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THE IMPACT OF INFORMATION TECHNOLOGIES ON SUPPLY CHAIN MANAGEMENT

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The article deals with the logistics processes in supply chain management, information technology in management and prospects for the use of information technology in logistics with particular attention paid to the key factors in information technology that affect the efficiency of the supply chain management, as well as conclusions are made regarding the importance of active use of information technology in logistics.

Keywords: *supply chain management, information technologies, logistics, information trend, supply chain operation, supply chain big data.*

The development of logistics in the world is fast. Every day there appears more industrial and commercial enterprises, having logistics services in their governance structure. The economy is constantly expanding the scope of application of modern logistics systems and technologies. To succeed in the digital economy, organizations have to manage the integration of business, technology, people, and processes not only within the enterprise but also across extended enterprises. Supply chain management system facilitates inter-enterprise cooperation and collaboration with suppliers, customers, and business partners.

Supply chain management is a highly-detailed system used by both small and large organizations to get products to consumers, including obtaining raw materials, manufacturing and delivering the final product to the customer. A well-organized supply chain management system involves optimizing operations functionality to be fast and efficient. Supply chain management in not only a process served to generate a cost reduction in the budget or a mission to create greater operational efficiencies within an organization. While these are a part of the whole ecosystem, modern supply change management encompasses the strategic alignment of end-to-end business processes to realize market and economic value, as well as giving a firm the competitive advantage over their business rivals [1].

Everyone agrees that effective supply chain management can provide a major source of competitive advantage. The goal of a supply chain manager is therefore to link the end customers, the channels of distribution, the production processes and the procurement activity in such a way that customers' service expectations are exceeded and yet at a lower total cost than the competition. One of the enabling factors for the achievement of this goal is the effective use of information technology.

In logistics, as in principle the economy, information technologies are a major source of productivity growth and competitiveness.

There are five major trends in information technologies: the information product interoperability, the ability to interact (the compatibility), the elimination of intermediate links, the globalization and the convergence.

The introduction of modern information technologies allows the user to work in a convenient and accessible information environment, which can eliminate the intermediaries. These factors are very important in the context of scientific and practical development of the transportation logistics segment, as shown in the fig.1.
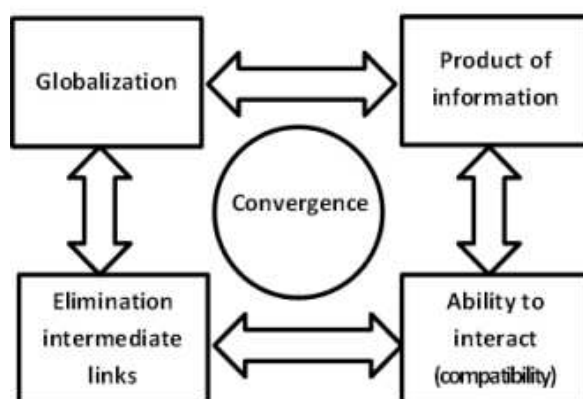

Figure 1. – Structure of the interaction of information trends [2]

Big Data and logistics are made for each other, and today the logistics industry is positioning itself to put this wealth of information to better use. Big data is revolutionizing many fields of business, and logistics analytics is one of them. The complex and dynamic nature of logistics, along with the reliance on many moving parts that can create bottlenecks at any point in the supply chain, make logistics a perfect use case for big data. For example, big data logistics can be used to optimize routing, to streamline factory functions, and to give transparency to the entire supply chain, for the benefit of both logistics and shipping companies alike. Third party logistics companies and shipping companies both agree.

The logistics sector is ideally placed to benefit from the technological and methodological advancements of Big Data. Big Data refers to datasets which size is beyond the ability of typical database software tools to capture, store, manage and analyse. IBM define Big Data as having four key attributes:

- **Volume:** the scale of data;
- **Velocity:** analysis of streamed data, that is, the rate at which data arrives at the enterprise and the time that it then takes to process and understand that data;
- **Variety:** the different forms of data: structured and unstructured;
- **Veracity:** uncertainty of data, refers to the quality or trustworthiness of the data [3].

