an enterprise and between enterprises,
- convergence of logistic processes in firms, supply chain links,
- development of international logistics networks including the construction of logistics centres.

In conclusion of this part of the ongoing considerations the following factors determining the development and changes in the logistics of the 21<sup>st</sup> century should be emphasized:

- greater orientation of logistics on customer expectations, creating new values and utilities for the client,
- focus on the key completions, outsourcing increasing range of functions and logistics

activities (the development of outsourcing),

- shortening product life cycle in conjunction with pressure on shortening the cycle of product creation and time to reach the final consignee,
- new concepts and strategies for the operation of the supply chain management (SCM), subject to growing trends relating to the limitation of time and costs,
- building strategic alliances,
- transfer of competitive struggle to the entire supply chain,
- initiating and practical use of the stream of innovations,
- introduction of innovative IT systems so as to allow the full integration of activities within supply chain, increase of flexibility and reducing operations costs,
- increase of transparency in the entire supply chain operations,
- rise in combined transportation and properly organized (innovative) transshipments,

- increase in the number of consignments in conjunction with e-commerce concepts,
- rise in aspects related to the concept of sustainable development,
- the need to handle multimillion cities, resorts, whose number and size will grow, especially in the context of the logistic use of so called "third" underground area,
- globalisation and liberalisation of world trade.

### **The development of the concept of SCM and its determinants**

It can be inferred from the above considerations that some of the key challenges facing modern logistics are issues related to the management and operation of a modern supply chain. However, before presenting the contemporary conditions of the functioning of supply chain, it is worth looking at the changes that accompanied the perception of this phenomenon (supply chain), its defining and evolution.

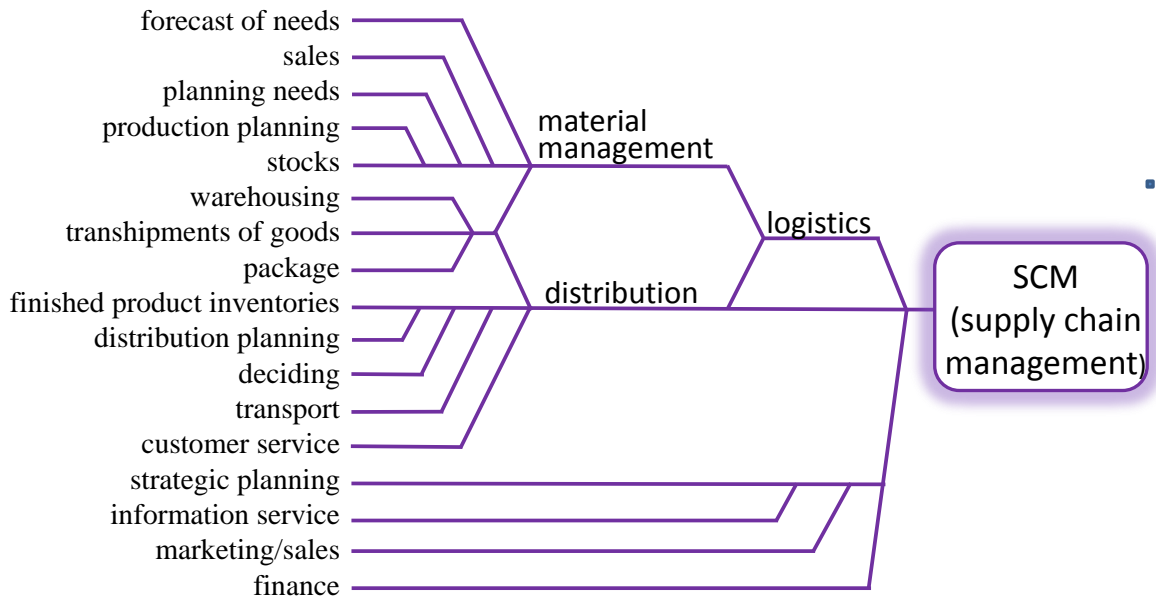
A supply chain can be defined as "a network of organizations engaged, through the relationships with suppliers and customers, in a variety of processes and activities that make up the value in the form of products and services provided to final consumers (Christopher 1998: 14)."

In defining the concept of "supply chain" there is a consensus among many theorists on how to present this term. A slightly different situation occurs when specifying the basis for supply chain management. This was already noticed by M. Koulikoff-Souviron and A. Harrison, who stated that: "while a consensus can be seen in the definition of the supply chain, there is a lack of harmony in the definitions of activities and types of relationships that are within the range of supply chain management (Koulikoff-Souviron, Harrison 2000: 344)." This lack of consistency stems from the fact that the authors of the considerations choose different perspectives and approaches to this problem. One of the first definitions of supply chain management in the context of logistics was the notion that it is planning, coordinating and controlling the movement of materials, components and finished goods from sup-

pliers to customers, which includes two separate streams of flows (materials and information) (Stevens 1989).

