

## ANALYSIS OF DETERMINANTS AFFECTING THE TRANSFORMATION OF SUPPLY CHAINS

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### Abstract

Analysis of factors affecting supply chains have been studied in the heavy industry sector. Determinants affecting the transformation of supply chains apply to each area of the business entity's operations. Starting from the closest surrounding of links in the supply chain, through social conditions, ending with the geopolitical situation of the world and globalization processes. The table described in the article presents the factors affecting supply chains. Social factors are extremely important in the global supply chain, because at different stages of the activity the supply chain can be serviced by extremely culturally different employees. The location of each element of the supply chain and its access to the communication infrastructure is another important issue. The operation of global supply chains depends not only on national legal and tax conditions, but also on international legal, tax and customs norms. The situation on global markets directly affects the functioning of supply chains. The supply chain is also transformed due to currency fluctuations and inflation. The pressure of international organizations on environmental protection is also becoming increasingly important in this area. Factors affecting economic entities in this article apply to enterprises operating in the heavy industry sector. The factors that were selected in the research were presented in the form of dependence graphs. This allowed for a thorough analysis of the links and impacts between factors and entities involved in the flow of goods in the heavy industry sector.

**Keywords:** supply chain, heavy industry sector, transformation of supply chains, Determinants affecting the transformation of supply chains

### 1. INTRODUCTION

Observing the changes in the business environment over recent years, one can notice the growing impact of globalization, digitization and dynamically changing technologies on supply chains and business entity management. Today's supply chains are transforming into networks operating not only in the real world and cooperating with real entities, but the growing share of supply chain management is moving into the virtual sphere. Due to technological trends or the Internet of Things, virtual reality is increasingly affecting the real aspects of supply chains. Therefore, the transformation of supply chains is primarily associated with the development of digitization as well as technology and mechanics.

The economic and industrial evolution has also influenced changes in supply chains, which primarily relate to its goals, substance and participants. Differences in the interpretation of supply chains also translate into the scope of functioning and goals of cooperation of supply chains. The most accurate wording defining supply chains include the subject structure, the object of flow, purpose, functional scope and areas of cooperation of entities participating in the flow of goods and services [1]. The supply chain can be defined as an economic network consisting of a network of enterprises that create exchanges of resources to obtain property benefits along with lowering costs and increasing competitiveness [2,3].

### 2. PROCESS OF TRANSFORMATION OF SUPPLY CHAIN

Supply chains are structures susceptible to external factors, and thus favor the creation of conditions for transforming the structure of the supply network. Supply chains are primarily focused on achieving specific economic, organizational and quality goals, are influenced by the cost reduction paradigm and increased

benefits for the final customer. These elements can be achieved by transforming a smaller or larger part of the supply chain without having to implement radical changes. An important element in supply chain management is the two-way flow of goods and information. Changes in this area are very dynamic and have a direct impact on the transformation of supply chains. Supply chain transformation must be preceded by accurate data as well as qualitative and quantitative indicators. The use of accurate performance, efficiency and quality indicators for the supply chain enables the development of an appropriate transformation strategy for the logistics network and provides basic data on the supply chain [4,5]. Based on the analysis of the heavy industry sector in 2016-2019 and research on the supply chains of nine companies operating in this industry, factors influencing the transformation of supply chains have been selected. Determinants have been cataloged in nine areas that relate to technology, time, location, economy, politics, ecology, etc. Subsequently, determinants are assigned to each area, which are presented in **Table 1**.

