

## Adaptation of Logistics Processes for International Supply Chains: Risk Management Approaches and Cost Reduction Strategies

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### Abstract

The article analyzes approaches to adapting logistics processes for managing international supply chains, focusing on risk mitigation and cost optimization. Modern strategies are considered, including the application of digital technologies, process automation, and multimodal transportation. Special attention is paid to the role of sustainable practices in reducing costs and enhancing competitiveness. Political, economic, infrastructural, and environmental factors influencing the efficiency of logistics operations are examined, along with methods for risk forecasting using Big Data and artificial intelligence. The study emphasizes the necessity of a comprehensive approach to improving the resilience and flexibility of supply chains in the face of global uncertainties.

**Keywords:** Logistics, International supply chains, Risk management, Cost reduction, Supply chains, Automation.

### 1. Introduction

Contemporary world logistics is challenged by a list of predicaments launched by the spread of globalization, increased complexity of the supply chain, and unstable geopolitical situations. Along this line, companies are obligated to make their logistics systems marginally more conforming in the attempt to keep costs low while minimizing risks. This is greatly relevant a goal since inadequate planning or management could be followed by humongous fiscal losses, which can contribute to loss of reputation and competitiveness for a firm in the international market.

These global logistic complexities are founded on so many variables, such as heterogeneity of requirements in legislations of various countries, impacts of volatile currencies, political risk, and adherence to sustainable environment standards. Moreover, consumers' demands are more significant in nature for faster delivery times and improved transparency in operations.

The objective of the article is theoretical analysis of methods of logistic cost reduction and risk management activities in foreign supplies with particular reference to supply chain optimization techniques, application of digital technology, and development of an effective methodology of risk management.

### 2. Main part. Factors influencing costs and risks in international logistics

In international logistics, there are several factors that influence costs and risks, and hence this process is highly complex and diversified. Some of the most significant factors are economic,

political, infrastructural and environmental factors, which require special attention while formulating logistics strategies.

Among the most decisive factors that mark the level of costs in cross-border deliveries, an important one is played by economic forces. Most significant of them is exchange rate fluctuation, which indirectly impacts the transport cost as well as the purchase cost of goods. For instance, an abrupt devaluation of the local currency against the USA dollar can boost the cost of international delivery because in most cases logistics operations are paid for in dollars. In contrast, taxes and customs also raise overall spending substantially, especially in those countries where tariffs on imports are excessive, like India or China, whose taxes on some products might be between 20-30% of the cost of products [1].

The most important place in international logistics belongs to political risks. A change in international policy-that is, the introduction of trade sanctions or tariff barriers-may seriously shake the stability of the logistics chains. For example, the establishment of trade sanctions against Russia led to a sharp rise in the cost of transport and seriously complicated the transiting of cargo through Europe. This also pertains to some legal distinctions between countries that demand accordance with various requirements, such as product certification, compliance with ecological standards, and compulsory cargo insurance. Poor preparation for any such differences could result in delays or additional financial loss [2].

Infrastructure limitations also have a big say in costs and risks. The state of the transport infrastructure, both internationally and locally, impacts the speed of delivery and its cost. In countries with developed transport systems, such as Germany or the USA, deliveries are usually faster and cheaper [3]. At the same time, in those countries with weaker infrastructure-for example, in large areas of Africa-transportation is prone to delay, which extends the operation cost and adds to the possibility of damage or loss of merchandise. The availability of suitable storage facilities is also not negligible. An example is the case of Hong Kong and Singapore using large port terminals; this reduces the cost of warehousing goods, compared with other regions that have no storage capacity.

Finally, environmental and social issues are becoming increasingly important worldwide in logistics. The new trends of sustainable development oblige businesses to limit their carbon emissions, which may add to the cost of implementing green technology, for example, the running of low-emission vessels or packaging optimization relative to the reduction of waste. At the same time, consumer demand is increasingly turning towards environmentally friendly products, which offers additional opportunities to reduce the risks of violating environmental standards and regulations. Currently, companies that are already implementing green technologies are not only saving on their costs in the long term but also improving their image worldwide [4].

Therefore, factors that influence costs and risks of international logistics represent one complicated system, in which economic, political, infrastructural, and environmental aspects closely interact. To manage the logistics processes effectively, all the aforementioned factors have to be taken into account and a strategy needs to be developed which, on each stage of the supply chain, would diminish the cost and level of risk.

### **3. Approaches to reducing costs in international logistics**

Among the most important tasks that every business aims for, in order to maintain competitiveness and increase the effectiveness of its work, is reducing the costs of international logistics. In this situation, where globalization is getting more powerful and supply chains more complex, companies strive to find new ways to optimize their costs. Supply chain optimization, use of digital technologies, and sustainable logistics are some of the most useful methods.