Before the latest trends and concepts of the SCM will be indicated, it is worth following the history of the changes in the approaches to this problem. Limiting this part of the analysis to a minimum and to the most significant changes, primarily the approach of R.H. Ballou should be mentioned, who points to the process of evolution of logistics leading to modern supply chain management (Fig. 4) (Ballou 2004: 7).

Figure 4. The evolution of logistics

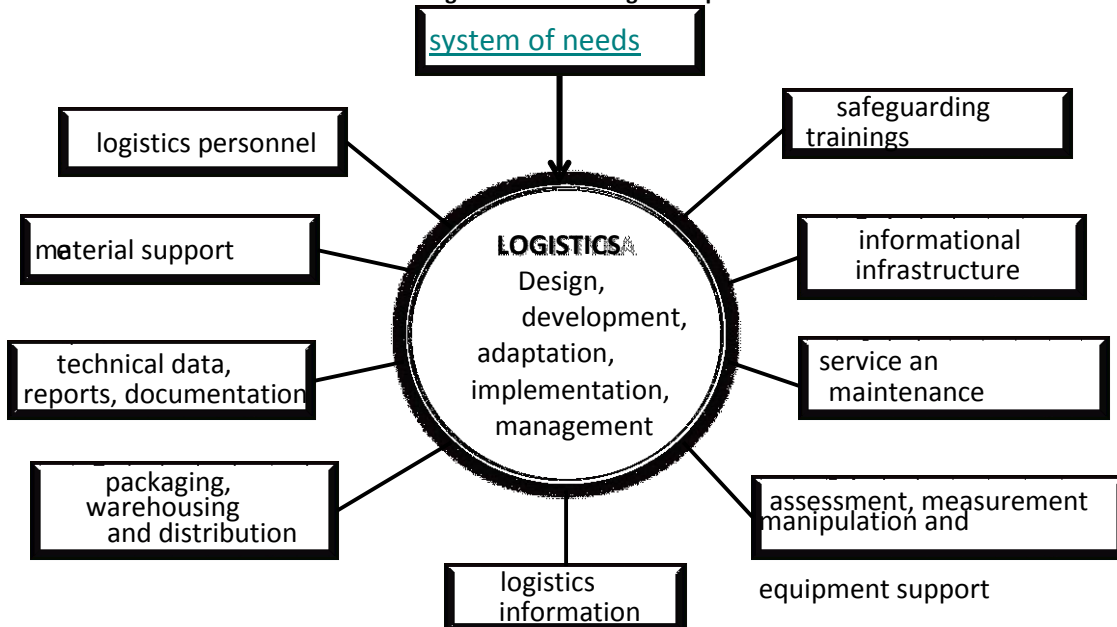


Source: Yuva (2002: 50)

By contrast, Benjamin S. Blanchard while making the analysis of the areas of logistics operation, compared various definitions and approaches, including, inter alia, definitions published by the Council of Logistics Management and other concepts relating to the

supply chain and its management, such as those of I.T. Mentzer and his co-authors in subsequent works (2000, 2004, 2007), which allowed him to determine the essential areas of functioning of contemporary logistics (Figure 5) (Blanchard 2005: 12).

