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MANAGING OPERATIONAL RISKS IN GLOBAL SUPPLY CHAINS

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ABSTRACT
This article examines the management of operational risks in global supply chains in the context of global instability. It examines the main problems related to political, economic, and climatic factors, as well as the specific characteristics of global supply chains, including their multi-tiered structure and geographical dependence. The analysis highlights adaptive strategies aimed at risk minimization, including proactive approaches such as supplier diversification, localization of production capacities, development of backup supply routes, and the adoption of digital technologies. The article also underscores the importance of integrating sustainable development principles and flexible approaches into supply chain management.
KEYWORDS: *Global Supply Chains, Operational Risks, Adaptive Strategies, Supplier Diversification, Digital Technologies, Sustainable Development.*

INTRODUCTION

Global supply chains (GSC) form the backbone of the global economy, ensuring goods and services flow between regions and countries. However, over the last couple of years, new challenges have emerged due to global instability that has raised the operational risks for businesses considerably. Political conflicts, economic crises, natural disasters, and pandemics have exposed the vulnerabilities of complex supply networks, demanding rapid response and adaptation. All these incidents have proved that effective risk management has to be the prerequisite to keep supply chains running without interruption under uncertainty conditions.

Global supply systems have gradually evolved to become more vulnerable, influenced by a multitude of stakeholders with disparate interests. The current state of globalization has increasingly made companies dependent on cross-border supplies, and any interruption due to external factors-such as political upheavals, trade embargoes, or natural catastrophes-can seriously affect their processes of production.

For companies today, this means not only mitigating such risks but also developing methods and approaches that give agility and adaptability in a turbulently changing environment. The objective of this article is to examine adaptive strategies in managing GSC operational risk for resilience within the face of instability across borders. The methodology of the research includes the systematization of theoretical and empirical data based on modern approaches to risk management and examples of successful practices in global companies.

MAIN PART. CONTEMPORARY CHALLENGES IN MANAGING OPERATIONAL RISKS IN SUPPLY CHAINS

The control of operational risks in GSC is among the most acute and sophisticated challenges of contemporary logistics and management. Due to political, economic, climate-related, and technological instabilities, companies increasingly face a need to make strategic and process adjustments with regard to ensuring the continuity of supply chains (Olawale et al., 2024). These risks in supply chains are not confined to the internal factors of management errors or issues at the enterprise level but are also conditioned by external causes that can be unpredictable and destructive.

An important aspect of operational risk management is understanding the various types of risks faced by participants in GSC. These risks can be classified into several major categories, each exerting its specific influence on supply chain stability (table 1).

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Table – 1 (Types of operational risks (Balgimbayev, 2024; Kidassova, 2024))

Type of risks	Description	Impact on the supply chain
Political risks	Political instability, trade wars, sanctions, changes in international politics.	Disruption of trade flows, delays in deliveries, increased costs, the need to review logistics.
Economic risks	Economic instability, inflation, currency fluctuations, economic crises.	An increase in the cost of materials, a change in the prices of goods, a decrease in demand, a shortage or excess of stocks.
Climate risks	Extreme weather events, floods, hurricanes, wildfires, droughts.	Blocking of transport routes, destruction of infrastructure, long delays in deliveries.

According to the author's opinion, GSC are confronted with diverse and interconnected risks. All of the regions discovered have a critical impact on the efficiency and stability of supply chains, and hence companies must develop integrated and adaptive risk management approaches. In situations of global instability, companies should not only respond promptly to arising risks but also proactively adjust their logistical and production processes to minimize potential losses.

CHARACTERISTICS OF GSC

Multi-dimensional and intricate systems with a number of actors, processes, and technologies that operate on different levels and in different countries are known as **GSC.** Such chains enable international trade by connecting raw materials suppliers, manufacturers, third-party logistics providers, and end-consumers. Even though numerous advantages such as cost reductions and world market access exist, they are faced with a number of specific characteristics that affect their performance and sustainability.

One of the characteristics of a GSC is that they are **multi-tiered structure**. Each member in the chain, whether it is a supplier of raw materials, a manufacturer of components, or a distributor, contributes to the delivery of the final product or service to the customer. These can be connected through multiple levels of middlemen, hence making the system complex and interdependent. For instance, major corporations can have dozens or hundreds of suppliers spread all over the world, and each one of them can depend on lower-level suppliers or producers. Breakdowns at one stage can lead to manufacturing process disruptions at another, and risk management becomes very complex and multitasking.

The **geographical dependence** of GSC is because they depend on the supply of materials and components from different countries. Each country involved in the chain has its unique economic conditions, level of political stability, and degree of infrastructure development. Crises in countries with low levels of economic stability can rapidly influence the availability of significant goods or resources, while currency fluctuations affect the cost of products. This, therefore, necessitates a close watch on the economic situation and political risks of the countries that are vital links to the supply chain.

Globalization has completely changed the perspective of world trade, whereby companies can optimize their supply chains and reduce production costs. It provides scope for savings by using cheap labor and raw materials, and offshoring production to the third-world countries (Umarov, 2025). But these advantages also mean increased dependency on external factors, like changes in policy, the economy, or weather.

One of the limitations of globalization is too much concentration of supplies in a few countries or from a few suppliers. This enhances the risks, and a failure in one of the important links of the chain may lead to serious problems for the whole supply chain. Globalization may reduce costs but leads to over-exposure if the organization does not take into account all possible risks surrounding current issues.

Under the current context of international uncertainty and turmoil, adaptability of GSC and its sensitivity to respond to changes from the outside world take paramount importance. It means companies should develop accommodating risk management policies that would enable them to respond with promptness in reaction to changes and curtail their potential losses to bare minimum.

