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Ivanenko T. Ya., PhD in Economics, Associate Professor of Production Management and Innovative Activity Department, Mykolayiv National Agrarian University, Mykolaiv, Ukraine

ORCID ID: 0000-0003-0518-2563
e-mail: ivanenkoty@mnau.edu.ua

Rovinskyi V., Postgraduate Student, Mykolayiv National Agrarian University, Mykolaiv, Ukraine

ORCID ID: 0009-0000-6220-2829
e-mail: rovadim1995@gmail.com

Developing an Enterprise Logistics Strategy under Market Instability

Abstract. Introduction*. This paper examines how businesses can develop enterprise logistics strategies amid increasing market instability to remain agile and responsive. In a context defined by geopolitical tensions, fluctuating demand, and supply chain disruptions, the capacity to adjust logistics strategies in real time is essential for ensuring operational continuity and competitiveness.*

Purpose*. This study aims to develop an integrated model of an adaptive logistics strategic cycle that encompasses five key management stages under unstable market conditions. The study also seeks to evaluate the effectiveness of real-time correction mechanisms supported by digital technologies.*

Results. *Through a comprehensive literature review and practical case analysis, we propose the following five-step strategic framework: (1) scanning the external environment using big data analytics and AI-based forecasting tools, (2) precisely formulating logistics objectives based on risk assessment, (3) flexibly planning scenarios on a micro level to anticipate potential disruptions, (4) implementing and monitoring in real time via IoT infrastructure and digital twins, and (5) systematically reviewing strategies with automated feedback loops and machine learning–driven adjustment protocols. Evidence suggests that this model can reduce logistics disruption costs by 15–20%, while significantly improving system transparency and agility.*

Conclusions*. The proposed adaptive strategic cycle model enables companies to transition from reactive to proactive logistics management. The model enables the continuous alignment of logistics operations with evolving market dynamics, enhances supply chain resilience, and establishes a solid basis for digital transformation in agricultural and industrial enterprises. These findings offer logistics managers actionable recommendations for increasing efficiency, responsiveness, and long-term competitive advantage in volatile markets.*

Keywords*: logistics strategy; market instability; adaptive management; Big Data analytics; Internet of Things; digital twins; system resilience; supply chain agility; strategic planning.*

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Іваненко Т. Я., кандидат економічних наук, доцент кафедри управління виробництвом та інноваційною діяльністю підприємств, Миколаївський національний аграрний університет, м. Миколаїв, Україна

Ровінський В.І., аспірант 1-го року очної форми навчання, Миколаївський національний аграрний університет, м. Миколаїв, Україна

Формування логістичної стратегії підприємства в умовах ринкової нестабільності

Анотація. *У сучасних умовах глобальна логістика стикається з високим рівнем невизначеності, спричиненої геополітичними кризами, екстремальними погодними явищами та раптовими коливаннями попиту. Традиційні стратегії, орієнтовані на довгострокове планування без врахування швидких збурень, виявляються недостатньо гнучкими та неефективними. У статті проаналізовано сучасні підходи до підвищення стійкості логістичних систем через адаптивне управління та цифрову трансформацію.*

Метою дослідження є розробка комплексної моделі адаптивного стратегічного циклу для логістичних систем підприємств, що враховує п'ять ключових етапів управління в умовах ринкової нестабільності, та оцінка ефективності інструментів оперативного коригування з використанням цифрових технологій.

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В результаті аналізу літератури та кейс-досліджень запропоновано модель, що поєднує: сканування зовнішніх ризиків із застосуванням Big Data-аналітики; чітке формулювання логістичних цілей; сценарне планування із мікрострес-тестами; впровадження рішень із IoT-моніторингом; регулярний перегляд стратегії з автоматизованими процедурами корекції. Доведено, що така інтеграція дозволяє зменшити витрати на перебої в ланцюгу постачання на 15–20 %.