Figure 5. Areas of logistics operation

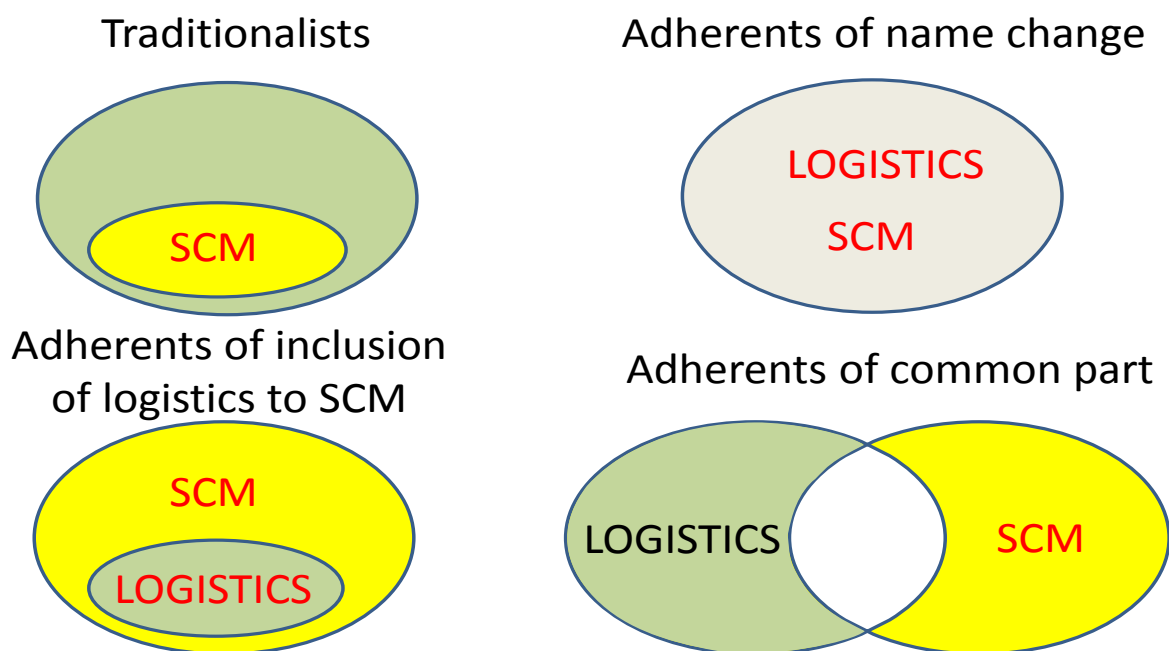


Source: Blanchard (2005: 12).

In 2007, S. Chopra and P. Meindl presented and described their views on the functioning of the SCM (Chopra, Meindl 2007). The indication of those authors stems from the fact that by analyzing the functioning of the supply chain they treated it as a kind of activity independent of logistics. This approach is essential for the subsequent stages of the perception of SCM as well as logistics, because part of the theorists such as David F. Ross in their studies indicated the evolutionary separation (exit) of the SCM from logistics and swapping roles

(Ross 2008). According to this author, enterprises narrow the fields of activities in logistics for operational and tactical actions in the area of storage, transport and cost management, leaving the strategic and tactical area of SCM to the integrational processes of it. Graphical illustration of conducted digressions, related to mutual relations of SCM and logistics, is presented in Fig. 6. Its authors, Mangan et al. (2008: 9-12), defined a similar view, though a bit different in details.

Figure 6. Assessment of the relationship and the development of logistics and SCM



Source: Blanchard (2005:12)

Polish scientists also joined the debate in this area, e.g. P. Blaik (2010: 272-276) who assigns a specific role to integration models of supply chain management or M. Ciesielski (2009, see also Ciesielski, Długosz 2010), who presented strategies and instruments for supply chain management. It is also important to look at the prognostic concepts of functioning of the supply chain and logistics. e.g., the studies of H. Brdulak (2012) or E. Gołemska (2012). To sum up this part of considerations, it should be noted that the modern concept of SCM and the entire logistics is an heir to various aspects of concepts and solutions. The continuous development of these concepts is noticeable. There is a constant increase of the

range of tasks and responsibilities, the range of complexity and dynamism of processes is growing, the scope and the way of exploitation and implementation of increasingly sophisticated tools resulting from technological and technical development in the field of operational, tactical and strategic operations in local, regional and global context. Contemporary development and creating supply chains that are increasingly global in nature, results from changes in the following circumstances: economic, financial, organizational, international legal, technical and technological. Changes to these conditions, which have been running more or less dynamically, led to a gradual transformation of the tradi-



tional model of the functioning of the economy into a very dynamic network of links and dependencies. A contemporary modern supply chain is characterized by many features, but the essential ones include:

- capacity for rapid reaction, ability to meet rapidly changing demand,
- flexibility and ability to adapt to the optimum: cost-level of service,
- ability to make optimal use of the resources of the company,
- ability to use all of the available information.

Today, in the era of integration and internationalisation as well as high-speed and dynamic changes, much attention is paid to searching new forms, ways and concepts of operation of supply chain which would meet current and future requirements, especially in the area of meeting customer expectations, and thus creating in this way a competitive advantage. It is difficult to identify and describe all concepts in this area, however, two of them have a crucial meaning:

- transfer of competitive struggle to the entire supply chain,
- increase in transparency of the supply chain.

The technical and technological revolution which can be observed since the turn of the centuries, changed the way of collaborating of suppliers and customers, as well as other traditional links of supply chains. To be on time with the booming market, today's companies must seek opportunities to build a competitive advantage outside their organizations. The individual effort often turns out to be insufficient to fully meet customer expectations. To be able to meet them, companies are forced to carry out joint activities together with their trading partners.

