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Anti-Crisis Management Measures For The International Business Of The Ukrainian Manufacturing Enterprise

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Abstract. *The article is devoted to the development of a set of crisis management measures for Ukrainian manufacturing enterprises engaged in international activities. The study explores the possibilities of adapting effective crisis response strategies to the specific conditions caused by disruptions, labor shortages, and unstable supply chains related to the war. **The main objective** is to propose practical solutions for enhancing business continuity, operational efficiency, and export competitiveness under crisis conditions. An additional objective is to demonstrate how simulation modeling and digital transformation tools can improve strategic decision-making in an uncertain environment. **The methodological approach** includes comparative analysis of international practices and the use of discrete-event simulation (DES) to assess crisis scenarios. Three operational scenarios were modeled: pre-crisis (baseline), crisis (with supply chain*



*and labor disruptions), and adaptive (involving automation and diversified suppliers). Key performance indicators such as order fulfillment time, production output, customer losses, and financial impact were used to evaluate the effectiveness of various strategies. **The results** indicate that adaptive strategies based on AI-driven automation, digital trade, and supply chain diversification significantly reduce operational risks and financial losses. In the adaptive scenario, production output recovered to 85% of baseline capacity, and financial losses were reduced by 57% compared to the crisis scenario. The study demonstrates the potential of localized adaptation of international crisis management frameworks to the Ukrainian context. **The conclusions** of the article emphasize that anti-crisis management should be integrated as a strategic priority in Ukrainian manufacturing enterprises, especially those involved in international operations. The simulation confirms that proactive planning and technology adoption are essential for sustaining competitiveness in volatile environments. Future research may benefit from applying hybrid simulation methods and integrating risk management frameworks to refine enterprise resilience strategies.*

Keywords: *project management, economic efficiency, digital technologies, sustainable development, innovation.*

Антикризові заходи управління міжнародною діяльністю українського виробничого підприємства

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Анотація. Стаття присвячена розробці комплексу заходів антикризового управління для українських виробничих підприємств, що ведуть міжнародну діяльність. У дослідженні розглядаються можливості адаптації ефективних стратегій реагування на кризу до специфічних умов, зумовлених перебоями, нестачею робочої сили та нестабільністю ланцюгів постачання, пов'язаними з війною. **Мета** – запропонувати практичні рішення для підвищення безперервності бізнесу, операційної ефективності та експортної конкурентоспроможності в умовах кризи. Додаткова мета – продемонструвати, як імітаційне моделювання та інструменти цифрової трансформації можуть покращити прийняття стратегічних рішень у невизначеному середовищі. **Методологічний підхід** включає порівняльний аналіз міжнародної практики та використання моделювання дискретних подій (DES) для оцінки кризових сценаріїв. Було змодельовано три операційні сценарії: докризовий (базовий), кризовий (з ланцюгом постачання та перебоями в робочій силі) та адаптивний (із залученням автоматизації та диверсифікованих постачальників). Для оцінки ефективності різних стратегій використовували ключові показники ефективності, такі як час виконання замовлення, обсяг виробництва, втрати клієнтів і фінансовий вплив. **Результати** показують, що адаптивні стратегії, засновані на автоматизації на основі ШІ, цифровій торгівлі та диверсифікації ланцюга постачання, значно знижують операційні ризики та фінансові втрати. В адаптивному сценарії обсяги виробництва відновилися до 85% базової потужності, а фінансові втрати зменшилися на 57% порівняно з кризовим сценарієм. Дослідження демонструє потенціал локальної адаптації міжнародних систем управління кризою до українського контексту. **Висновки** статті підкреслюють, що антикризове управління має бути



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інтегроване як стратегічний пріоритет для українських виробничих підприємств, особливо тих, що здійснюють міжнародну діяльність. антикризове управління має стати стратегічним пріоритетом українських виробничих підприємств, особливо тих, які здійснюють міжнародні операції. Моделювання підтверджує, що проактивне планування та впровадження технологій є важливими для підтримки конкурентоспроможності в нестабільному середовищі. Майбутні шляхами дослідженнями можуть стати аналіз застосування гібридних методів моделювання та інтеграції структур управління ризиками для вдосконалення стратегій стійкості підприємства.