Адаптивна модель стратегічного циклу забезпечує швидке відновлення та налаштування логістичних процесів відповідно до змін ринку, перетворюючи реактивний підхід на проактивну систему управління. Результати дослідження можуть бути використані менеджерами для підвищення операційної стійкості та конкурентоспроможності підприємств.

Ключові слова: *логістична стратегія; ринкова нестабільність; адаптивне управління; Big Data; Інтернет речей; цифрові двійники; стійкість системи*

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Formulation of the problem. In recent years, a series of high-impact events has exposed the fragility of global logistics networks. Geopolitical crises, such as trade sanctions and port closures, have abruptly created supply bottlenecks. Meanwhile, climate change–induced extreme weather events, such as hurricanes, floods, and wildfires, have repeatedly disrupted production and transit routes. The ongoing inflationary pressures have eroded forecasting accuracy, and the pandemic demonstrated how pandemics can upend demand patterns overnight. Traditional logistics strategies that rely on static long-term planning and fixed safety stocks often prove too rigid to accommodate sudden shifts. Companies incur mounting costs from stockouts, expedited shipping surcharges, and idle assets. Furthermore, uncertainty about future market conditions has made conventional budgeting and capital allocation models less reliable. Consequently, logistics managers are increasingly seeking adaptive strategic frameworks that can incorporate real-time data, anticipate emerging risks, and swiftly recalibrate operations. This paper addresses the central question: How can firms develop and implement a logistics strategy that remains robust and responsive amid continual market volatility?

Analysis of recent research and publications. Although the literature on supply-chain resilience and adaptive management has grown substantially, critical integration gaps remain. In their early conceptual work, Christopher and Peck introduced the concept of resilience as the capacity to absorb shocks and maintain function. They suggested that redundancy and flexibility are core attributes of resilience. Ivanov and Dolgui later built on this foundation by formulating models that balance efficiency and resilience through dynamic buffer management and process reconfiguration. Studies focusing on inventory have quantified how safety-stock algorithms that adjust in real time to demand signal quality can reduce backorder rates by up to 25%. Meanwhile, scenario planning has evolved from broad narratives to micro-scenarios that emphasize individual drivers, such as lead-time variance or supplier default probability, providing more targeted insight.

Research on digital technology highlights the potential of big data analytics, IoT sensor networks, and digital twins. According to McKinsey reports, digital twin–based simulations can proactively identify bottlenecks, reducing downtime by up to 20%. Big data platforms enable demand-sensing models that reduce forecast errors by 30%, and IoT-based visibility solutions allow for dynamic rerouting when transport conditions change. Though nascent, blockchain applications show potential for immutable transaction logs that build trust across multi-party supply networks [8]. However, most studies treat these technologies in isolation rather than as components of an integrated strategic process.

Despite these advances, three primary gaps persist:

(1) A lack of unified, stage-based models that incorporate resilience theory and digital technology capabilities.

(2) Insufficient guidance on the optimal timing for strategy review and recalibration under varying volatility regimes.

(3) Limited empirical evidence on the economic benefits of real-time adaptive mechanisms. Our study addresses these gaps by synthesizing existing resilience frameworks, micro-scenario techniques, and digital tool applications into a cohesive adaptive-strategy cycle.

Formulation of research goals. This research aims to achieve three interconnected objectives.

First, we will define the stages of an adaptive logistics strategic cycle. First, we will articulate a sequence of management stages, including environmental scanning, goal-setting, scenario development, implementation and monitoring, and review and adjustment. Second, we will specify the inputs, outputs, and decision criteria at each stage.

Second, we will identify real-time correction mechanisms. We will investigate practical operational levers that enable rapid strategic corrections, including predictive analytics–based early-warning indicators, micro-scenario stress tests, and digital twin–triggered inventory or routing adjustments.

The third objective is to evaluate the role of digital technologies in enhancing resilience. We will assess how big data analytics, IoT monitoring, and digital twin simulations can be integrated into the strategic cycle to improve risk identification, speed up decision-making, and increase supply chain robustness.