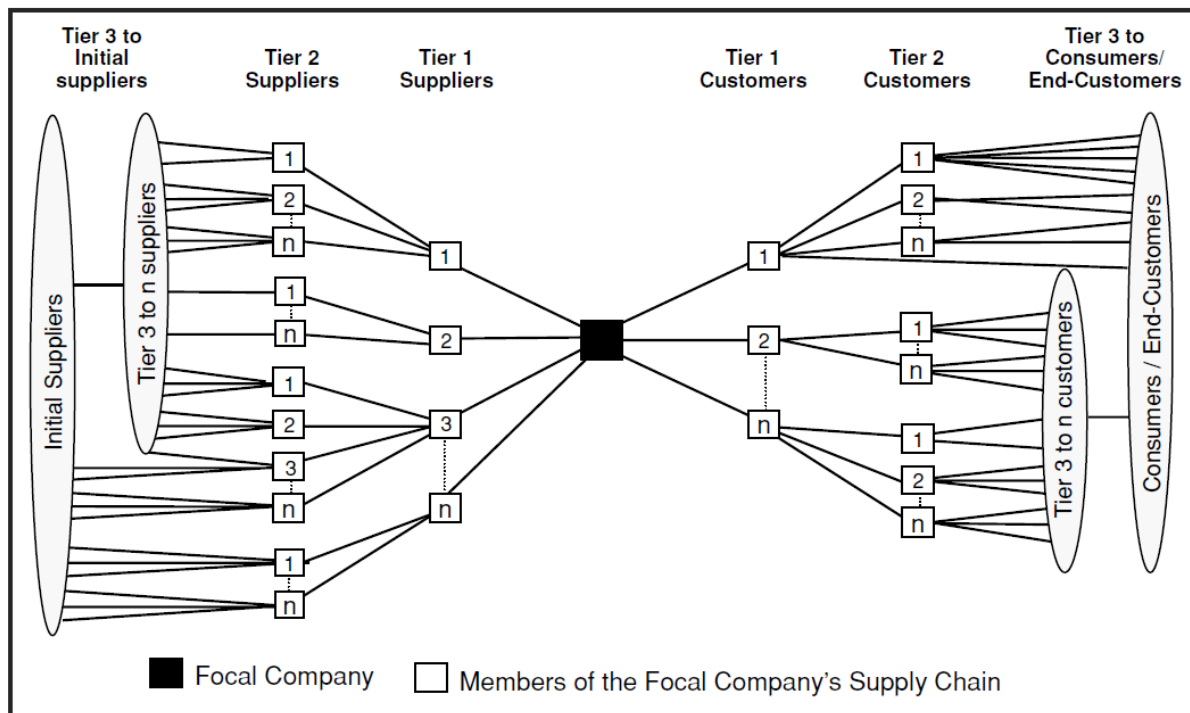
"Transparency in the supply chain" - the main objective of the transparency in the supply chain solutions is to improve the organizational capacity of the operators to connect logistics and transport functions, and through the use of global standards to increase productivity. The increase in transparency in the supply chain is an element which can lead to a reduction in costs and result in improved performance. In addition, it is necessary to recognize

changes in the approach to the issue of product knowledge among today's customers. Consumers, public authorities and businesses are demanding detailed information on systems and sources of supply and are directly interested in issues such as the quality of the particular activities and processes, safety, ethics and the impact of a business on the environment. There are more and more tools which ensure the transparency of supply chains. These include product labels and Internet databases available to customers, and Web cams, which show in real time what happens in the suppliers' plants throughout the whole supply chain, at any stage of the flows. Thus, the following questions occur more frequently: where are my goods, what is happening to them, how they are transported, where do they come from. Today's companies must know the answers to these questions, give opportunities to a potential customer to track their goods (consignment). The lack of such opportunities brings on the consequence of leaving (the loss of) customers.

A crucial element as well as a determinant of modern supply chains is their improvement by applying the methods of lean logistics and the use of the latest solutions from the IT area, especially ERP software (Enterprise Requirements Planning), systems allowing for appropriate and efficient planning and using the resources of the company. The combination of this concept and the use of modern tools give a chance to better cope with many contemporary problems, e.g., the problem of uncertainty, which is one of the conditions of operation of supply chains in the market economy.

Much of the analyses and searching for new and better (innovative) solutions also apply to the issue of raising the efficiency of supply chain management. In this context, most often "automatization of transaction" and "stabilizing operating conditions" are pointed out as more effective solutions. Elimination and simplification of transactions shall be treated as a way to improve supply chain management.

Figure 7. Supply chain network structure



Source: Lambert et al (1998: 3).

Nowadays, the development of technologies and the competitive struggle have led to a situation where consumers have a choice of many technologically advanced goods, whose quality is comparable, or the difference increasingly difficult to notice. In this situation, gaining a competitive advantage and its maintenance is becoming more and more dependent on the efficiency of the entire supply chain than the product itself. Key factors for success in the supply chain become, apart from its organization (range), the speed and flexibility to respond to the changing market situation.

A supply chain should be characterized by an ongoing process of improvements. Therefore, supply chain management, being the coordinator of this chain, becomes a very important task. Today, there is an increase in customer requirements in terms of process time of delivery services, their flexibility, availability and reliability. The expectations and the requirements of customers grow and, on the other hand, there occurs a need to reduce costs and

limit the amount of working capital in inventory. Reduction of expenses related to the supply chain is not only a direct route to maintain and even strengthen the competitiveness of the company, but also a need of time associated with the operation in a difficult period of economic crisis, where very often there is a simple conjunction, the one with cash has the advantage.