How is big data being applied in supply chain operations? Despite the largest growth of data analytics being experienced in downstream customer insights, analytics can have applications across the end-to-end supply chain. Supply chains that are embracing big data capability development, first need to become aware of the benefits that big data solutions can deliver to their operations. Decisions need to be made about the cost effectiveness of prioritizing certain parts of their operations. Holistic big data solutions applied to the whole supply chain can involve high costs, making supply chain decision makers more selective in customizing solutions to specific operations.
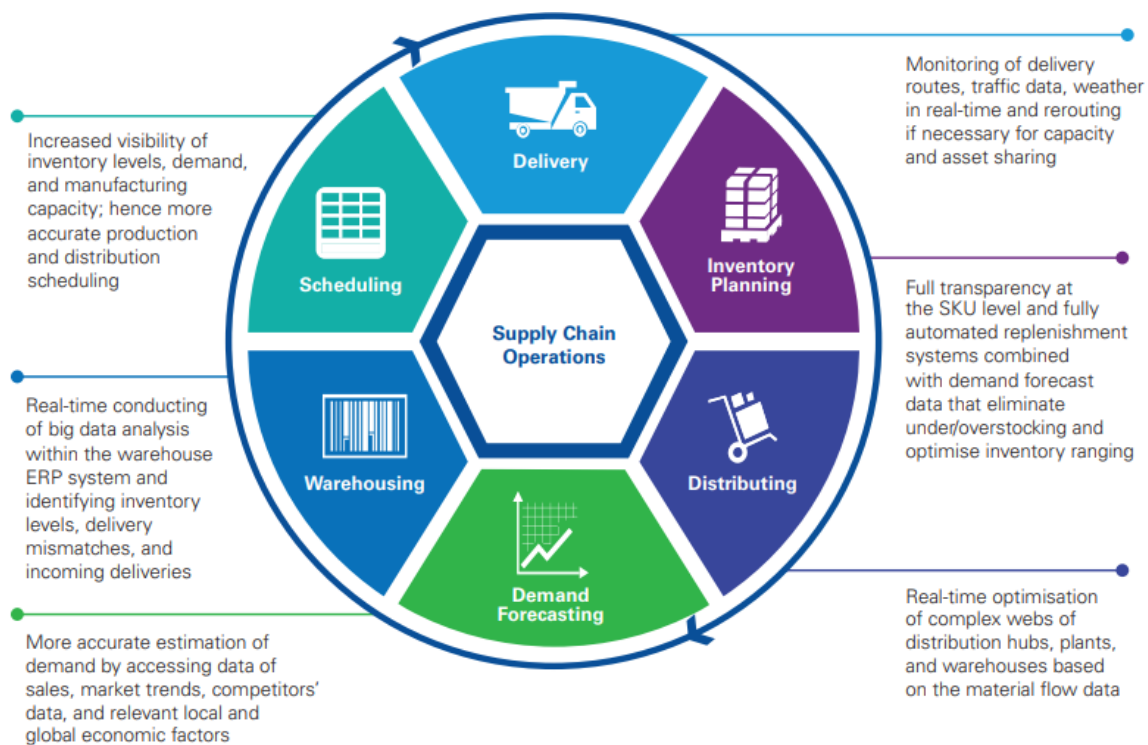

Figure 2. – Applications of big data analytics in supply chain operations [4]

What are the capabilities of future big data practitioners? A survey of more than 3,000 business executives, managers, and analysts in 108 countries across 30 industries conducted by MIT showed that most of the respondents identified three core obstacles for effective application of big data solutions:

1. The lack of understanding of big data to improve business;
2. The lack of management bandwidth to interpret insights from big data;
3. The lack of big data skills in the line of business.

Capability Application	Capability Description
Supply chain statistics	Awareness of methods of statistical estimation and sampling
Supply chain forecasting	Understanding of qualitative and quantitative methods of forecasting
Supply chain optimisation	Capability to adopt analytical and numerical methods of optimisation
Supply chain simulation	Redesigning supply chain processes using simulation models, data visualisation, and data repositories

Figure 3. – Some of the main capabilities needed for supply chain big data analysts [4]

To summarize the above, we understand that logistics is inconceivable without the active use of information technology. It is impossible to imagine the formation and organization of the chain of delivery of goods without intensive rapid exchange of information between participants in the transport process, without the capacity for rapid response to market demand for transport services.