One of the effective methods in the context of supply chain optimization as a tool for cost reduction is the implementation of Lean and Agile models. They have been developed to reduce excessive costs and increase the flexibility of logistic processes. The Lean model is focused on the minimization of losses at all stages of the supply chain—from the purchase of raw materials to delivery to the end consumer. For example, reducing inventory and improving the coordination of supplies help reduce storage and transportation costs. While the Agile model will be able to respond on time to changes in the conditions of the external environment and to avoid unnecessary costs linked either to fluctuations in demand or in the conditions of transportation. Developing a hybrid strategy, through consideration of Lean and Agile methods' principles, allows companies to achieve just the right balance of a high level of efficiency and a corresponding level of flexibility in the context of rapidly changing market conditions. Moreover, the Design Thinking methodology can be included within this process, which assists in identifying customer needs better and optimizing logistic solutions, providing more opportunity to reduce costs and improve the overall logistic chain. The approach, focused on solving complex problems and honoring user requirements, can be capable of complementing Lean and Agile methodologies (fig.1).

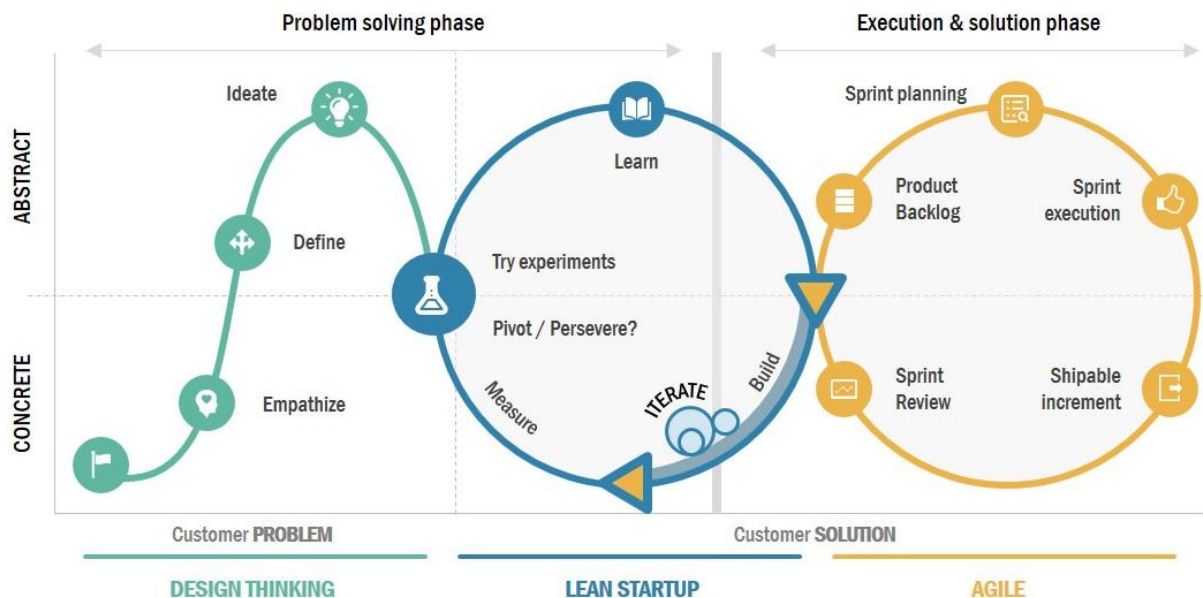


Figure 1. Hybrid strategy model [5]

Multimodal transport is also a determining element in cutting down costs. Multimodal transport involves more than one mode of transport, allowing one to have the option to select the best routes and transportation means for particular cargo. As an example, shipping products from China to Europe through sea and land transport is cheaper than relying on one transportation mode. This will not only reduce the cost of shipping but also reduce the risk of depending on one mode of transport.

The next relevant step toward cost reduction involves the digitalization of logistic processes. Implementation of TMS (transport management system) and WMS (warehouse management system) allows for substantial enhancement of the coordination and optimization processes related to the logistics at hand. All stages of delivery can be monitored and analyzed in real time with the help of such systems, which enables one to respond promptly to changes and plan logistics with minimal costs. For instance, TMS enables the choice of the most cost-effective routes and the optimization of transportation schedules, what significantly cuts transportation costs. The introduction of Big Data and Internet of Things (IoT) technologies allows for real-time tracking of cargo movement, predicting delays, and optimizing warehouse stocks, which minimizes storage costs and surplus products. The use of such technologies can lead to a reduction in costs by 10-15%, depending on the scale and level of automation of logistics processes [6].

Long-term costs are also established through sustainable logistics practices. Within the existing reality of rising requirements for the environment's protection, businesses today increasingly use green technology to make their logistics more streamlined. As an example, utilization of low-emission ships and recycling packaging systems not only saves the environment but also cuts on the cost associated. Whereas others have already begun utilizing other sources of energy to power their logistics, reducing fuel costs and decreasing the carbon footprint.

Hence, a balanced strategy with supply chain optimization, multimodal transportation, adoption of digital technology, and sustainability is the most effective in lowering cost in international logistics. Such measures not only help companies reduce cost but also make them more flexible, and consequently, they will be more competitive in the global market.

