

INNOVATIVE CLUSTERS AS A WAY OF IMPROVING LOGISTICS ECOSYSTEM: BENCHMARKING POLISH EXPERIENCE FOR UKRAINE

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The article is dedicated to the investigation of Polish experience in logistics clusters development. The primary accent is put on the implementation of innovative logistics solutions through triple helix cluster concept. Polish and Ukrainian transportation infrastructure are compared in terms of countries national logistics potential. In this research, it was also determined how relevant Polish logistics progress might be applied in Ukraine. Balanced scorecard method is used for benchmarking critical objectives of cluster development strategy in Ukraine.

Keywords: Cluster, Innovations, Logistics, Triple helix, Transport infrastructure

1. Introduction

Logistics has been recognized as one of the most important and useful tools for developing one's competitiveness both on national and enterprise levels. Competitive advantage means the ability to differentiate itself in the customer's eyes, and also operate at a lower cost and higher profit. Logistics facilitates in getting products and services as and when they are needed to the customer. According to the *Colliers International Report*, the enlargement of the European Union, continual infrastructure development, and the growth of a consumer mass market in the Central Eastern European (CEE) countries are contributing to redefine distribution patterns in Europe and supporting the development of new freight traffic routes.

This development is, in turn, impacting European logistics markets and leading to the emergence of new industrial and distribution hubs. Some of these hubs are competing with more established centers (Dusseldorf, Antwerp, Rotterdam, Brussels, Hamburg) as alternative locations for logistics centers [19]. Poland's geographical location makes it a natural transit hub between Western and Eastern Europe. Therefore the ongoing shift of Europe's logistics center from Germany to Poland is not surprising. This process accelerated significantly recently, partially due to low labor costs and partly thanks to improving quality of transport infrastructure [14]. In addition to this, by 2020 Polish regions of Silesia, Lodz, and Tricity are supposed to emerge into significant European logistics clusters [19].

Abovementioned global European tendency of eastern expansion opens excellent opportunities of becoming an important part of worldwide logistics system not only for Poland but also for the neighboring countries in general and Ukraine in particular. Historically the countries within CEE share close ties. Consequently, today logistics activity in these countries is continually increasing heightening interactions both between the countries inside the region and with external areas [8]. All of these form the objective of the research – investigate Polish experience of logistics ecosystem development (primarily, using cluster approach) and identify the lessons Ukraine can learn from it.

2. Theoretical background of logistics cluster emergence

Logistics as a study subject was a part of many Polish, Ukrainian and other countries research activities. Many of them position logistics as an essential business factor for cutting costs [11]. In addition, direct connection between logistics processes optimization and enterprise income was identified in numerous studies [23].

One of logistics evangelist D. Bowersox predicted the development of global logistics even more than 20 years ago. International macroeconomic integration, customs deregulation, and expansion of technologies caused drastic changes in worldwide logistics system [1]. In this case, it is of vital importance to mention the emergence of logistics clusters worldwide. The idea was developed by other researchers [22] who laid stress upon globalization challenges in the first place as well as other factors leading to the creation of a new system of logistics clusters to optimize flows of goods, finances, and information by combining best of transportation, customs regulations, warehousing, and use of technologies. Some researchers prove the idea that logistics clusters are an efficient way of enhance logistics potential of a country by improving logistic processes of many firms [10].

While exploring factors that influence Ukrainian enterprises logistics development it was concluded that introducing innovative flexible logistics solutions could help to reduce costs and reduce market volatility for industrial enterprises with high benefit product. However, in Ukraine many companies still underperform in their

daily logistics operations [15]. Ukrainian logistics system is only at its initial stage of implementing new technologies or equipment and integration into the world logistics system. To be more precise, the latter is mostly caused by the fact that Ukrainian enterprises deploy only a small share of existing innovative solutions lagging far behind other countries and misusing national geographical potential [3]. In this research, we focus on the potential of innovative solutions implementation in Ukraine based on Polish experience, which makes this work extremely important for modern Ukrainian policy-makers.