Currently, it is very important for consumers that products and services are tailored to their individual needs. Consumers are becoming more and more impatient. How to meet these expectations in the context of the supply chain? The speed required to respond to the demands of clients generates the need to manufacture close to the potential consumer. Thus, there is a justified necessity to manufacture in many different parts of the world, which simplifies the supply chain of finished products, but it also often complicates the process of supplying raw materials and semi-finished products. In this situation, the key to success can become a

segmentation of supply chain oriented to the demand and the specific needs of consignees. Segmentation of the supply chain can contribute to reducing the size of stocks, especially those which do not attract the interest of the consumer, and, as a consequence, may lead to the optimization of costs.

The requirements related to security and potential dangers in the supply chain will become increasingly important. This will result not only from rising consumer expectations, but also from changes in their needs, which are visible in the course of time. In this situation, it is the flexibility that will most often decide on the competitiveness of the company on the market. In addition, this problem will be complicated by the ageing and population migration to big cities, which raises serious implications for distribution in their area. Moreover, the ecological aspects will play an increasingly important role in the supply chain, and this trend should be included in the supply chain management in the future.

Modern concepts implemented within supply chains should lead to the "break down" of the walls of an undertaking, both interior, separating fairly artificially extracted organizational units (departments), as well as external for effective integration of company's technology with its business, technical or social environment.

On the basis of conducted considerations it can be argued that the factors substantially affecting the supply chains (networks) in the next decade will be:

1. Dialogue with the consumer:

- customer preferences, personalized promotion,
- orders, comments, requests,
- mass adaptation of modern technology.

2. Sharing information (network approach):

- standardization in the area of scope and forms of communication,
- a common platform for sharing data,
- data obtained from a variety of sources (cash points, forecasts, promotions, customers studies, products movement, etc.),
- Global Data Synchronization Network - GDSN,
- global standards: common identification mechanisms GTIN, GLN, EPC, codes, communication standards GS1, new networking solutions, for example, EPCglobal networks,
- increase of the importance of access to the full information in the supply chain

3. Synchronized production.

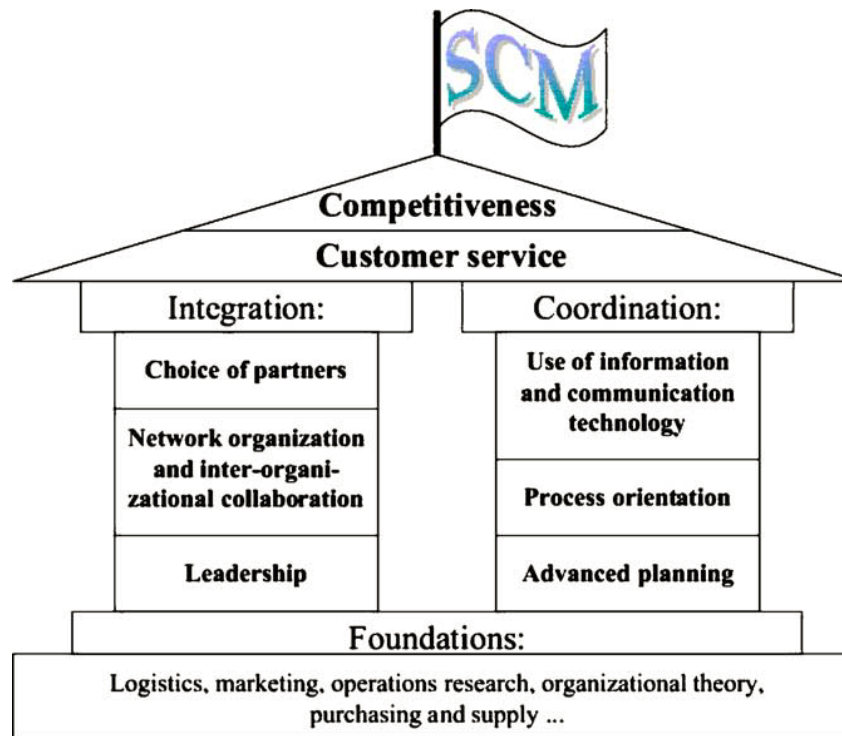
4. Integrated logistics.

5. Sustainability.

- sustainable development in the area of health and healthy lifestyles,
  - sustainable development of transport.
6. Changes in the corporate culture:
- increased confidence, common strategies and tactics.

Nowadays, a supply chain shall be treated as a basis for economic flows that evolve rapidly towards the combined flows in physical resources, people and information (Gołembska 2011: 73).

Figure 8. House of Supply Chain Management



Source: Stadler, Kilger (2002).

Utilizing the latest technological and technical solutions, these combined flows are carried out within the framework of modern logistic processes, which are, to a larger extent, subject to the concept of sustainable development. The very meeting of expectations, requirements which are formed by today's free market environment requires:

- concentration on activities that make up the value for the customer,
- optimal use of the possibilities (assets) of companies-links in the supply chain by reducing inventories,
- creating a culture of innovativeness and implementation of supply chain related innovations,
- perfect use of technical and technological capabilities in the interest of the conducted activities and logistic processes,
- use of outsourcing and the concepts of 3PL, 4PL, 5PL,
- increasing the time compensation of all logistics operations (e.g. storage, transport, sorting, etc.),
- reducing the transaction costs,
- implementation of the requirements associated with the concept of sustainable development.