Ключові слова: міжнародний бізнес, стійкість, адаптивні стратегії.

Introduction. In today's global economy, manufacturing enterprises are increasingly exposed to geopolitical risks, economic shocks, and disruptions in international trade. The full-scale war in Ukraine has further intensified these challenges, severely affecting the stability and resilience of domestic companies engaged in international business. Ukrainian enterprises face urgent needs to adapt their crisis management strategies to ensure survival, sustain exports, and remain competitive in volatile global markets.

The practical importance of this problem lies in the need to develop effective anti-crisis management measures tailored to the realities of wartime conditions, labor shortages, and unstable supply chains. At the same time, the scientific relevance is connected to the lack of adapted models that integrate global best practices (such as those implemented in China) with local conditions in Ukraine. This study addresses these gaps by proposing and evaluating strategic crisis responses – such as AI integration, supply chain diversification, and digital transformation – that Ukrainian manufacturers like LLC «Andreal» can adopt to strengthen resilience and business continuity.



Analysis of recent research and publications. The issue of anti-crisis management in international business has attracted significant academic interest, particularly in the context of growing geopolitical instability, war-related disruptions, and accelerated digital transformation. Over the past decade, researchers have approached this topic from conceptual, technological, strategic, and regional perspectives, revealing both common trends and context-specific gaps.

Early conceptual frameworks are outlined by Bundy et al. (2017) [1], who integrated crisis types, organizational responses, and reputational effects in the management literature. Paraskevas (2013) [2] built on Mitroff's five-phase crisis management model, which remains influential in structuring practical response strategies. Czarnecki and Starosta (2014) [3] provided a dual-perspective view of anti-crisis management: preventive versus reactive, emphasizing the importance of strategic foresight.

Modern approaches increasingly rely on technological innovation. Mocanu [4] explored the implementation of anti-crisis technologies, while Pozhueva and Shchegolevatykh [5] investigated the role of digital tools in decision-making. Damerji and Salimi [6] addressed artificial intelligence readiness in financial reporting, indirectly contributing to crisis-resilient business processes. In the Ukrainian context, Ganushchak et al. [7] analyzed innovation management in retail during wartime risks, and Lashkun et al. [8] proposed a system of anti-crisis measures based on project analysis.

Several studies emphasize the international dimension. Khalatur et al. [9] analyzed how global anti-crisis practices can be adapted to transitional economies, including Ukraine. Kara, Atamanchuk, and Kurytskyi [10] highlighted international economic mechanisms applicable to Ukrainian enterprises. Rohulia et al. [11] focused on risk mitigation strategies within international business security.

Workforce and institutional aspects are also prominent. Blikhar et al. [12] investigated forced migration's effect on enterprise human capital, while Sova and



Morozov [13] emphasized changes in anti-crisis paradigms under war conditions. Blakyta et al. [14] provided a broader model linking anti-crisis management with international business security systems. Bashynska et al. [16] proposed a model for assessing sustainable leadership within the framework of circular economy-oriented innovation, offering valuable insight into leadership strategies that can enhance resilience and international adaptability in times of crisis. In addition, Stroiko and Kharus [15] discussed economic stability as a performance target of anti-crisis management.

Identification of previously unresolved aspects of the overall problem.

Despite the volume of research, several problems remain unresolved. Few studies combine discrete-event simulation (DES) with anti-crisis management modeling, especially under war-induced disruptions. There is also a lack of comparative analysis of foreign practices, particularly China's crisis strategies, and their direct application to Ukrainian enterprises operating internationally.

Setting objectives. The study aims to adapt effective crisis response strategies to the conditions faced by Ukrainian producers amid war-related disruptions, labor shortages, and unstable supply chains. The objective is to propose practical solutions for enhancing business continuity, operational efficiency, and export competitiveness under crisis conditions. An additional goal is to demonstrate how simulation modeling and digital transformation tools can improve strategic decision-making in an uncertain environment.