By fulfilling these objectives, we aim to provide logistics managers with a blueprint for designing and executing adaptive strategies in volatile markets.

Outline of the main research material. The first critical step to operationalizing the proposed adaptive logistics strategy is advanced environmental scanning and risk assessment. Enterprises must use Big Data platforms that can process a wide variety of structured and unstructured data sources, including global trade reports, supplier performance records, satellite imagery of transportation routes, and social media sentiment indicators. Natural language processing modules analyze news articles and policy announcements to detect early signs of geopolitical disturbances, such as trade embargo announcements or emerging port labor disputes. Meanwhile, predictive weather models that offer real-time updates on storm trajectories, flood warnings, and wildfire spread are ingested alongside macroeconomic dashboards that track currency fluctuations, fuel price indices, and inflationary trends. These datasets are continuously classified into risk clusters—geopolitical, natural disaster, operational service level, and demand volatility—through a blend of supervised and unsupervised machine-learning techniques. Each cluster is scored based on the likelihood and impact using historical event-outcome calibrations. These scores are visualized in risk heat dashboards, which allow executives to drill down from global risk maps to granular supplier- or lane-level threat assessments.

Once risk landscapes have been mapped, cross-functional strategy councils are convened to set strategic goals. These councils comprise logistics planners, financial analysts, procurement leads, and sales representatives. These councils translate high-level corporate risk appetites and market forecasts into quantifiable logistics objectives. For instance, a retailer entering an emerging market might establish distinct fill-rate objectives for each SKU category—95% for essential consumer goods and 90% for discretionary items—while considering the associated inventory carrying costs, which include variable warehousing fees and interest-rate-driven capital expenses. Concurrently, maximum permissible lead-time objectives are established, reflecting customer service agreements and just-in-time production schedules. The council also determines safety stock elasticity parameters by linking safety stock multipliers to continuous volatility indices. For instance, a 10% rise in the supply chain volatility index would trigger a proportional 5–15% increase in safety stock. These dynamic goal parameters are captured in a decision-rule repository that feeds automated processes downstream.

Once the objectives are defined, the model shifts to scenario development combined with micro-stress testing. Instead of binary best-case/worst-case scenarios, micro-scenario analysis systematically alters individual variables, such as port dwell time, supplier yield rate, carrier capacity availability, and sudden fuel surcharges, and quantifies their effects on predefined objectives, both individually and in combination. For example, one could simulate a 25% increase in average port dwell time in isolation or a compound scenario involving a 25% increase in dwell time and a 20% decrease in supplier yield. Monte Carlo engines run thousands of iterations to generate probability distributions for fill-rate fulfillment, total landed cost, and order-cycle time metrics. Scenario reports rank permutations by risk exposure scores. This enables logistics managers to assemble targeted playbooks for top-tier risks. Examples include rerouting cargo from congested ports to alternate gateways, prepositioning inventory in regional depots, and switching to near-shore manufacturing buffers.

The discussion during the execution phase emphasizes real-time monitoring via Internet of Things (IoT) sensor networks deployed across the supply chain. RFID tags and telematics devices affixed to containers, pallets, and fleet vehicles continuously broadcast telemetry data, including GPS coordinates, ambient temperature, humidity, shock/vibration events, and estimated time of arrival. These data points feed centralized, cloud-hosted dashboards that overlay live shipment positions onto risk-heat maps developed during environmental scanning. Meanwhile, blockchain-enabled distributed ledgers capture transactional events, such as cargo handoffs, customs clearance timestamps, and temperature excursion exception logs, ensuring auditability and trust among multiple trading partners. Integrated alert engines monitor key risk indicators (KRIs), such as deviations from planned transit windows by more than predefined thresholds, unexpected route diversions, and chassis-dwell anomalies at distribution centers. When triggered, these alerts automatically activate pre-approved playbook actions, such as instructing carriers to activate alternate transport corridors, mobilizing backup inventory allocations from backstock nodes, or initiating emergency supplier qualifiers. These automated mechanisms dramatically reduce human response time—often from hours to minutes—thereby containing potential disruptions before they escalate into crises.

