# LOGISTIC CHALLENGES FACING PRODUCTION AND MATERIAL PROCESSING SECTOR

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**Abstract**

Logistic has become crucial area of competitiveness in many industrial sector. Sector of material production and processing, due to high values of material flows, is especially beneficial for implementing logistics solutions. The main goal of the paper is discussion of potential effects of resolving logistics challenges compared to other factors of the sector's development. In the paper, the situation in Silesian Voivodeship was characterized by the main regional indicators.

**Keywords:** Regional development, material processing, logistics processes, efficiency of logistics activities

## 1. INTRODUCTION

The world is changing very fast, what is effective today will not always be an adequate and good solution tomorrow. The ever more volatile and more dynamic market on which modern logistic companies operate makes the effective methodology so far based on verification, evolution and constant adjustment is less and less effective. There is a growing need for introducing innovative solutions, and so changes of revolutionary character, not evolutionary ones.

Logistics is a sector that is gaining more and more importance in the globalized world. In Poland, it is constantly developing. Due to its specificity, it is constantly evolving to meet the requirements of modern business and adapt to dynamic changes in the economic environment. The ongoing virtualization of the world and the pursuit of its interests pose a number of new challenges for her, at the same time making the position of innovative logistics grow with each subsequent year. Producers, retail chains or even individual stores, in order to earn and successfully compete in the market, had to go beyond their region, country and even continent. A huge challenge for logistics is also the extremely fast development information technology [1].

Modern logistics, its role and its complex character as well as the fact of acting in increasingly complex conditions require a wide scientific involvement in its areas. The success of modern logistics is determined not only by the innovative approach to its problems and tasks but also by very high specialization, work culture, mutual trust of partners, rigorous cost management and speed and efficiency of resource exchange within the network. It is also worth noting here that despite the indicated values of innovative logistics, today there is no such model, concept or method of logistics management even the most innovative one that would work in every situation [2].

In the direction of changes in logistics, besides the client, science should play the leading role. In the area of scientific deliberations, there should certainly be problems related to further implementation and an ever closer link between logistics and information. There is no doubt that the importance of information in the logistics and production system will increase more and more, thus increasing its effectiveness. The problem, however, is based on an innovative approach to this issue, on the close linking of logistics with information, and thus information systems built in accordance with megatrends in the IT area [3].

According to the concept of "high-speed changes", in the context of both gaining and maintaining a competitive advantage of a given organization, the change process depends on the creation of an organizational culture that is capable of adapting quickly to high variability of the environment. This concept focuses on the changing market conditions and individual needs. As part of the adopted organizational culture, it quickly implements

market changes to its activities and strategies. The essence of action and success lies in the preparation of mental and organizational, cultural to such activities and awareness that only a few are able to produce and maintain such a high speed of change and adaptation that is wide-ranging, as well as create and implement, in very short time, improvements and innovations. Thanks to the concept of "high speed" after its implementation in practice, the organization achieves very high levels of flexibility and efficiency.

## 2. LOGISTIC CHALLENGES - THEORETICAL AND PRACTICAL DETERMINANTS

The growth rate of the polish gross domestic product in 2017 amounted to 4.6 % (see **Figure 1**). This was the highest rate of economic growth for six years. The main factor behind such growth was domestic demand, especially the very robust increase in household consumption. Higher consumption was supported by the increase in real incomes due to low price dynamics of imported goods, moderate inflation rate and an increase in wages and salaries.

The other growth driver turned out to be coming from investments which went up, observable with delay, only in the second half of the year. The main driving force behind investment growth in 2017 was in accelerating public sector investments, while investment in the corporate sector continued to decline. Public investments moved up along with the gradual intensification of EU funds usage. The recovery in investment spending of the enterprise sector occurred at the very end of the year, while good dynamics was still maintained in housing/residential investments due to the growing demand of households and relatively low interest rates on loans.

The favorable situation in the country and in the environment of the polish economy was conducive to a further increase in turnover in polish foreign trade. Exports were growing almost as fast as a year earlier, but imports sped up supported by investments. The foreign trade surplus decreased so that the trade balance had a negligible impact on GDP growth.