3. Poland and Ukraine national logistics development potential

To understand whether Poland could stand as a relevant benchmark for Ukraine, firstly, it is vital to compare countries logistics potential. These countries share the common border of 498 km, and both are located in the CEE area. Consequently, Poland and Ukraine play a role of the connector between Europe, Middle East, Caucasus, and Russia. For example, according to *Eurostat* Russia and Turkey were 4th and 5th leading EU trading partners respectively standing together for 10% of the whole EU trade turnover in 2015, which proves the importance of establishing good relations and tuning logistics mechanisms. However, under modern globalization challenges, geographical position is not the only determinant of logistics development. For example, transport infrastructure was also identified as another crucial factor [5] – see Table 1 for details.

Table 1. Poland and Ukraine transportation infrastructure comparison

	Poland	Ukraine
Area	total: 312,685 sq km land: 304,255 sq km water: 8,430 sq km	total: 603 550 sq km land: 579 330 sq km water: 24 220 sq km
Land boundaries	total: 2,845 km	total: 5 581 km
Coastline	440 km	1 532 km (excluding ~1250 km of temporarily occupied Crimea)
Railways	19 428 km 11 805 km electrified – 60% (2011)	21 619 km 10 242 km electrified – 47% (2011)
Roadways	total: 412 035 km paved: 280 719 km - 68% (2012)	total: 169 694 km paved: 166 095 km – 98% (2012)
Waterways	3,997 km of navigable rivers and canals (2009)	1,672 km (2012)
Merchant marine	total: 9 (2010) registered in other countries: 106	total: 134 (2010) registered in other countries: 172
Airports	total: 126 paved: 87 - 69% (2013)	187 paved: 108 - 58% (2013)

Source: own work based on *CIA World Factbook* data

As it could be seen, both countries have basically similar transport infrastructure predisposed to active amplification of logistics system. Obviously, bigger territory and population resulted in the fact that some of the Ukrainian indicators are higher than Polish. However, it is essential to emphasize the differences of quality nature in Polish and Ukrainian transport infrastructure affecting countries' priorities and development vectors:

- having almost two times bigger territory, Ukrainian roadways and railroads system is strongly underdeveloped comparing to Poland both in quantitative (length) and qualitative (electrification and paving) dimensions;
- Ukraine has bigger marine potential; but it is not used completely. According to *TheGlobalEconomy.com* data, since 2009 Poland has higher port container traffic in twenty-foot equivalent units (TEUs) and only increase its lead from year to year which is now two times bigger over Ukraine (approximately 2 mln vs. 0,8 mln TEUs);
- according to *WorldBank* data, since 2011 Ukrainian air freight market demonstrated a significant decrease from 81 to 22 mln ton-km while Poland has grown over the same period from 39 to 99 mln ton-km;
- Russian occupation of Crimea and parts of the Eastern regions of Ukraine as well as bilateral trade wars and transit blockade do complicate the processes of logistics development primarily for Ukraine and marginally for Poland.

Based on abovementioned facts, it might be concluded that future logistics development in Ukraine should consider these points. First, it is crucial to understand that poor transport infrastructure is a main barrier to logistics development in Ukraine. Being a result of inefficient governmental policy after the collapse of USSR, it requires new liberal plan from the state for improving national transport ecosystem. On the other hand, current Ukrainian policy makers can apply another technique of stimulating national logistics development taking Poland as a benchmark in the context of logistics clusters.

4. Current ecosystem of logistics cluster in Poland

Modern EU economic growth strategy is primarily based on stimulating regional development. By creating appropriate framework and providing support for bottom-to-top initiatives realization any region of EU has a chance to use its competitive advantage fully. The emergence of logistics clusters is a bright example of giving a powerful impulse for regional development [6].

