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INTRODUCTION

We are happy to invite you to get acquainted with the first issue of the new scientific and practical publication "Intellectualization of Logistics and Supply Chain Management".

We strongly believe that the launch of this magazine indicates the objective need to rethink a wide range of issues related to the development of theory and practice in logistics and supply chain management, awareness of the need to unite the scientific community and logistics practitioners, dissemination of modern knowledge and best practices for innovative development of the logistics services market.

The first issue of the magazine is published at a difficult time. The global coronavirus pandemic and the deep economic crisis have significantly worsened business activity in the world. Currently, global supply chains are collapsing, international trade is declining, and competition between global and regional logistics operators is intensifying. The most common thesis is that the world will never be the same again. Industry experts predict the emergence of new, more flexible and adaptive supply chain management strategies and approaches to logistics business process management. The trend towards collaborations, cooperation and unification of services is emerging, comprehensive proposals for clients are being developed. There is increasing talk about the need to build bimodal supply chains, which involves the development of different decision-making scenarios: the traditional approach - cost-effective efficiency, low risk, high predictability; a new approach "second mode" - rapid recognition of opportunities, adaptability, willingness to solve unexpected problems and look for new opportunities.

Radical transformations of the global and national markets for logistics services require appropriate scientific support. Logistics science has a special role to play in this process. Initiating the emergence of a new journal, we decided to focus on its coverage of problematic aspects of the formation and development of logistics systems at the micro, mezo and macro levels, supply chain management, digitization of logistics, methods and tools for optimizing processes in logistics and supply chains, sociopsychology relations and network interaction of enterprises using cloud technologies, artificial intelligence, e-learning, neural business process management systems, etc.

Therefore, we invite scientists, researchers and business representatives, as well as our colleagues from abroad, to cooperate and present the results of scientific research, to discuss and debate on them, to work together to develop the scientific theory of logistics and promote mutual intellectual enrichment.

We hope that the new scientific publication will become a theoretical guide for young researchers and representatives of other fields.

HRYHORAK Mariia
Chief Editor



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CHALLENGES IN DEVELOPING THE ICAO PROACTIVE RISK MANAGEMENT TOOLKIT FOR CIVIL AVIATION FLIGHTS IN ARMED CONFLICT ZONES

Dmytro Bugayko, Ramil Mammadov, Huseyn Akhmadov. *“Challenges in developing the ICAO proactive risk management toolkit for civil aviation flights in armed conflict zones”.* The global air transport network is an open system subject to a vast array of interdependent and independent variables. This is particularly evident during periods of military conflict. Notable incidents such as the downing of Malaysia Airlines Flight MH17 by a Russian missile and the 2014 downing of a Ukraine International Airlines Boeing 737 by an Iranian surface-to-air missile starkly illustrate the vulnerability of civil aviation in rapidly shifting conflict zones. [1] The catastrophic events, including the downing of an Embraer 190 operated by Azerbaijan Airlines (Flight No. J2-8243, Baku-Grozny, December 25, 2024), underscore the urgent need to evaluate the effectiveness of international frameworks, particularly the International Civil Aviation Organization (ICAO). Under the 1944 Chicago Convention, ICAO is tasked with promoting flight safety in international air navigation [2], a mandate critical for the protection of civil aviation against the growing threat posed by military activities. This article seeks to undertake a rigorous legal analysis to evaluate the efficacy of current international civil aviation regulations

and their capacity to mitigate similar aviation disasters in the future, alongside proposing measures to enhance the security of civil aviation amidst escalating global conflicts.

Keywords: analysis, aviation safety, aviation security, civil aviation, risk management, zones of armed conflict

Дмитро Бугайко, Раміль Маммадов, Хусейн Ахмадов. «Виклики розвитку інструментарію проактивного ризик менеджменту ІКАО щодо польотів цивільної авіації у зонах збройних конфліктів». Світовий авіаційний транспорт є системою відкритого типу, на яку мають вплив велика кількість, як пов'язаних, так і не пов'язаних між собою чинників.. Особливо це відчувається у період проведення воєнних дій. Катастрофа Боїнг 777 Малайзійських Авіаліній у наслідок влучення російської ракети та катастрофа у 2014 році Боїнг 737 Міжнародних авіаліній України в Ірані у наслідок влучення іранських протиповітряних ракет у 2020 році є прикладом вразливості цивільної авіації у швидкозмінних умовах воєнних дій [1]. Кількість жертв цих катастроф, а також катастрофи повітряного судна Embraer 190 компанії Azerbaijan Airlines, який виконував рейс № J2-8243, Баку – Грозний 25 грудня 2024 року обумовлює актуальність дослідження ефективності діяльності Міжнародної організації цивільної авіації, покликаної згідно з Конвенцією про міжнародну цивільну авіацію від 7 грудня 1944 року. та «сприяти безпеці польотів у міжнародній аеронавігації» [2]. У рамках цієї статті ми постараємося провести максимально об'єктивний правовий аналіз того, наскільки ефективно існуюче на сьогоднішній день міжнародно-правове регулювання діяльності цивільної авіації дозволяє запобігти подібним авіаційним пригодам у майбутньому і які заходи можуть бути вжиті з метою посилення захисту повітряного транспорту та його користувачів від головної небезпеки повітряного судна різними видами зброї.

Ключові слова: аналіз, безпека авіації, авіаційна безпека, цивільна авіація, ризик менеджмент, зони збройних конфліктів

Introduction. The soaring demand for civil aviation services for both passengers and cargo is increasingly juxtaposed with a disturbing rise in aviation accidents. A significant number of these incidents occur when aircraft traverse airspace embroiled in military operations or armed conflicts. The utilization of military weaponry constitutes a direct and potent threat to civil aviation. Catastrophes in the skies are not the result of technical malfunctions but rather are the consequences of decisions made on the ground, particularly the determination to allow flights over hazardous zones. As long as such flights continue, the risk to civil aviation remains ever-present. Unfortunately, despite extensive international efforts to mitigate global security threats, many regions of the world remain hotspots of political and military tensions. Aircraft traversing these regions remain vulnerable, caught in the crossfire of geopolitical strife.