The reorganisation of the supply chain is connected with, created in recent years, the concept of "value chain", which, according to P. Blaik and R. Matwiejczuk (2008: 8), provides strategic instruments to achieve a competitive advantage by the company, by providing value added, which is not only more favourable when compared to its competitors, but also more relevant from the point of view of customer preferences. This approach is a kind of summary of that part of the considerations.

An issue which is very important for the functioning of modern supply chain is safety. Globalization carries separate risk and uncertainty. The time needed for planning is extended (thus it is less accurate). The number of participants in the supply chain increases, including new business contexts, blurring the transparency of the structure of the chain, there are more opportunities for theft, accidents, low labour standards, etc. There is more uncertainty, both on the demand and the supply side.

## **Innovations and Information Technology in logistic activities**

### **Telematics solutions in supply chain**

A supply chain should be characterized by an ongoing process of improvements. Therefore, managing the supply chain, being the coordinator of this chain, becomes a very important task. Today, there is an increase in customer requirements in terms of duration of delivery services, their flexibility, availability and reliability. The expectations and the requirements of customers grow and, on the other hand, a need occurs to reduce costs and limit the amount of capital tie-up. Currently, it is very important for consumers that products and services are tailored to their individual needs. Consumers are becoming more and more impatient. How to meet these expectations in the context of supply chain? The required speed of response and need to ensure high level of safety as well as the possibility to efficiently respond to potential dangers in the supply chain, generates the need to use all the modern technical and technological solutions and latest concepts for functioning of logistics, including solutions from the area of telematics.

The broadest area of use of telematics solutions in the supply chain is, of course, transport, which combines the individual links. In this case, telematics, or rather telematics of transport, will refer to the movement of people and goods (the cargo), using the appropriate means of transport and technical solutions - organizational, which through integrating IT and telecommunication solutions allow for proper management and control of movement in transport systems to improve efficiency and safety of operation of these systems and positively affect the environment. The objective of telematics is to support, supervise, control and manage the processes in transport and link these systems within all transport tasks carried out in the supply chain. The priority element for the implementation of these tasks in telematics systems are functions of operating of information, which primarily relate to the collecting, processing and distributing of data essential for making the right decision. Such processes are both processes implemented in the manner determin-

ed in advance (for example, automatic control of movement) or processes arising from the ad hoc situations (decisions of the operators, dispatchers, independent users of infrastructure such as drivers or pedestrians, etc., supported by updated information) (Wydro 2002).

Today, the ability to ensure fluent and efficient transport of people and goods, transport prepared for the implementation of tasks under conditions of interference, is an essential requirement. The way to guarantee such possibilities is the introduction and extensive use of telematics solutions in the supply chain. The delay in implementation or the lack of such solutions will affect the level of competitiveness and will generate the unsustainable use of logistic infrastructure.

### **Innovativeness in logistic operations**

In the XXI century we observed the rise of innovation and innovativeness as one of the main factors of industrial competition. Innovation becomes increasingly important in creating and maintaining an organization's competitive advantage. It is more and more visible that innovation itself is a strong competitive strategy to become a world-class manufacturer and compete effectively in global markets (Prajogo et al. 2007). For the same reasons, innovativeness has become a main interest for academics and practitioners.

Nowadays, the concept of innovativeness shall not be viewed as only product and high-tech issues. Innovation is one of the key capabilities to gain competitive advantage in many other industries such as logistics. The boundaries between local and the international and global in globalizing economies are vanishing, therefore, the logistics industry today seems to be highly dynamic. This dynamic situation has been forcing the companies to diversify their logistics activities. Innovativeness in logistics processes is the key factor for the logistics firms to differentiate the logistics capabilities and finally to achieve sustainable competitive advantage.

An important element as well as a condition of modern supply chains is their improvement by applying the methods of lean logistics and using the latest solutions from the IT area,

especially ERP software (Enterprise Requirements Planning), systems allowing for appropriate and efficient planning and using the resources of the company. The combination of this concept and the use of modern tools gives a chance to better manage many contemporary problems such as the problem of uncertainty, which is one of the conditions of operation of supply chains in the market economy.

Today the market constantly raises the level of competition and generates the need to implement more efficient logistic processes. The essential challenges facing logistics is to reconfigure, integrate and optimize supply chains within the global logistics network. Effective management of the supply chain requires not only seeing all processes and the links of the chain, but also automating many processes, acquiring data in real time, or managing events in the course of performing the tasks. To meet these expectations logisticians make use of the newest innovative organisational and technical solutions. However, constant looking for other new, even more innovative solutions may not only ensure the effectiveness and efficiency of logistics operations in the new surroundings, but also allow to automate many actions and processes more flexibly, and increase the possibilities for achieving the objectives according to the expectations of potential customers.