Large enterprises, especially those related to international transportation, among the first to feel the need to introduce information technology in management of production processes. Competition in the market of transport services in connection with the emergence of many small private companies and an active exploration eastward transport by foreigners, coupled with tight fiscal policy and the rising costs of resources supplied to the transport companies need to mobilize internal resources. It became obvious that without the use of information technology and personal computers, efficient operations of transport companies are no longer possible [1].

Information technology in logistics has a few useful functions. Firstly, with their help accelerate the process of receiving orders, delivery of goods. The sooner all this happens the less the duration of the cycle of works from the perspective of the customer, and therefore costs will be. Secondly, information technology productively impacts on planning and evaluating alternatives.

The process of introducing information and computer technology is now required and, moreover, inevitable. This is due to the increasing volume of data to be processed. Conventional, traditional methods are no longer able to extract from this thread with all useful information and use it to manage the enterprise. The determining factor in the administration is the speed of data processing and obtaining the necessary information.

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WAYS TO IMPROVE THE EFFICIENCY OF IMPLEMENTING INTERNATIONAL CARGO TRANSPORTATION BY MULTIMODAL TRANSPORT

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Annotation: The article describes multimodal transportation as a promising direction for increasing the efficiency of transport services, draws attention to their advantages and disadvantages, focuses on the selection criteria for multimodal transportation during cargo transportation, describes in more detail a practical example that reflects the efficiency of using international freight transportation by multimodal transport.

Keywords: multimodal transportation, cargo, mode of transport, route, permit, expansion of the geography of transportation, minimization of costs, increase in profit.

Cargo transportation has been, is and always will be an urgent task in the system of managing international supply chains. It requires compliance with the basic principles of logistics, which consist mainly in delivering the right cargo of the right quality in the right quantity to the right place with the lowest logistics costs in a short time with high quality service and continuous information support. To improve the transport process during the transportation of goods, all types of transport are used, the combination of which allows them to be combined with the maximum extraction of their advantages.

By multimodal transport it is understood the transportation of any goods by two or more modes of transport organized by one carrier. In this case, the carrier may use for its purposes other transport organizations (sub-carriers) for certain types of transport. But, regardless of the number of involved modes of transport and sub-carriers, the sole responsibility for the delivery of goods to the customer lies with the carrier, since the entire route of the cargo consists of only one contract between the customer and the carrier. The carrier responsible for the entire transportation is called a multimodal transport operator. When transporting goods by multimodal transport, a single transportation document is drawn up taking into account a single end-to-end tariff rate. In addition, the carrier calculates the cost of transportation, taking into account many factors, such as the type of cargo, time and final destination, season, availability of convenient flights, etc. It should be remembered that an important requirement of the consumer of transport services is the timely and high-quality delivery of goods.

Multimodal transportation has its advantages and disadvantages, which must be taken into account to reduce the cost and speed up the delivery of goods along a given route. When using multimodal transportation, a longer delivery time is observed due to the need for loading and unloading when changing vehicles. Nevertheless, difficulties in using several types of transport at once can be avoided if the carrier has extensive experience in organizing such types of work [1].

The choice of multimodal transportation, as a rule, begins with determining the parameters of the cargo, its volume and type. Then follows the development of an optimal transport route with a favorable tariff for the client. The next step is to prepare the necessary documentation, which will be required at each stage of cargo transportation. Next, an analysis of possible unforeseen situations and ways to resolve them is carried out and the forwarders are trained to accompany the cargo throughout the journey. In order to ensure safety on the way of cargo transportation, it is necessary to carry out work on cargo shipment, selection of necessary fasteners and other means and monitoring of the passage of each stage during cargo transportation [2].

The use of multimodal transportation has its own characteristics and combines the necessary criteria that a carrier can use, for example, accelerating the delivery of perishable goods or reducing storage costs by choosing a long delivery. Thus, the "multimodal transportation" allows you to select the type of transport depending on the characteristics of the cargo. It is also worth paying attention to the fact that the use of multimodal transportation can reduce the malfunction of various types of transport and, thereby, optimize the entire transport system in order to meet the needs of customers, ensure economic growth and sustainable development of the national economy as a whole. Therefore, today, the development of the transport industry is aimed at expanding the use of multimodal transportation.

Thus, multimodal transportation is today a universally recognized means of reducing environmental pollution and reducing congestion in the automobile network. An ideal transport market will use all kinds of means of transport taking into account their specific advantages and, in many cases, come to combined transport, as a possible solution to many transport problems.