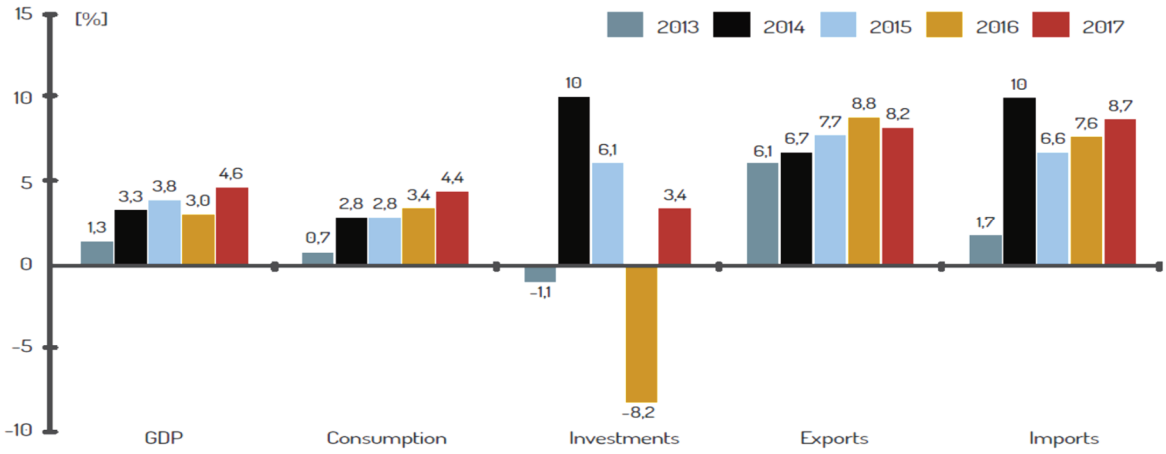


**Figure 1** Economic indicators in Poland in the period from 2013 to 2017 (%) [4]

In Silesian Voivodeship dominates industry as it is the second top Polish Voivodeship of sold production of industry which is 18.2 % of total number for Poland [5]. All above sectors are directly connected with the material and manufacturing and processing defined by NACE codes. In **Table 1** we can see the basic economic indicators characterizing the material manufacturing sector in the region. The sector gets very high contribution to the regional domestic products (for the divisions 24 and 25 it is almost PLN 40 billions) and employs large number of employees. According to the Polish Information and Foreign Investors Agency the sectors with huge potential in the region are automotive (as numerous renown enterprises and developed network of suppliers

of this industry are present in the region: FIAT (largest factory in Europe), General Motors Manufacturing, Isuzu Motors, Delphi Automotive Systems, Tenneco Automotive, etc.), business process outsourcing and IT [6].

**Table 1** Basic measures characterizing the business potential of Śląskie in the area of production and processing materials - data for the year 2015 [5] (a), [6] (b)

| Divisions of NACE | Number of enterprises | Number of employees | Sales revenues (product and services) (PLN thousands) | Sales revenues (materials) (PLN thousands) |
|---|---|---|---|---|
| Division 24 and 25 | 5,121 (a)<br>513 (b) | 70,697 (a) | 39,672,818 | 2,910,004 |
| 24 - Manufacture of basic metals | 340 (a)<br>84 (b) | 22,613 (a) | 23,770,608 | 1,108,582 |
| 25 - Manufacture of fabricated metal products except machinery and equipment | 4,781 (a)<br>429 (b) | 48,084 (a) | 15,902,210 | 1,801,422 |
| 22- Manufacture of rubber and plastic products | 1,287 (a)<br>217 (b) | 27,762 | 9,972,384 | 992,645 |
| 23 - Manufacture of other non-metallic mineral products | 1,070 (a)<br>89 (b) | 15,646 | 7,359,410 | 858,273 |

Metallurgy is categorized in the metals department, which is one of the top ten largest industrial sectors. The value of shipments of the steel sector in 2017 amounted to PLN 33.6 billion, which accounted for nearly 3 % of industrial production. In terms of revenues, it was a very good year for steel-making as, after 2 years of declining sales, the companies managed to achieve growth of almost 15 %, which is more than double of the industry's total. Thanks to this, steel managed to some extent to rebuild its position within industry, as, before the 2008 - 2009 crisis, it constituted approx. 4 % of the industry total. However, despite good sales in steel and steel products manufacturing sector, profit margins went down as costs, especially of materials and energy, were growing much faster than the revenues.

Export sales accounted for approx. half of the value of steel shipments at PLN 17.1 billion in 2017. The exports competitiveness in foreign steel trade improved, the terms of trade index was at 1.03 after a decline in 2016. Export share, however, was slightly lower than in the previous year as the increase in foreign sales was smaller than the domestic sales growth. On the other hand, imports growing dynamically for several years exceeded the value of sales and amounted to PLN 33.7 billion. The negative trade balance (-16.6 billion PLN) worsened by as much as PLN 2.5 billion and was the highest in history [7].

Thanks to the increase in product output, employment in steel making enterprises went up approx. 2.5 % and amounted to 25.5 thousand at the end of the year. The growth rate of gross salary per employee in 2017 accelerated in the entire industry to 5.5 % from 3.0, while it remained in the steel sector at a similar level as in the previous year, i.e. approx. 4 %. Nonetheless, wages and salaries in the metallurgy are on average 15 % higher than the industry average and 20 % lower than the average pay level in the entire economy. From the point of view of the average pay, the steel sector is an attractive place to work for, but it had in recent years been struggling with generational gap problems and the lack of adequate vocational education system [7].