### **Support of Information Technology and new patterns of innovations**

Nowadays, no single supply chain can achieve success without the support of IT. The fact that suppliers are located in different part of the world forces companies to integrate the activities both inside and outside of an organization. Thus, a new need springs out to make use of an integrated information system (IS) for exchanging information on various operations within the supply chain. Gunasekaran and Ngai claim that IT may resemble a nerve system for SCM (Gunasekaran, Ngai 2004). A popular operations paradigm was created of the concepts of supply chain design and management together with the development of information and communication technologies (ICT) that include electronic data interchange (EDI), the Internet and World Wide Web

(WWW). The complication of SCM has also made companies choose online communication systems. These days, the Internet increases the richness of communications through greater interactivity between the firm and the customers (Watson et al. 1998).

EDI technology is used for information sharing between members of a supply chain because organizations wish to reduce uncertainty and improve shipment performance of suppliers and the performance of the supply chain system. Companies invest large amount of money in restructuring internal organizational and technical processes, and change traditional product distribution channels and customer service procedure and training staff to develop IT-enabled supply chain.

The Internet and the World Wide Web have helped the development of new forms of marketing and new possibilities of cooperating and exchange between a company and its partners. There is no doubt that Electronic Commerce (EC) is the most noticeable application of the Internet. However, to achieve a successful implementation of EC, it is crucial to “re-engineer” the logistics activities of the company. The following issues are connected with the recent technological evolution and are closely linked with the implementation of new activities (Zanjirani Farahani et al. 2009):

- the computerisation of information systems,
- the development of the communication technologies and databases,
- the implementation of production management systems,
- the widespread use of simulation and optimisation,
- the integration of agility and adaptability concepts,
- the transformation from a mass market to a customised market,
- the consumers’ interest for the numerous opportunities offered over the Web.

Most companies have or may have access to information that they can use to expand an existing business or launch new ventures. The chances for these operations have emerged due to the explosion of digital data, the development of analytical tools and technology of the digital cloud. To release a new business

value companies must find the answer to a few key questions, for example: What data which we do not currently possess can we have access to? Can we share one of our capabilities in the form of digital services?

Digitization makes it possible to have wide access to huge amounts of data. Data on partners and suppliers can be accessed almost in real-time, customers are happy to share all kinds of information. For a bigger part of the history of business transactions took place in a physical space. However, these days computer programs can support increasingly complex processes which then can be converted to cheaper and more effective ones for the use of cloud computing. Digitization and business opportunities reduce the operating costs of businesses and create new products and services. The companies may take advantage of several new patterns of innovations to study and implement the best possible option:

- enrichment of products to generate more data,
- digitization of data assets,
- integration of data within the industry and within many industries,
- trading data,
- codification of exceptional abilities in the area of services (Parmar et al. 2014).

### Concluding remarks

Nowadays, the market, devoid of many barriers, continuously raises the level of competition, pointing to the need to implement more and more efficient logistic processes. The essential challenges facing logistics are: reconfiguration, integration and optimisation of complex logistics networks, changes in the location of its components, transport planning in terms of tactical and operational levels, and inventory management. The complexity of the problems and the enormity of the tasks facing the logistics in conjunction with its global nature means that it is now one of the most difficult and the most important elements of the modern economy. The complexity of the logistics systems is additionally complicated by: globalisation and the movement of producers in search of more favourable manufacturing conditions, an increase in the requirements of consumers arising from large compe-

tion in the market of services and the performance of the tasks of reversed logistics under closed loop-systems. This causes an increase in the need for the development of new methods of advanced planning and its automation.

Logisticians should not tolerate any stagnation in improving ties in the relationship between the partners of supply chain in order to ensure the liquidity supply, safety, efficiency, cost reduction, under all circumstances and in every relationship. In order to meet those expectations every logistics company in the 21st century is obliged to use the latest achievements of technology and technological innovations for logistic processes.

The indicated areas of change and forward-looking transformation of the supply chain should be treated as an open set as the future will probably generate the need to consider and take account of a number of new factors and circumstances. It is difficult to clearly tell what the future holds, but one can believe that a large impact on the logistics and the development of supply chains will also affect further development of communications technologies, especially the Internet.

It is important to note that the world is changing very quickly, what is effective today will not always be an adequate and good solution tomorrow. More and more changeable and more dynamic markets where modern logistics companies operate, makes the methodology of verification, evolution and continuous adjustment become less effective. More and more often the need appears to implement innovative solutions, which means the changes are rather of an revolutionary than evolutionary nature.

Modern logistics, its role and its complexity and the fact of acting under increasingly complex circumstances, requires broad scientific involvement. Modern solutions connected with building supply chains require a connection with such concepts such as the design and exploitation of logistically associated flexible manufacturing systems ESP/FMS (Zawadzka 2005).