Logistics cluster is a hub of specific area where all the activities relating to transport, logistics and goods distribution – both for national and international

transit – are carried out, on a commercial basis by various operators [12]. It is important to highlight specific activities performed by logistics centers besides basic cluster functions (e.g., calling the main coordinator of the cluster, inviting new members, developing growth strategy and so on). They are as follows: lobbying for investment in infrastructure and thus supporting the activity of the cluster and regional shipper strategy and cooperation; support for investments in information communication systems for surpluses/shortages capacity; demand for transport services, shipping and logistics; raising awareness of the logistics outsourcing and comprehensive management of logistics processes, increasing innovations implementations by the regional logistics companies, optimization of logistics processes by combining orders of different shippers; increasing the utilization rate of cargo space; implementation of new IT solutions in order to adapt new applications; cooperation with other regional clusters [17].

Successful development of logistics cluster is based on infrastructure (including transport) and consumers. In addition to this, realities of modern knowledge economy also place education and innovation among the most essential factors of logistics systems amplification [7]. Modern logistics requires innovativeness, which in turn may even help to overcome possible geographic limitations. Importance of innovations for economic growth has been figured out by numerous followers of Schumpeter. In order to survive in global market, it is impossible to survive without innovations implementation [21]. IT provides wide opportunities for improving the transportation mechanics and other components of logistics process [5]. Finally, it is worth mentioning RFID (radio frequency identification) as one of the best examples of modern innovative solutions in logistics.

RFID is an innovative megatrend in logistics. Its functions are partially like those of the traditional barcode: the provision of information about a product, pallet or entire inventories. However, RFID's critical advantage over barcodes is that the data does not have to be read in a cumbersome line-of-sight process. Instead, everything is done with radio waves: consequently, it is fast and automatic [16]. In addition to this, there are plenty of other innovative solutions with great logistics potential.

Nevertheless, in logistics, it is vital not only to discuss the importance or perspectives of innovations but to find the ways for implementation and commercializing them [2]. In this context, a concept of triple helix replaced traditional linear innovative models. According to Etzkowitz and Leydesdorff [4], the relations of university-industry-government cooperation evolved from business-industry ties due to increasing role of universities as research institutions. Logistics is not an exclusion, and it has been affected by the same tendency as it happens in many other spheres: cooperating companies cluster together around universities and local

administrative bodies (e.g. *Regional Polish Chamber of Shipping and Logistics*, *Polish Agency for Enterprise Development* and others) [18]. Joining logistics cluster is the most beneficial for small and medium enterprises that achieve several competitive advantages. Consequently, in Poland, only 14% of cluster members are large enterprises (>250 employees), while the prevailing cohort (36%) is that of small enterprises (10-49 employees) – see Figure 1 for details.

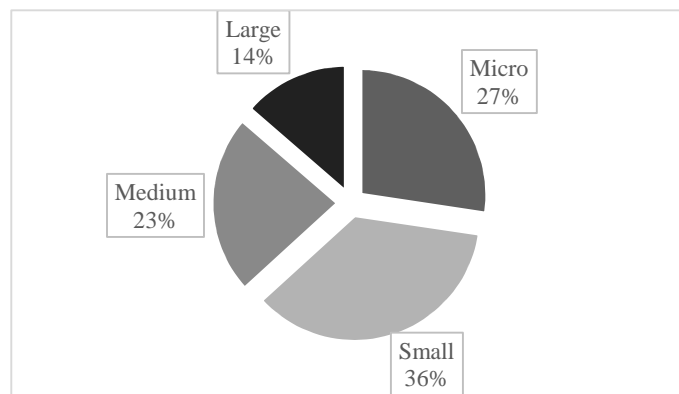


Figure 1. Size of Polish enterprises - logistics cluster members.

Source: own work based on Polish Agency for Enterprise Development data

Analysing current situation in Poland, it might be stated that country is experiencing an active expansion of logistics clusters. Table 2 provides examples of leading Polish logistics clusters.