The technological revolution with which we have been dealing since the turn of the century has changed the way of building relationships between customers and suppliers, as well as in the manner of configuring traditional supply chains. In order to keep up with the dynamically developing market of business, nowadays, they must look for opportunities to build a competitive advantage with their co-operators and clients.

Individual involvement is often inadequate to fully meet customer expectations. In order to be able to meet clients' needs, enterprises are forced to carry out joint activities together with their business partners. To achieve the transparency of the supply chain, the organizational capacity of operators to combine logistics and transport functions should be improved, and through the application of global standards to increase productivity.

To achieve the transparency of the supply chain, the organizational capacity of operators to combine logistics and transport functions should be improved, and through the application of global standards to increase productivity. Increased transparency in the supply chain is an element that can lead to lower costs and improve efficiency. In addition, changes in the approach to the issue of product knowledge among customers of the industrial market have to be noticed [8]. Recipients are demanding detailed information about systems and sources of supply, they are interested directly in such issues as the quality of individual products, operation of processes, safety, ethics and the impact of the company's operations on the environment.

The supply chain is slowly changing its original meaning and is evolving into a supply network. For materials processing enterprises in the Silesian Voivodship, this evolution will mean the creation of a value network. It will cover supply chains from suppliers, demand-driven supply chain and realizing that the company multiplies many supply chains.

Lee's analytical work focuses on determining the efficiency, effectiveness and efficiency of the supply chain. Organizational intelligence should lead to such a concentration of Supply chains to match them best to the characteristics of market needs [9].

Therefore, they should be (see **Figure 2**):

- flexible, which results in a quick response to changes in demand and supply,
- adaptive, It is quickly adapted to evolving market strategies and structures,
- line-set, that is, taking into account the interests of all companies, and thus improve the operations of the entire supply chain.

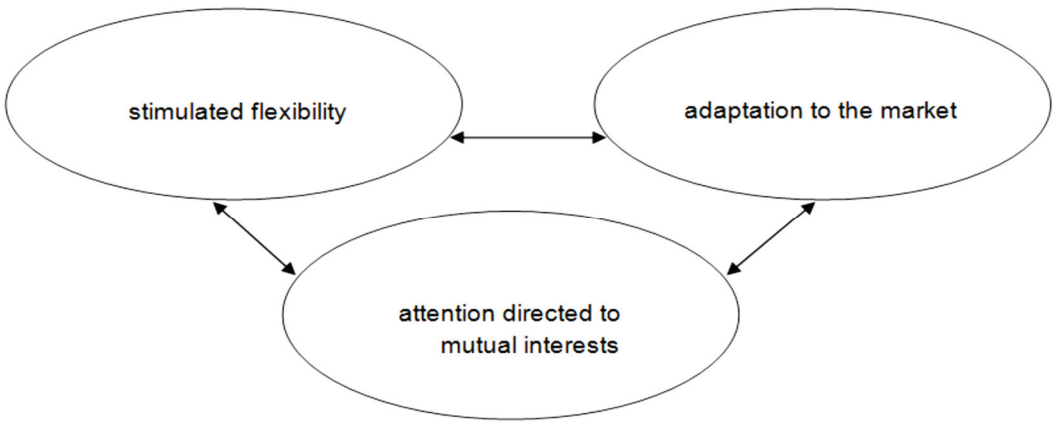


**Figure 2** Elements of the triple A approach [9].

The term "intelligent logistics" is not new though it has acquired a new meaning in the current conditions, and it is about the logistics of new solutions offered by information technologies and their use in logistics processes. A modern look at logistics, however, is not only the result of progress in IT, it also understands the client's needs and the fact that meeting these requirements may determine the existence or failure of a given logistics company. Thus, IT only plays the role of technology that creates the conditions for a specific action, which is therefore a tool that must be integrated with the entire complex logistics process complex to make it faster, more efficient and more integrated internally and correlated with the environment. As a result of such defined

trends, every element of technological development in logistics significantly increases competitiveness in an increasingly demanding environment. As part of "intelligent logistics", it is not only about simple modeling of each process based on the obtained parameters, but about building systems that have the ability to learn and adapt to emerging needs, as well as to deal with information deficiencies. These systems must be able to generate forecasts, demonstrate the ability to react and adapt to change. In addition, they must communicate with other systems and characterize [10]:

- real-time work skills,
- the ability to use standard solutions and interfaces and openness to new sources of information,
- the ability to acquire, aggregate, process, distribute along with data transmission and use a large number of differentiated data,
- the ability to adapt and the possibility of scaling,
- the ability to learn and acquire data and provide feedback,
- the possibility of immediate reaction to changes in operating conditions,
- possible to expand,
- modular structure and mechanisms ensuring safety and high operational reliability.