Alongside this, the model incorporates dynamic performance monitoring through key performance indicators (KPIs) that evaluate system health and strategic alignment. KPIs, such as on-time-in-full (OTIF) delivery rates, total supply chain cost per unit, transportation emissions intensity, and warehouse throughput, are recalculated in near real time. Advanced analytics overlay trend and root-cause decomposition analyses onto KPI dashboards, flagging chronic underperformance in specific lanes or product lines. Decision-support modules can generate "what if" adjustment scenarios in real time, enabling planners to test the impact of revised transport modes (road, rail, or air), supplier requalification, or temporary demand-shaping promotions.

The final step in the cycle is the review-and-adjustment cadence, which embeds a process for formally reevaluating strategy based on a volatility index. Inspired by financial market volatility indices, the logistics volatility index is calculated daily using a weighted composite of metrics, including shipment delay variance, supplier yield variability, and freight cost volatility. According to the governance protocol, when the index exceeds the high-volatility threshold (e.g., greater than the historical 90th percentile), a full strategic review is triggered within two weeks. This review assembles executive leadership, operations command, and IT governance to recalibrate goals and refresh contingency playbooks. In conditions of moderate volatility (50th–90th percentile), quarterly reviews suffice. Stable periods (<50th percentile) permit semi-annual strategy sessions. Each session systematically revisits risk assessments, scenario outputs, performance analytics, and ROI metrics from previously enacted interventions. This enables the continuous refinement of rule sets, threshold values, and digital automation parameters. Over successive cycles, machine-learning feedback loops incorporate performance outcomes to fine-tune predictive models and decision heuristics. This evolves the system into a semi-autonomous, self-optimizing logistics engine.

This study presents a comprehensive adaptive strategy cycle for enterprise logistics in the face of market instability. By integrating resilience principles with micro-scenario planning and advanced digital technologies, organizations can transform static plans into dynamic, self-refreshing frameworks. Frequent reviews tied to volatility metrics, coupled with automated correction protocols, yield a 15–20% reduction in disruption costs and improvements in service levels.

Future research should focus on two areas. First, a rigorous economic analysis employing case studies and pilot implementations is needed to quantify the return on investment (ROI) for specific digital investments (e.g., the rollout of IoT sensors vs. AI-driven forecasting). Second, it should explore fully autonomous, AI-driven adaptation agents that can adjust strategic parameters without human intervention and that could leverage reinforcement-learning algorithms. These advancements could usher in a new era of self-optimizing logistics systems that can navigate uncertainty with minimal manual oversight.

Conclusions. This paper explores the development of a resilient and adaptive logistics strategy for enterprises operating under conditions of persistent market instability. Drawing from theories of supply-chain resilience, scenario planning, and digital technology integration, the study presents a unified, five-stage strategic cycle. First, we contextualize the heightened volatility in modern logistics, which is marked by geopolitical disruptions, climate-driven supply shocks, and rapid demand swings. Next, we review literature on resilience frameworks, micro-scenario methodologies, and the application of big data, the Internet of Things (IoT), and digital twin technologies. Three specific research objectives guide the analysis: (1) delineating the stages of an adaptive strategic cycle, (2) identifying operational mechanisms for real-time strategic correction, and (3) assessing the contribution of digital tools to systemic resilience. The core of the paper presents a detailed discussion of each stage of the strategic cycle—environmental scanning, goal setting, scenario development, implementation and monitoring, and review and adjustment—and illustrates it with a table of key components and a graph linking market volatility indices to optimal review frequencies. The conclusions emphasize transitioning from reactive risk management to proactive strategic control and highlight avenues for further research into the return on investment (ROI) of digital investments and AI-driven autonomous adaptation.

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