Table 2. Examples of Polish logistics clusters

Cluster name	Enterprises-members	Research institutions - members	Local administration bodies	Research centers or dedicated laboratories
North-South Logistics and Transport Cluster	36	7	3	1
Cluster TSL	11	3	3	0
Polish Maritime Cluster	7	4	0	2
Southern Railway Cluster	39	7	1	0
Silesia Logistics Cluster	15	3	1	0

Source: own work based on Polish Agency for Enterprise Development data

It is worth noting the absence of research centres or laboratories in two out of five sampled clusters. In fact, lack of research facilities was identified as a critical problem the whole Polish innovative system [20]. On the other hand, it is possible to find the strong signal of triple helix model emergence as most of united under the cluster initiative businesses are looking for cooperation with government and universities. What is more, Poland has great potential for future triple helix logistics cluster development. It could be proved by the existence and active functioning of numerous local initiatives in logistics spheres, some of which has already turned into powerful institutions. They are *Centre for Analysis in Transport and Infrastructure* (Warsaw), *Institute of Logistics and Warehousing* (Poznan), *First Transport Cluster Spedigo* (Warsaw), *Lazarski University Centre for Logistics and Innovations* (Warsaw), *Warsaw University of Life Sciences Cluster of Innovation in Agribusiness*, and others. Polish experience of innovative logistics cluster development is incredibly valuable for Ukraine in the context of continuing post-soviet transformations and strengthening its positions on global logistics market.

5. Logistics cluster amplification balanced scorecard strategy

Some of Ukrainian researchers even now suggest creation of innovation logistics clusters using linear approach for improving current situation with national transport infrastructure [13]. However, modern innovative systems are switching to integrated and hybrid models. In this context it is important to extend the cooperation between different market players in triple helix format. In order to aggregate the results of this research and define specific objectives of how Polish experience of developing logistics cluster might be applied in Ukraine, we will use a balanced scorecard - a strategy performance management tool introduced by Bob Kaplan and David Norton in their seminal work [9]. Now it is a widely popular reporting framework. The balanced scorecard suggests the assessment of specific development objectives from four perspectives: financial, customers, internal business procedures, and learning & growth. Each strategic goal has its own related metric in order to make the progress measurable. It is an excellent way to promptly identify particular weak places of the whole strategy. Finally, we added fundamental factors that make it possible to reach those goals in Table 3.

Table 3. Logistics clusters development strategy

Perspective	Strategic Goals	Metrics	Supporting factors	Comments
Financial	Lowering logistics-related costs	Total enterprise logistics costs	<ul style="list-style-type: none"> ▪ Scale effect ▪ Cluster promotion ▪ Preferential tax regime ▪ Professional coordinating team 	This goal should be considered as the ultimate one in developing logistics clusters. In case of appropriate cluster management for coordination and promotion, tax support from the government as well as right scaling it is possible to make logistics processes more efficient by lowering related expenditures.
Customers	Faster/cheaper delivery	Average delivery time/price	Adoption of latest technologies	Using cluster infrastructure, it is possible to make customers happy by providing them with fast and cheap delivery as well as secure goods from accidents, which in turn affects overall business performance in general and helps to lower logistics costs.
	Increasing transportation safety	Quantity of accidents	<ul style="list-style-type: none"> ▪ Use of new packaging technologies ▪ Delivery tracking 	
Internal Processes	Improving warehousing efficiency	Warehousing related costs	<ul style="list-style-type: none"> ▪ Special offers for cluster members ▪ Common use of cargo spaces 	Improved warehousing efficiency due to smart use of cargo space and special offers for cluster members is a great way to achieve another strategic goal – faster/cheaper delivery of goods. Moreover, both infrastructure investments and technologies application can have significant impact on transportation safety.
	Increasing local infrastructure investments	Infrastructure investment volume	<ul style="list-style-type: none"> ▪ Active lobbying in local community ▪ Application for international infrastructure projects 	
	Information and technologies exchange intensification	Typical operations execution time	<ul style="list-style-type: none"> ▪ Co-working events for cluster members ▪ Knowledge-sharing online platform 	
Learning & Growth	Implementation of innovations	In-house developed innovative solutions quantity	<ul style="list-style-type: none"> ▪ Cooperation with universities ▪ Partnering with R&D institutions ▪ Innovations diffusion between cluster members 	Implementation of new technologies could reduce logistics costs. In addition to this, employees' productivity directly correlates with information and technologies exchange between cluster members.
	Increasing employees' productivity	Tasks performing time	<ul style="list-style-type: none"> ▪ Educational events organization ▪ Salary motivation system 	

Using the ADOScore software, we developed the initial balanced scorecard proposal for Ukrainian policy-makers. Each objective (marked as a pyramid) meets a particular metric (connected circles) for more detailed analysis and long-term progress tracking. See Figure 2 for details.