Results. Drawing on China's successful anti-crisis management experience, Ukrainian manufacturing enterprises involved in international business can significantly strengthen their resilience by adopting key crisis response strategies. Chinese companies have demonstrated the effectiveness of combining government support mechanisms, digital transformation, and adaptive supply chain management to mitigate financial risks and maintain stable operations under volatile conditions.



Based on this experience, a set of practical recommendations is proposed for developing and customizing an effective anti-crisis management model that aligns with the specific challenges faced by Ukrainian producers (Table 1). The proposed strategies emphasize the importance of integrating artificial intelligence, digital trade tools, and diversified supply chains as core elements of business continuity planning.

Table 1.

Key Recommendations for Adapting Anti-Crisis Management Models

Recommendation	Chinese Practice	Enterprise Implementation	Expected Outcomes
Government-Supported Financial Stability	Chinese firms utilize state incentives, tax relief, and low-interest financing.	Pursue state-backed loans, deferred taxes, and grants, especially in Ukraine and the EU, to enhance financial stability.	Improved liquidity, reduced tax burden, and better access to affordable capital.
AI-Enhanced Production and Cost Efficiency	Chinese manufacturers employ AI, automation, and data-driven tools to cut expenses and boost productivity.	Adopt AI-based inventory systems and automate production to lower waste and streamline supply chains.	Reduced operational costs, better efficiency, and increased competitiveness.
Supply Chain Resilience and Localization	Chinese businesses create layered supplier networks across multiple regions to reduce risks.	Build supplier networks in China, Europe, and beyond to minimize dependence on single suppliers and stabilize sourcing.	Stronger supply chain resilience, cost efficiency, and enhanced sourcing flexibility.
Digitalization and E-Commerce Growth	China rapidly adapts to market changes through digital channels and cross-border e-commerce.	Develop digital sales strategies, integrate with e-commerce platforms, and use AI-powered marketing tools to improve online visibility.	Higher international sales, improved customer engagement, and reduced reliance on traditional channels.
Currency Risk Management and Flexible Pricing	Major Chinese exporters use hedging instruments (e.g., forward contracts, multi-currency pricing) to manage currency risks.	Apply hedging techniques and adaptive pricing models to protect revenue and maintain financial stability.	Reduced currency volatility impact and more reliable financial forecasting.
Crisis Preparedness and	China utilizes a centralized crisis	Create internal crisis teams, implement	Faster recovery during crises,



Strategic Flexibility	response model with real-time monitoring and strategic adaptation.	real-time financial tracking, and maintain a flexible strategic plan.	minimized disruptions, and stronger organizational resilience.
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Source: authors' own development

The adoption of these approaches can contribute to improved financial stability, increased operational efficiency, and enhanced international competitiveness. Moreover, they provide a foundation for navigating uncertainty and promoting sustainable long-term growth in dynamic and crisis-prone market environments.

Discrete-Event Simulation (DES) is a widely used approach in logistics, supply chain, and production process modeling. Unlike continuous simulations, DES models business processes as a sequence of discrete events occurring at specific points in time. This allows us to capture the dynamics of production, order fulfillment, and logistics delays under different crisis scenarios.

For Ukrainian enterprises, Discrete Event Simulation (DES) proves especially valuable in evaluating:

- production bottlenecks: assessing how delays in raw material deliveries influence manufacturing efficiency.
- order fulfillment: understanding how production limitations impact the company's capacity to meet customer demand.
- operational disruption due to crisis: analyzing the effects of war-related supply chain interruptions on enterprise's overall performance.
- alternative strategic scenarios: exploring the outcomes of sourcing from alternative suppliers (e.g., in China or the EU) or investing in production automation.

To simulate the impact of the ongoing crisis, we define essential input variables, system constraints, and performance indicators, as outlined in Table 2.



Table 2.