**Table 1** Determinants affecting the transformation of supply chains [own study based: 2,4,5,6,7]

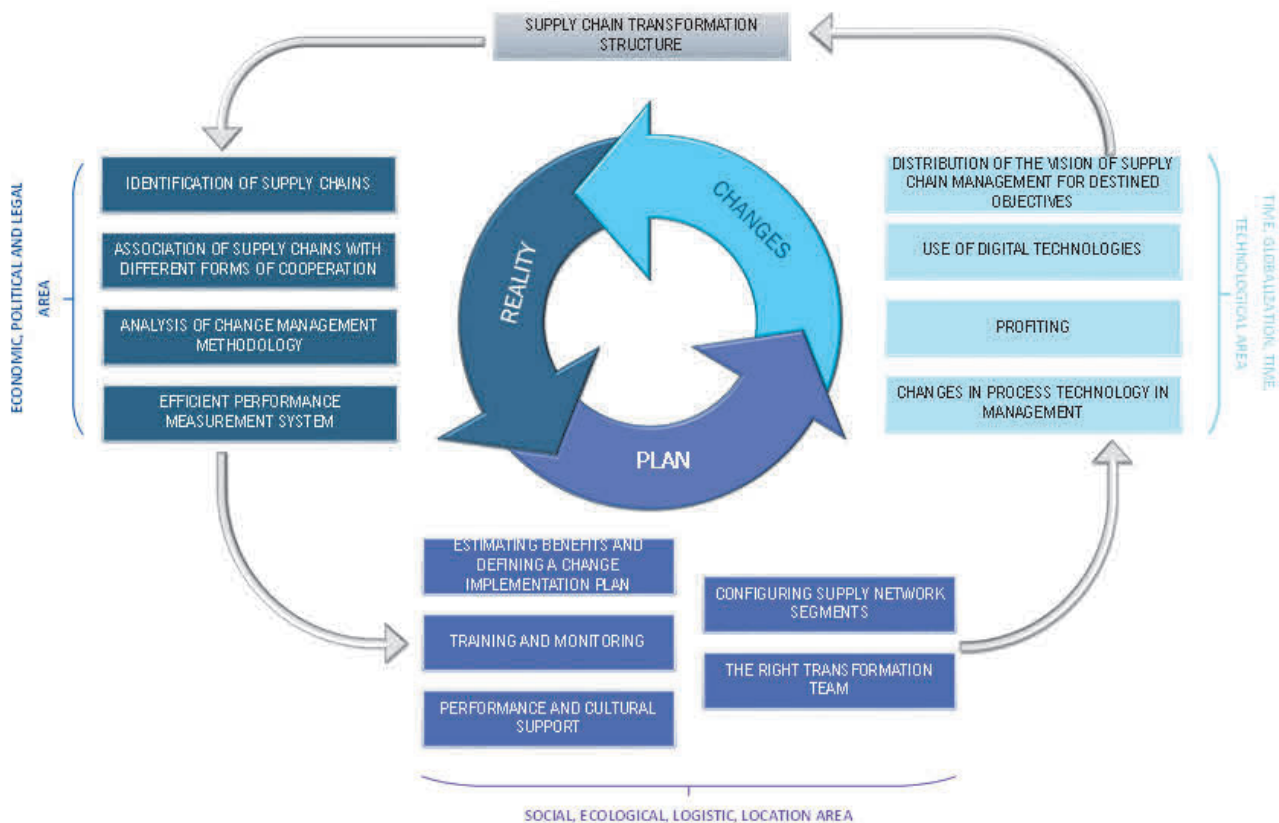
Area	Determinants
Technology	<ul style="list-style-type: none"> <li>- technological progress</li> <li>- technological development</li> <li>- the growing role of telecommunications</li> <li>- access to a fast internet network</li> <li>- access to new technologies</li> <li>- access to information</li> <li>- quality of information flow</li> <li>- data theft</li> <li>- technological and technical innovations</li> <li>- use of IT systems</li> <li>- electronic banking</li> <li>- electronic data processing</li> <li>- data archiving in the cloud</li> <li>- digitization</li> <li>- digital business</li> <li>- virtual reality</li> <li>- virtual supply chains</li> </ul>
Time	<ul style="list-style-type: none"> <li>- technology development</li> <li>- development of IT techniques</li> <li>- information flow</li> <li>- developing emerging markets</li> <li>- quick response to customer inquiries and wishes</li> <li>- development of competition</li> </ul>
Localization	<ul style="list-style-type: none"> <li>- reduction of spatial barriers</li> <li>- deterritorialization</li> <li>- integration</li> <li>- limitation of state sovereignty</li> <li>- transport network density</li> <li>- communication network density</li> <li>- access to airports / sea / inland</li> <li>- access to train stations</li> <li>- access to highways, national roads</li> <li>- spatial mobility</li> </ul>
Logistical	<ul style="list-style-type: none"> <li>- dynamic spread of storage units</li> <li>- dynamic product changes</li> <li>- quick changes in product configurations</li> <li>- greater product personalization</li> <li>- compressed delivery cycle</li> <li>- B2B relations</li> <li>- B2C relations</li> </ul>
Economic	<ul style="list-style-type: none"> <li>- domination of economics</li> <li>- unpredictability of the future</li> <li>- accumulation of wealth</li> <li>- economization of politics</li> <li>- balance of payments charges</li> <li>- increase of unemployment</li> </ul>