#### **4. Approaches to risk management in international logistics**

Risk management in international logistics is quite a complex process, including the identification, assessment, and minimization of those possible threats that may influence the efficiency and safety of logistic operations. In the conditions of a globalized economy and unstable geopolitical situation, enterprises are facing various types of risks: operational, financial, legal, and environmental. Successful risk management presupposes the use of a systematic approach with various strategies aimed at their minimization.

Risk identification and assessment are the major stages of risk management. Among the initial steps, an analysis of the external environment is conducted through assessing the political situation, economic factors, and the state of infrastructure in the countries the goods pass through. For instance, the introduction of trade sanctions can significantly alter the cost and delivery time of merchandise, and the company should be flexible enough to choose other routes or suppliers. In this context, companies have to actively monitor the political and economic situation in key markets and make plans in advance to minimize the impact of such changes. It enables one to predict the appearance of possible risks more accurately, and to adopt all previously prepared measures to eliminate them [7].

Insurance against cargo is an effective tool to manage the risks involved due to possible damage or loss in transit. It is also one of the most traditional, yet effective, ways for protection against operational risks. Again, the most important aspects are the selection of an insurance company and the preparation of a proper insurance policy that considers all types of risks, covering damage to goods and/or loss resulting from accidents or natural calamities. However, full

insurance coverage of all types of risks is not possible, especially those related to long-term delays and changes in tariffs and taxes; for which additional strategies need to be devised to minimize these threats.

Forecasting and monitoring risks using modern information technologies are becoming an integral part of risk management in international logistics. Big Data and artificial intelligence (AI) based forecasting systems finally enable a substantial increase in the accuracy of predictions and immediate reactions in the case of emerging threats. For example, systems using machine learning algorithms to analyze vast volumes of cargo movement data can detect beforehand the logistics routes that might face problems, such as delays at borders or ports. This allows for a reduction in response time to a threat and the minimization of the consequences of risks, such as loss of time or additional costs.

Diversification of supplies – is another key strategy for managing risk. Instead of relying on a single supplier or transport route, companies seek to distribute their supplies across multiple regions or contractors. This reduces dependence on specific countries or companies and reduces the likelihood of problems arising in the event of political or economic crises in one of the regions (table 1).

**Table 1. Comparison of cost levels for different types of transport [8]**

Mode of transport	Average shipping cost (per 1 kg) in USA \$	Advantages	Flaws
Sea transport. Used to transport large volumes of goods over long distances (for example, from China to Europe).	0,02-0,05	Low cost, suitable for large volumes.	Long delivery times, dependent on weather conditions.
Air transport. Used for urgent deliveries, goods with high added value (e.g. electronics, pharmaceuticals).	2-10	Fast delivery, high reliability.	High cost, limited capacity for large volumes.
Rail transport. Suitable for intercontinental transport, especially in countries with a developed railway network (e.g. USA, Russia).	0,1-0,3	Average price/time ratio, relatively resistant to external factors.	Limited routes, infrastructure dependency.
Automobile transport. Suitable for short distance or last mile delivery.	0,5-2	Flexibility in routes, direct deliveries from warehouse to warehouse.	Dependence on road conditions, delays due to traffic jams.
Used for long-term deliveries that require a combined approach (e.g. container shipping between continents)	0,03-0,07 (maritime segment) + cost of rail or road segment	Convenience of combining different types of transport,	Difficulty in coordination, possible delays at the junction of vehicles

with a transition through several modes of transport)		cost optimization	
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Companies shipping goods from the USA to Europe may face a variety of challenges, including high transportation costs, long delivery times, and potential supply chain disruptions [9].

Risk management from a sustainability perspective is also becoming an important part of the strategy of companies seeking to reduce the environmental impact of their logistics operations. The challenges posed by climate change and its impact on transport routes require measures to manage the risks associated with natural disasters and unpredictable climatic conditions. The introduction of a climate change monitoring system and the use of alternative, more sustainable modes of transport, such as electric vehicles or waterways, help reduce the risks associated with extreme weather conditions and excess carbon footprint.

Thus, effective risk management in international logistics involves a comprehensive approach based on analysis, insurance, forecasting, diversification and the application of sustainable solutions. These strategies allow companies not only to minimize risks, but also to increase the flexibility and resilience of their supply chains in conditions of uncertainty.

## 5. Conclusion

Adapting logistics processes to handle international deliveries requires a comprehensive approach that includes risk management, cost optimization, and the introduction of modern technologies. Effective management of international deliveries requires taking into account many factors, such as economic, political, infrastructural, and environmental aspects that affect the efficiency of logistics operations. The development of digital technologies, including transport and warehouse management systems, as well as the use of multimodal transportation, significantly increase flexibility and reduce costs.

To minimize risks, forecasting and monitoring threats using AI and Big Data is an important tool. Diversification of supplies, cargo insurance, and flexibility in choosing transport routes are key strategies to ensure stability in the face of global uncertainties. Sustainable logistics practices, such as the use of green technologies and reducing the carbon footprint, not only meet market requirements, but also help improve the competitiveness of companies.

Thus, successful adaptation of logistics processes to international deliveries is impossible without taking into account all of the above factors and implementing innovative solutions that can increase efficiency and reduce risks.

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