ADAPTIVE STRATEGIES FOR MANAGING OPERATIONAL RISKS

Adaptive strategies for managing operational risks in GSC make a substantial contribution to their resistance against changes in the external environment. **Proactive approaches** stand on the basis of the forecast of possible threats and the application of measures for their prevention before risks can manifest themselves (Kramskyi et al., 2024). This approach significantly reduces the possibility of disruptions, at the same time minimizing losses and enhancing the resilience of supply chains in conditions of global turbulence.

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One of the main factors of an active strategy is the **diversification of suppliers**. This decreases the level of dependence on one or several suppliers, which is vitally important for minimizing risks connected with supply breaks because of political instability, economic crises, or natural disasters (fig. 1).

Figure – 1 (Importance of diversification in business)

Diversification can involve not only the geographic distribution of supplies but also the selection of different types of suppliers with varying levels of reliability and pricing policies. Another crucial strategy is the **development of backup supply channels**. These channels act as alternatives to primary routes and can be utilized in unforeseen circumstances, such as the closure of ports or transport routes (Holgado et al., 2023). Reserving logistics routes and transport options enables companies to redirect cargo efficiently and minimize losses. Manufacturing facility **localization** is yet another tactic through which companies can lower the risk associated with international supplies. Taking production nearer to final markets or more stable destinations renders a company less reliant on external influences such as international trade policy and exchange rate uncertainty.

The supply chain management **digitalization** process enhances efficiency while reducing risk. One of the tools actively employed for this purpose is Big Data. Its application enables the analysis of large volumes of information, identifying patterns and trends that could signal potential risks. Predictive analytics, in turn, helps forecast potential threats and take preemptive measures to neutralize them.

Real-time supply chain monitoring tools are also being actively implemented for risk monitoring and management. These systems track the movement of goods, inventory levels, and production processes at all stages of the supply chain, enabling rapid responses to emerging issues. Of the most promising supply chain transparency and security guarantee technologies, blockchain technology is preeminent. **Blockchain** provides data immutability and data security, which boosts the degree of trust among supply chain stakeholders and reduces the chances of data transmission fraud or data mistakes.

This implies that the incorporation of sustainability development (ESG) into GSC management for operational risks will be an imperative and increasing trend, crucial not only for ensuring the sustainability of business activities economically but socially and environmentally, too. Therefore, the relevant strategies usually contain the most important environmental, social, and managerial aspects. In regard to operational risks, this means that companies will need to incorporate the environmental, social, and corporate governance ethics impacts of their operations in the bid to support achieving a sustainable and responsible business.

Environmental factors consist of resource-use efficiency, low carbon footprint, reducing waste and emissions, and adherence to worldwide environmental standards. On the social aspects of ESG strategies come labor conditions, workers' rights, equality and inclusion, and interaction with communities.

Agility in controlling the operational risks of a supply chain is important; it will make sure the supply chain is resilient to anything that happens around the globe. It allows companies to immediately adapt to changes in external circumstances and reduce risks related to force majeure circumstances. Agile methodologies followed in supply chains help organizations meet demand changes, supply disruptions, and market condition fluctuations more effectively. For instance, during times of global crises and uncertainties like the COVID-19 pandemic, several companies employed Agile techniques to the quick reorganization of supply chains and quick recovery from disruptions.

That is, adaptive operational risk management in GSC encompasses a huge array of mechanisms aimed at enhancing flexibility, minimizing risks, and enhancing resilience. Adaptive operational risk management strategies need continuous improvement and the implementation of novel solutions to meet challenges that modern businesses are faced with in an environment of global uncertainty. Many companies actively utilize adaptive

strategies for managing operational risks in GSC. For instance, **Apple** successfully implements supplier diversification strategies, which minimize risks associated with geopolitical and economic changes in supplier countries. To reduce dependency on supplies from China, Apple has expanded its production base in India and Vietnam. This approach helps prevent potential disruptions caused by trade wars or political instability. Apple similarly actively leverages digital technology in tracking its supply chain (Yang et al., 2023). The company has established real-time monitoring of information and forecasting analysis, which helps it respond early to potential supply disruptions and make necessary adjustments to its production plan accordingly.

Another example is Kazakhstan's **KazMunayGas**, the national oil and gas corporation that effectively utilizes adaptation strategies to provide risk management in its supply chains. Diversification of supplies' sources is an important aspect of the company's strategy. In the situation of global instability in the oil market, economic and political instability, KazMunayGas is working intensively on projects with a number of international partners, less sensitive to one region or supplier (Hajiyev et al., 2024). These examples show that the realization of such policies significantly enhances external challenge resilience, really resolves changes in market conditions, and reduces risks from global instability.

CONCLUSION

With global instability, supply chain operational risk management has been among the top strategic priorities for a firm's competitiveness and robustness. Political instability, economic uncertainty, global warming, and technological problems acutely require responsive strategies to avoid negative business impacts. With examples and strategies in play, positive movements towards supplier diversification, manufacturing facility localisation, and developing back-up supply channels assist firms in overcoming dependency on external resources and establishing powerful supply chains. At the same time, digital technologies and ESG contribute to the transparency, efficiency, and ecological friendliness of supply chains, which enables business to respond to contemporary challenges.

Successful examples of adaptation to operational risks have been presented through innovative technologies, diversification strategy, and sustainable development. Such cases illustrate that strategies of adaptation do not just neutralize the risk but at the same time create quite impressive advantages in the highly competitive world market.

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