Innovation in logistics, in the management of modern supply networks is not limited to the involvement of modern IT solutions in this process [11]. A common feature of projects in this area is high creativity and integration. These are projects with high technological complexity. The basic assumption of all these solutions is better adaptation to changes in the environment and the ability to respond faster to market needs. In the era of continuous and unpredictable changes in the business environment, enterprises that want to be successful in the 21st century must be able to react quickly in this difficult and permanently changeable environment, together with the growing responsibility for the natural environment. The elements and goals set for them, in the triple A concept, have been supplemented with the methods necessary to use in the construction of effective supply chains. Shows they are aggregated in **Table 2**.

**Table 2** The elements in the triple A concept (preparation based on [12])

| **Flexibility** | **Adaptability** | **Line setting** |
|---|---|---|
| Long-term goal: Quick reaction to changes in demand and supply and liquidation interference | Long-term goal: Network design delivery to structural changes on the markets and modification according to the strategy, products and technologies | Long-term goal: Creating incentives to increasing efficiency |
| Methods:<br>• Taking care of information flow to suppliers and customers and from them<br>• Developing a cooperation relationship with suppliers<br>• Designing enabling products postponement in time stages of individualizing them<br>• Creating inventory buffers important components<br>• Using a logistics system and the partner providing the services in a reliable manner<br>• Having emergency plans and crisis management teams | Methods:<br>• Monitor the economy on to detect new sources of supply and new markets<br>• Using intermediaries to acquire new ones suppliers and new infrastructure logistics<br>• Assessment of final needs consumers, not just direct customers<br>• Determining the stages of cycles technological and cycles life of manufactured products, taking into account the specificity of demand changes | Methods:<br>• Leading to the free exchange of information with suppliers and customers<br>• Clear roles, tasks and responsibilities suppliers and customers<br>• Fair sharing of risk and costs and profits resulting from the introduction of new ones initiatives |

## 3. CONCLUSIONS

Continuously increasing valuing of the strategic importance of the logistics concept, which is a multidimensional potential of changes in the system and subsystems of business management and enabling the achievement of the hackers' market-economic effects by the company are manifested, among others [13]:

- in the development and growth of the so-called logistics potentials, and more precisely,
- logistic potentials of success, including logistics resources, capabilities,
- logistics and logistics competences - these potentials form the basis for defining and developing logistic determinants of business management also in the environment of material processing enterprises.

Taking into account the dynamics of the environment, the innovativeness of logistics activities in materials processing enterprises can focus on:

- modularization of logistic services combined with lowering costs is now the main goal of logistics innovation,
- cost-oriented innovations will be replaced with customer-oriented innovations,
- creating new services to meet current requirements and creating and at the same time an answer to new requirements will become the most important goal for innovation in the future,
- steps should be taken to achieve greater transparency of activities,
- the incentives for the development of innovation at logistic service providers are mainly projects aimed at clients,
- Understanding the dynamics of customer perception of value carries important opportunities for the development of innovation in logistics,
- modern achievements in the field of information systems and communication technologies have significant innovative potential,
- virtual concept and reality as well as automated systems are extremely important areas of development for innovation,
- development and implementation of standards that will support the interoperability of supply chains and the transparency of operations.

New trends and challenges for technological areas in Silesian Voivodeship create horizontal links that strengthen local value chains:

- creating the basics of functioning and implementation of the circular economy,
- orientation on the growth in the creation and implementation of all types of innovations,
- ensuring and health protection safety,
- reduce material costs and increase productivity (this applies to a large extent manufacturing materials),
- energy efficiency in the sphere of production, distribution and exploitation (including materials),
- use of global resources,
- increased demand for materials (in particular metallic materials and polymers),
- increase in labor costs in materials processing.

Main logistics challenges for enterprises from the material processing sector in the Silesian Voivodeship are focusing on:

- relocation of service centers for materials processing enterprises,
- proper links with IT systems of the logistics facilities,
- matching technical competences to customer service in the sphere of logistics,
- matching the processing offer in the field of packaging, e.g. biodegradable packaging,
- the challenge of cost associated with the transportation - skillful finding in the international supply chain,

- supply chain management, using services provided in the cloud ,
- providing personalized transport that allows you to react in the "just in time" system,
- implementation, by logistic operators, of business models based on access to resources - not necessarily their own - in various configurations, depending on the level of demand at a given moment,
- implementation of specialized logistic services in internal logistics processes,
- using the logistics potential of external carriers to optimize inventory costs, with a noticeable trend of inventory centralization, which results in an increase in the number of logistic operations.

## ACKNOWLEDGEMENTS

***The paper presents selected results of the research project entitled "A network of regional specialist observatories in the process of entrepreneurial discovery" project number WND-RPSL.01.03.00-24-06A2/16-005, Task 7: Observatory in the area production and processing of materials***

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