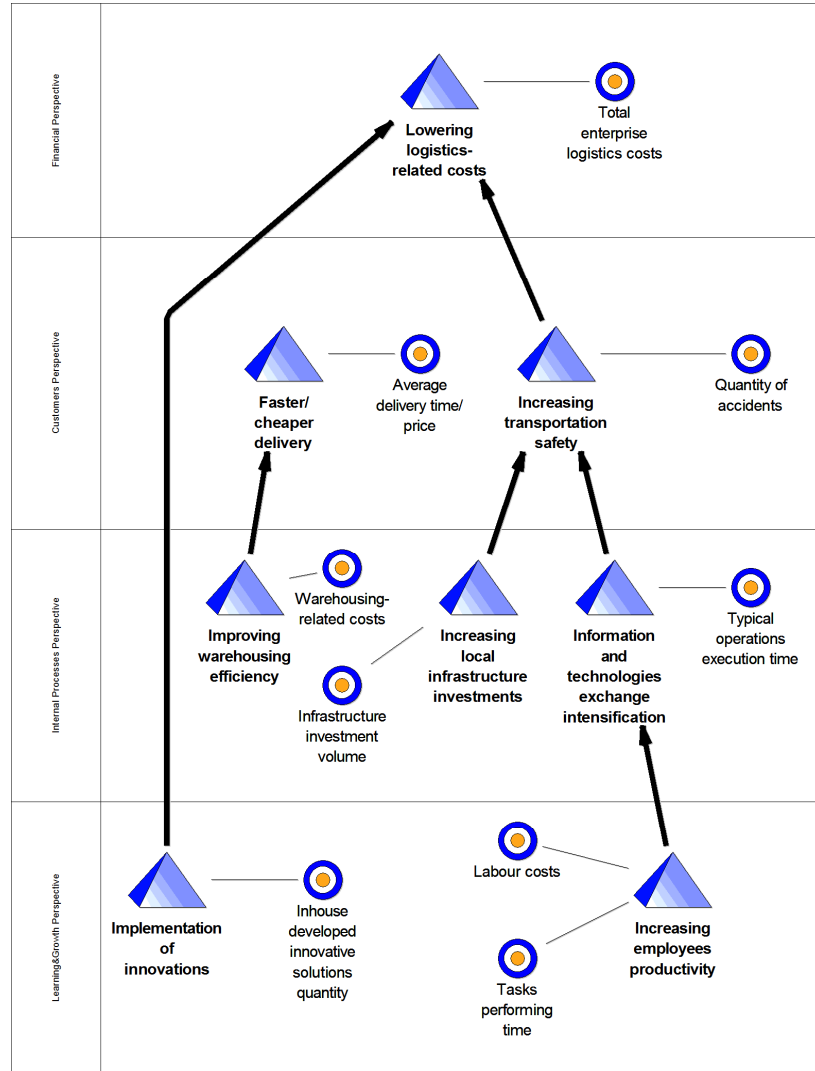


Figure 2. Balanced scorecard of logistics cluster amplification

Logistics cluster creation brings multiple economic benefits from different perspectives. Consequently, advance in one aspect may contribute to other fields. In fact, all of the proposed steps are aimed at cutting logistics-related costs and satisfying clients' needs. Nevertheless, sustainable progress in cluster development is based on multiple factors, which were recorded in Figure 3 referring to particular objective of the proposed balanced scorecard.