	<ul style="list-style-type: none"> <li>- lack of qualified labor force</li> <li>- situation of global markets</li> <li>- volume of foreign exchange turnover</li> <li>- average amount of customs duties</li> <li>- market regulation mechanisms</li> <li>- stock exchange quotations</li> <li>- exchange rates</li> <li>- inflation</li> <li>- turmoil in the energy markets</li> <li>- economic situation</li> <li>- liberalization of markets</li> <li>- strategies for responding to supply</li> <li>- budget restrictions</li> <li>- standardization</li> <li>- unification</li> <li>- integration</li> <li>- fragmentation</li> <li>- formalization</li> <li>- institutionalization</li> <li>- economy innovation</li> <li>- level of economic growth</li> <li>- uncertainty about market position</li> <li>- uncertainty about market identity</li> <li>- economic volatility</li> <li>- variability</li> <li>- leveling of prices / wages</li> <li>- price / wage level</li> <li>- number of international corporations and branches</li> <li>- share of intra-company flows</li> <li>- degree of concentration of production</li> <li>- export rate</li> <li>- industry relevance</li> <li>- share of production value in global production</li> <li>- level of foreign direct investment</li> <li>- investment projects</li> <li>- industry consolidation / transformation</li> <li>- implementation of strategic transactions</li> <li>- changes in company structures</li> <li>- costs increase</li> <li>- changes in demand and supply</li> <li>- competitiveness policy</li> <li>- tightened competition policy</li> <li>- business relations with clients</li> <li>- undisturbed communication</li> <li>- commitment to the implementation of orders</li> <li>- information flow</li> <li>- payment transactions</li> <li>- customer insolvency</li> <li>- payment deadlines</li> <li>- international flow of capital, goods, services and knowledge</li> <li>- export value</li> <li>- value of international investments</li> <li>- internationalization of the company</li> <li>- number of contractors / foreign branches</li> <li>- production fragmentation</li> <li>- market segmentation</li> <li>- supply chain segmentation</li> <li>- export capacity</li> <li>- international division of labor</li> <li>- changes in production structures and product offer</li> <li>- expansion of markets</li> <li>- new work places</li> <li>- access to international raw materials, capital and production resources</li> <li>- access to the global labor market and sales market</li> </ul>
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Political and legal	<ul style="list-style-type: none"> <li>- unpredictability of the future</li> <li>- dependence of the economic and political sphere on international capital</li> <li>- weakening of state structures</li> <li>- international legal and social relations</li> <li>- international tax regulations</li> <li>- aid received from public funds</li> <li>- policy of state authorities towards enterprises</li> <li>- changeability of legal regulations</li> <li>- legal regulations regarding the freedom to conduct business activity</li> <li>- effectiveness of corporate governance mechanisms</li> <li>- economic freedom</li> <li>- changes in economic conditions</li> <li>- tax rates</li> <li>- state fiscal policy</li> <li>- condition of the public finance sector</li> <li>- effectiveness of state control bodies</li> <li>- export value</li> <li>- value of state investments</li> <li>- changes in the political and economic structures of the state</li> <li>- limitation of political and economic sovereignty</li> <li>- political corruption</li> <li>- burden on the state budget</li> <li>- tax system reforms</li> <li>- functioning within the customs union or union of nations</li> </ul>
Social	<ul style="list-style-type: none"> <li>- instability of life</li> <li>- unpredictability of the future</li> <li>- depleting cultural diversity</li> <li>- commercialization of consumer culture</li> <li>- cultural deterritorialisation</li> <li>- commercialization of social relations</li> <li>- links with the cultural, territorial and professional community</li> <li>- social disintegration</li> <li>- increase in social activity</li> <li>- fees for social and social benefits</li> <li>- demand and supply of qualified labor</li> <li>- minimum wage amount</li> <li>- increase in labor costs</li> <li>- population movements</li> <li>- knowledge of foreign languages</li> </ul>
Globalization	<ul style="list-style-type: none"> <li>- the growing role of non-state, ineligible and undemocratic centers of economic power</li> <li>- concentration of power resulting from the superpower</li> <li>- separating the world of finance from the real economy</li> <li>- increase in differences between individual market segments</li> <li>- uncontrolled privatization of the sector and public space</li> <li>- centralization of political and economic decisions</li> <li>- globalization of social pathologies</li> <li>- social threats and terrorism</li> <li>- universalization</li> </ul>
Ecological	<ul style="list-style-type: none"> <li>- soaring pressure to use ecological solutions</li> <li>- legal regulations regarding environmental protection</li> <li>- use of alternative fuels</li> <li>- solutions aimed at environmental protection</li> <li>- ecological disasters</li> <li>- natural disasters</li> </ul>