Key variables and assumptions for the model

Variable	Description
Raw material lead time	Duration needed for raw materials to arrive at the production facility; used to model delays under various disruption scenarios.
Production cycle time	Time taken to manufacture a single batch of security seals under normal operating conditions.
Order-to-delivery time	Total time from receiving a customer order to its fulfillment and dispatch.
Machine uptime	Availability status of production machinery, reflecting potential downtime due to maintenance or unexpected failures.
Labor availability	Number of workers available for manufacturing processes, considering possible shortages due to war-related challenges.
Inventory status	Quantity of raw materials and finished products in storage, determining readiness to fulfill orders.
Delivery time to markets	Estimated shipping time for finished goods to reach customers in target regions such as the EU, China, or North America.
Alternative sourcing scenario	Impact of switching to a new supplier in China to offset material shortages or delays.
Automation investment scenario	Effects of introducing automation technologies to reduce reliance on manual labor and enhance production resilience.

Source: authors' own development

These parameters enable the simulation of various crisis and recovery scenarios, allowing us to evaluate the effectiveness of alternative strategies in enhancing operational efficiency.

To assess how external disruptions affect enterprise performance, we develop three core scenarios. The simulation relies on the operational characteristics of a typical Ukrainian manufacturing company – LLC Andreal – as presented in Table 3.

Table 3.

Simulation Scenarios for LLC «Andreal» Under Different Crisis Conditions

Factor	Scenario 1: Baseline (Pre-War Normal Conditions)	Scenario 2: Crisis Scenario (Supply Chain Disruptions)	Scenario 3: Adaptive Strategy (Alternative Suppliers & Automation)
Raw Material Supply	Standard delivery time of approximately 2 weeks.	Shipments are delayed by 4–6 weeks due to supply chain instability.	Procurement shifts to Chinese suppliers, resulting in shorter delivery times.



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Manufacturing Time	Each production batch takes 7 days.	Production efficiency drops to 60% due to equipment limitations, extending manufacturing time.	AI-enabled automated sealing machines are implemented to enhance production speed and efficiency.
Worker Availability	Full staffing levels with 100% workforce availability.	Workforce availability declines by 50% due to wartime displacement.	Automation compensates for labor shortages, ensuring consistent production.
Transportation Time	Export deliveries take 5–10 days.	Transport restrictions lead to significant logistical delays.	Streamlined logistics networks reduce overall shipping times.
Order Fulfillment Time	Average order completion in about 3 weeks.	Fulfillment is delayed by 6–8 weeks.	Production delays are reduced by 50%, and overall order fulfillment is accelerated by 30%.
Customer Retention	Stable base of domestic and international clients.	Loss of some international customers to competing firms.	Improved delivery reliability and production speed help retain key clients and maintain trust.

This structured approach highlights the critical differences in Andreal's operational capacity under crisis conditions and demonstrates the potential benefits of adopting an adaptive strategy based on supply chain diversification and automation. The following simulation results will further illustrate the impact of these strategies on Andreal's financial performance and market resilience.

Using DES, we simulate the production system and measure performance under 1000 iterations per scenario. We generate insights into: Production bottlenecks (e.g., raw material waiting time); Delays in customer orders; Warehouse stock fluctuations; Financial impact of different strategies.

The flowchart (Fig. 1) illustrates the step-by-step process modeled in the DES simulation.