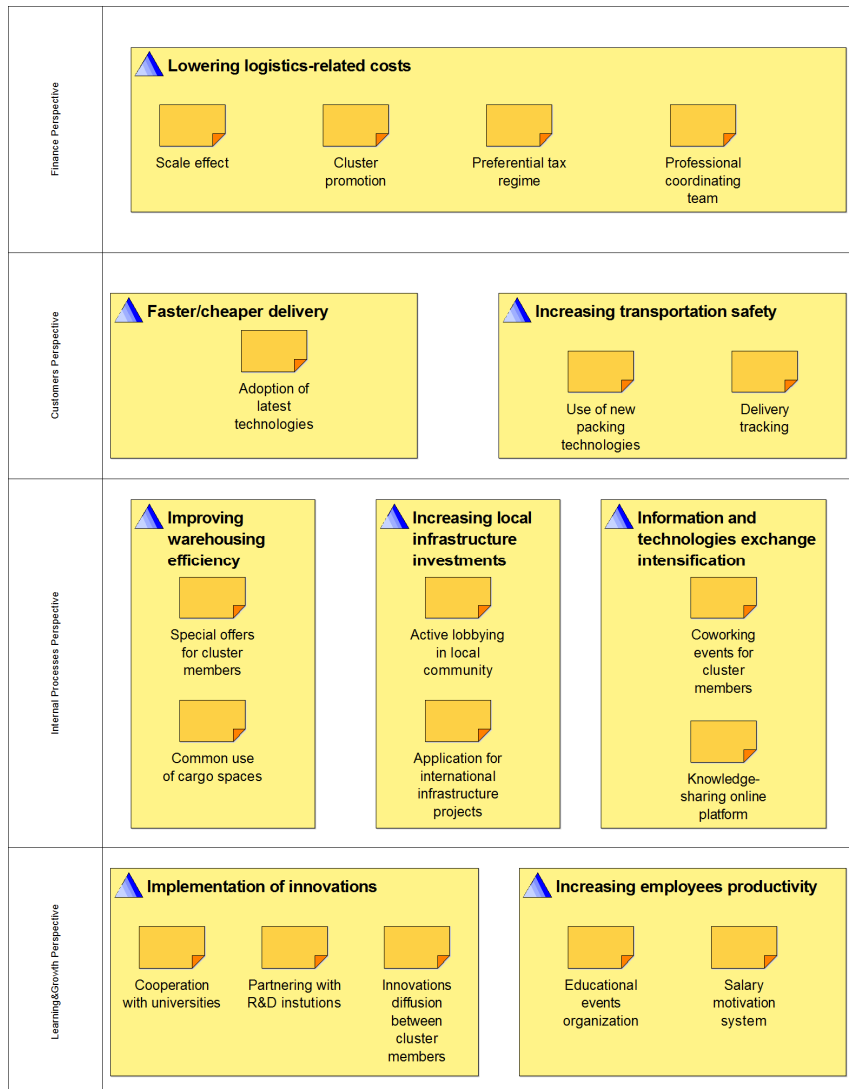


Figure 3. Fundamental factors for logistics cluster development

As it might be seen cluster amplification requires considerable amount of comprehensive work. That is why it is vital for the government in this initiative to create appropriate framework and decent freedom for clusters to build own highly motivated coordinating teams, transparently compete for funding, and regularly prove their efficiency.

6. Conclusion

In this paper we investigated Polish logistics cluster ecosystem putting main accent on the exploration of innovative solutions implementation opportunities. We compared Polish and Ukrainian transport systems and identified the clear relevance of Polish experience in the field. Besides working on overall infrastructure development, Ukrainian policy-makers should pay attention to logistics cluster expansion, which in turn will contribute to national logistics improvement. In Poland, it could be seen that regional development framework for realizing bottom-to-top initiatives stimulates logistics cluster amplification. Based on literature review and expert opinions, we developed a strategy for improving national logistics cluster ecosystem in Ukraine. With the help of balanced scorecard, we benchmarked main objectives of cluster development for Ukraine from different perspectives, defined appropriate metrics for progress evaluation, and described key supporting factors for advancing in the field. Despite the fact that Polish clusters face many problems, Ukraine can learn much from their experience. Consequently, this may bring sufficient improvements of Ukrainian enterprises (primarily, small and medium size ones) competitiveness; however, all of the connected issues require further detailed investigation.

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