In formulating directions of changes in logistics, apart from the client, a leading role should be played by science. In the area of scientific considerations there should certainly be pro-

blems strictly connected with tighter binding logistics with changes on global markets and thus creating the basis for the implementation of appropriate solutions and concepts particularly in the area of functioning of supply chain. Only such an approach will enhance the credibility of the formulated forecast.

Nowadays, the market is devoid of many barriers, continuously raises the level of competition, pointing to the need to implement more and more efficient logistic processes. The essential challenges facing logistics are: reconfiguring, integrating and optimizing the supply chains within the global logistics network. Effective management of the supply chain requires not only to view all processes and links of the chain, but also automation of many processes. Efficient and flexible supply chain management also requires a lot of data, which must be obtained in real time. The realization of expectations which are generated in relation to contemporary and future supply chain continues to grow, and the requirements grow while the costs and turnaround time for logistics activities is expected to decrease. A solution that will allow, or to a large extent, facilitate the fulfillment of these requirements, is telematics and the pragmatic solutions related to it.

Therefore, the knowledge of the latest and future telematics concepts and solutions and their correct implementation to support actions in progress, becomes one of the essential elements of gaining success in current market conditions. The introduction of telematics solutions makes it possible not only to automate and shorten processes and logistic activities, but also affects their safety and enables greater flexibility and reliability of the activities within supply chain. Additionally, it is a feature that allows for reducing the negative impact of transport on the environment. Therefore, the ability to properly use an even wider range of opportunities which are generated by modern telematics and its solutions for conducted logistic activities becomes one of the fundamental issues.

For several years, IT has gone beyond the traditional role of automation and cost reduction processes in the sphere of operations and management. Information technology will continue to serve this task, but it is becoming

an increasingly important factor in search for business opportunities. It is time for the company to have an ordered and structured approach to the study of technological innovations and think how IT can contribute to the creation of not only better products and services, but also new business models and platforms. Companies can find new ways to engage in the digital economy by using and combining the five patterns of innovations.

Modern logistics is one of those areas that has to respond permanently and quickly to the still emerging new challenges, needs, but also to fully exploit emerging opportunities. Although the future cannot be accurately predicted, one can expect to see certain events with varying degrees of uncertainty, depending on the conditions that appear. We may not be able to predict exactly all the events, but we can rethink our expectations for future performance, taking into account the specific conditions and scenarios. A good forecast is always made from what we already know about the past, is based on our knowledge, experience and habits. Thinking about the future logistics, its size, role and importance because of the pace of change has become a necessity. The main objective of forecasting is to identify possible scenarios for the development of events. As a consequence, it does help us in making such decisions and actions, which will have positive consequences in the future. Each forecast is thoughtful anticipation of certain events in the future, an informed speculation, or a set of hypotheses.



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## **Rozwój koncepcji zarządzania łańcuchem dostaw jako przykład ewolucji logistyki**

### **Abstrakt:**

Gospodarka światowa przechodzi coraz szybsze przemiany. Z pewnością jednym z obszarów, w których dokonują się najbardziej dynamiczne zmiany jest logistyka oraz zarządzanie łańcuchem dostaw. Nowoczesny i perspektywiczny łańcuch dostaw charakteryzuje się coraz większym stopniem zintegrowania, funkcjonowania pod presją czasu i realizowania zadań na coraz większe odległości, tak aby dostawa była wykonana zgodnie z oczekiwaniami klienta. Znajomość najnowszych, ale również potencjalnych rozwiązań w prawidłowej realizacji działań w ramach łańcucha dostaw staje się jednym z najbardziej istotnych elementów osiągnięcia sukcesu w obecnych i przyszłych warunkach rynkowych. Możliwość przewidywania potrzeb, jak również warunki realizacji działań logistycznych, budowanie kultury organizacyjnej koncentrującej się na innowacyjności oraz zmianach w sposobie podejścia i rozwiązywania kluczowych problemów dla funkcjonowania łańcucha dostaw stwarza perspektywę osiągnięcia sukcesu rynkowego w znacznie szerszym aspekcie. Zasadnicze wyzwania nie stoją tylko przed samym łańcuchem dostaw, ale przed całą logistyką: rekonfiguracją, integracją i optymalizacją całej sieci logistycznej, zmianami w lokalizacji elementów systemu, planowaniem transportu pod względem taktycznym i operacyjnym oraz zarządzaniem zapasami. Reorganizacja logistyki i łańcucha dostaw są związane z pojęciem "łańcucha wartości", który powstał w ostatnich latach, i których stanowi strategiczny zestaw instrumentów do osiągnięcia przewagi konkurencyjnej. Niniejszy artykuł jest poświęcony wszystkim tym problemom, możliwością dostrzeżenia ich w kontekście obecnych i przyszłych wyzwań oraz wykorzystania do budowy nowoczesnego łańcucha dostaw dostosowanego do aktualnych potrzeb i wymagań.

**Słowa kluczowe:** logistyka, łańcuch dostaw, zarządzanie łańcuchem dostaw, ewolucja logistyki