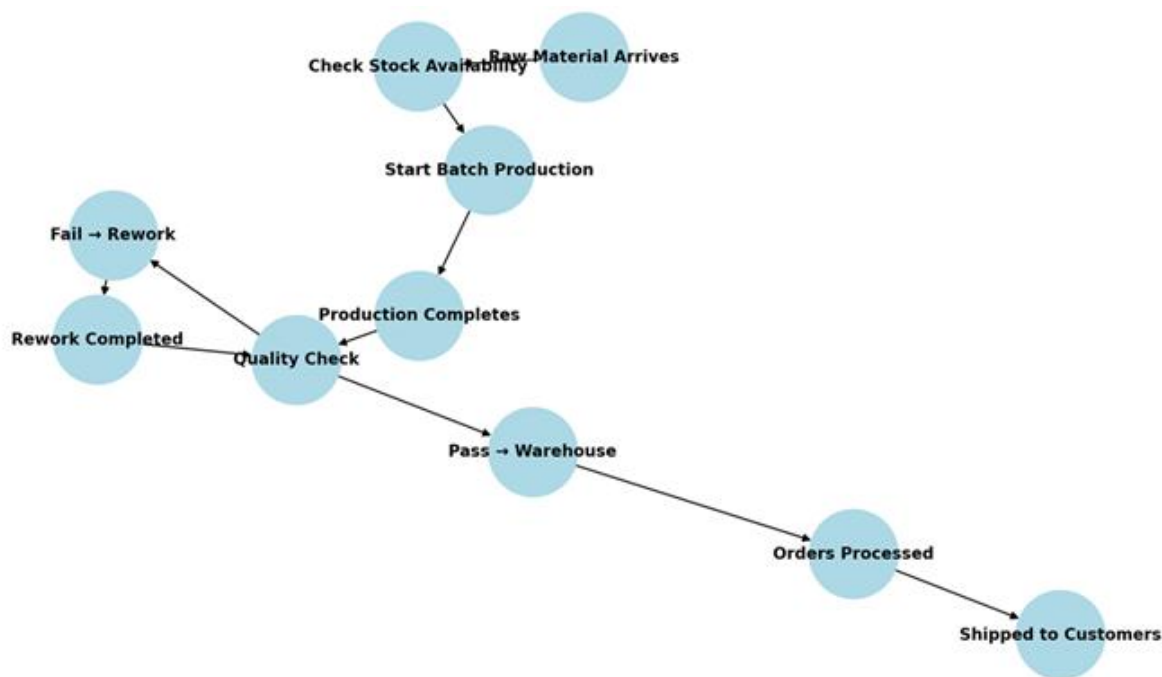


Fig. 1 – DES Process Flowchart for LLC Andreal

Source: authors' own development

Following the simulation, we evaluate several key performance indicators (KPIs) to compare operational outcomes across the three modeled scenarios. The results are summarized in Table 4.

Table 4.

KPIs across the three scenarios

KPI	Scenario 1. Normal	Scenario 2. Crisis	Scenario 3. Adaptive
Average Order Fulfillment Time (days)	21	45	28
Production Output (as % of full capacity)	100%	60%	85%
Inventory Shortages (percentage of impacted orders)	5%	50%	15%
Workforce Utilization Rate	100%	50%	70%
Customer Attrition (percentage of clients lost)	2%	30%	10%
Estimated Financial Losses (UAH millions)	0	7.5M	3.2M

Source: authors' own development



So, the results are follows:

Scenario 1 (Normal Conditions) reflects Andreal's pre-war operational environment, where the company functioned at full production capacity. Orders were fulfilled within three weeks, inventory shortages were minimal (5%), and customer retention stood at 98%. No notable financial losses were incurred during this period.

Scenario 2 (Crisis – Supply Chain Disruptions) illustrates the substantial negative effects of wartime disruptions on enterprise performance. Order fulfillment times extended to 6–8 weeks, with half of all orders affected by inventory shortages. Production output dropped to 60% of capacity, and workforce availability declined by 50% due to displacement. These disruptions led to a 30% loss of customers, as many international clients turned to more reliable suppliers. Consequently, financial losses totaled 7.5 million UAH, driven by decreased production, supply chain interruptions, and missed sales opportunities.

Scenario 3 (Adaptive Strategies – Alternative Suppliers & Automation) explores the impact of strategic interventions inspired by China's crisis response model. Through supplier diversification—including sourcing from China—and the introduction of automation to offset labor shortages, Andreal managed to shorten order fulfillment to four weeks, recover production to 85% capacity, and reduce financial losses by 57% compared to the crisis scenario. Although customer retention (90%) did not return to pre-war levels, it represented a marked improvement over the crisis conditions.

To illustrate the simulation outcomes, we present key performance indicators graphically (Fig. 2).