The table above presents the factors responsible for the transformation of supply chains in the heavy industry sector. **Figure 1** presents the process of transformation of supply chains together with the identified areas defined in **Table 1**. The transformation process concerns in the first stage a look at reality, which is determined by identifying supply chains including forms of cooperation. Each stage is preceded by an analysis of management methodologies together with an effective measurement of management performance. Successively moving to the action plan, there are estimated benefits from the transformation of supply chains based on training and continuous monitoring of changes. An invaluable element of transformation is support

at the executive stage and high organizational culture, which applies to every aspect of the flow of goods. The last element concerns constant changes in the environment, in particular time, technology and progressive globalization, which in turn affects economic and economic factors, etc., which manifests itself in the structure of transformation of supply chains.



**Figure 1** Transformation of supply chains [own study based on 8]

Globalization forces producers, suppliers and distributors to constantly improve their products and services. Supply chain management must also be constantly improved so that the flow of goods is dynamic and unwavering. In order to achieve competitive advantage on the market, elements of the supply chain should be "updated" on an ongoing basis. The functioning of a given supply chain in a certain strategy is sufficient for a given period. However, globalization processes, the development of information technology and technologies mean that the concept proven and implemented a few years earlier may not be sufficient under today's political, economic and economic conditions. Transformation of the supply chain allows maintaining the current management concept, while transforming only those elements that are considered weak or insufficient. Transforming parts of the supply chain is undoubtedly a less costly and time-consuming operation compared to implementing a completely new management strategy [9].

## CONCLUSION

The recipe for success in managing the supply chain transformation is to master the transformation transformation cycle, which is shown in **Figure 1** by using digital technologies and ensuring effective change management. Dig. 1 presents a practical and comprehensive framework for the transformation of supply chains, including implementation aids and action plans [8].

Globalization is an element that influences the structure, functioning and development of the supply chain. The concentration of population around urban centers contributes to centralizing logistics services within major

urban agglomerations. Due to the dynamic development of globalization processes, consumers have become accustomed to the situation in which they can get anything from anywhere in the world in a very short time. An important factor in the functioning of supply chains is the consolidation of markets - mainly through political and economic issues regarding regional legal conditions to the world's largest markets. The success of the supply chain is largely dependent on local legal determinants, tax and tax ordinances, along with other specialized legal provisions regarding business operations. International activity of supply chains forces adapting to legal norms prevailing in a given country. Any political, economic or economic breakdown in a country where certain elements of the supply chain are implemented can lead to serious consequences for the functioning of the entire logistics chain. The supply chain collapse can be caused by the economic, political, social, etc. crisis in neighboring markets. Enterprises are forced to operate on the basis of economic forecasts regarding the planned demand or supply, while it is impossible to forecast exchange rates or the political and economic situation of a given geographical area. The right tool for responding appropriately to changes in the world of politics or economics is the rapid flow of information together with the appropriate reaction of business entities [3,9].

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