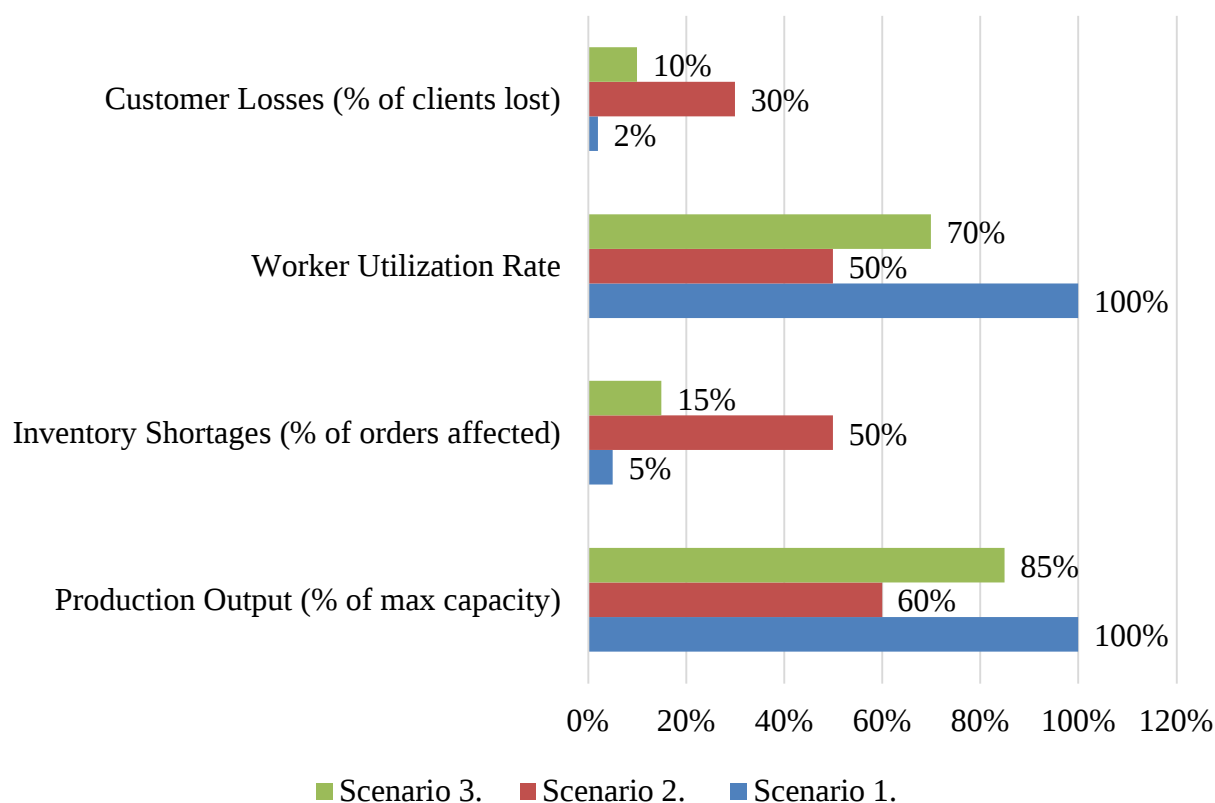


Fig. 2. KPIs across the three scenarios

Source: authors' own development

The results of the Discrete-Event Simulation (DES) offer important insights into how LLC Andreal can lessen the adverse effects of crises by adopting alternative sourcing strategies and automation.

DES has proven to be an effective tool for modeling the impacts of external disruptions on production processes, supply chains, and financial outcomes.

These findings underscore the critical role of proactive risk management, digitalization, and supply chain adaptability in ensuring business continuity for Ukrainian enterprises operating in an increasingly unstable global environment.

Conclusions. The results of the study confirm the relevance and necessity of developing a comprehensive anti-crisis management approach for Ukrainian manufacturing enterprises engaged in international business. Based on the goal of the research – to adapt successful foreign practices, particularly China's experience,



to the Ukrainian context – the proposed measures effectively address key crisis-related challenges. Through the application of simulation modeling and strategic recommendations, the study demonstrates the potential of AI integration, supply chain diversification, and digital tools to enhance enterprise resilience and performance. All research objectives have been achieved, yet further studies are needed to assess the long-term impact of automation and financial risk mitigation under prolonged instability. Future research may benefit from applying comparative regional analysis and hybrid modeling approaches to refine anti-crisis strategies for small and medium-sized enterprises.

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