The purpose of the article. This article aims to conduct a thorough and objective legal analysis of the present international legal framework governing civil aviation and its capacity to prevent future aviation accidents. Additionally, it will explore what measures can be instituted to bolster the protection of civil aviation users from the main risk posed by military weaponry targeting aircraft.

Presentation of the main results. Since its inception in 1944, the International Civil Aviation Organization (ICAO) has overseen the development of a robust regulatory framework aimed at safeguarding international air transport. Yet, the history of aviation is marred by over a dozen significant incidents in which military actions—intentional or unintentional have resulted in the destruction of civilian aircraft, claiming the lives of over 1,352 people [3]. These incidents highlight the vulnerability of civil aviation to military activities and the

limitations of current safety protocols in conflict zones.

An example of a national response to such threats was the situation when at the beginning of the Second Karabakh War, the Republic of Azerbaijan called on the International Civil Aviation Organization (ICAO) to bolster safety measures in its airspace due to the aggression and missile attacks by Armenia. The appeal stated that "Over the past few days, the Armenian Armed Forces have continued intensive shelling with medium- and long-range missiles at civilian targets on the territory of Azerbaijan. These actions pose a serious threat to civil aircraft operating international flights through the airspace of Azerbaijan."

Unfortunately, Azerbaijan and Ukraine have not bypassed such disasters. Despite the efforts of states and the international aviation community to ensure the safety of air transport, unfortunately, there are many threats to the safety of civil aircraft flights in the world nowadays, which include, in particular, military operations and other military activities conducted in various parts of our planet. The crash of a Malaysian Airlines Boeing 777 after being hit by a Russian missile and the 2014 crash of a Ukraine International Airlines Boeing 737 in Iran after being hit by Iranian anti-aircraft missiles in 2020 are examples of the vulnerability of civil aviation in the rapidly changing conditions of warfare. The tragedy that shocked the world community and once again clearly demonstrated the dangers faced by civilian aircraft flying in the airspace near areas where military actions take place was the accident involving Azerbaijan Airlines flight No. J2-8243 en route from Baku to Grozny on December 25, 2024. The plane crashed near Aktau city in Kazakhstan, where it was attempting to make an emergency landing. There were 62 passengers and 5 crew members on board. This disaster claimed the lives of 38 people, 29 survived. Despite the fact that a considerable amount of time has passed since the plane crash, numerous political, legal and other issues related to it

remain open and continue to be discussed at various levels [4].

The preliminary investigation concluded the following:

- the aircraft was subjected to an external impact that resulted in failure of its hydraulic systems and damage to the electrical wiring of the stabilizer control mechanism (pitch trim) prior to impact with the ground, caused by metal objects penetrating the aircraft components;

- the air traffic controllers responsible for providing services to the aircraft were not timely informed about operations under "Carpet" plan (closed skies regime) and subsequently did not inform the crew about restrictions in effect at the time of approach for landing at Grozny;

- the concerned flight was operated on an airworthy aircraft and no technical malfunctions that could affect safety of the flight were known, both pilots had necessary clearances and appropriate qualifications to operate the aircraft of this type [5].

According to government sources, the aircraft was hit by Russian surface-to-air missiles. Missile fragments struck passengers and crew members, exploding near the plane [4]. According to preliminary information from military experts, the plane was hit by the Russian Pantsir-S air defense system, and its communications systems were paralyzed by electronic warfare systems long before it approached Grozny [6].

Thus, as can be seen from the above, the air crash of December 25, 2024 was not associated with any technical malfunction of the aircraft or, for example, with the so-called human factor (in particular, with errors of the pilot or air traffic controller), but occurred as a result of the aircraft being hit by an external high-speed object during its go-around after an unsuccessful landing approach at the airport of the city of Grozny, which was open for international flights of civil aircraft. Although it is obvious that the prevention of air accidents similar to the one that occurred with the Embraer 190 aircraft of Azerbaijan Airlines depends on many factors of an

organizational and technical nature (including, for example, the timeliness and completeness of the provision of the necessary aeronautical information, the accuracy of the coordination of the actions of air traffic services, etc.), it seems that it is the proper international legal regulation of civil aviation activities and issues of ensuring its safety that can and should play one of the primary roles in solving this problem. And it is very interesting to find out what type of safety & security in civil aviation the issues of this incident relate to?

Therefore, it seems appropriate to consider the documents developed within the framework of ICAO in order to ensure the safety of civil aviation flights in a situation of armed conflict in the territory of a state.

The basis of the international legal regime for ensuring safety of civil aircraft flights in combat areas is made up of treaty and customary norms of international law, as well as standards and other acts adopted by ICAO. Article 9 of the Convention "Prohibited Zones" states: "a) Each Contracting State may, for reasons of military necessity or public safety, restrict or prohibit on a uniform basis the flights of aircraft of other States over certain areas of its territory ...". The Chicago Convention of 1944 only confirms the right of each state based on the principle of state sovereignty over airspace, but does not oblige it to prohibit or restrict flights of aircraft within its territory if any danger arises. At the same time, the Convention establishes that the exercise of this sovereign right should not be discriminatory on the basis of the nationality of the aircraft.

The standards and recommended practices adopted by ICAO and contained in the annexes to the 1944 Chicago Convention regulate in sufficient detail the actions of States in cases where there is an activity that creates a threat to the safety of international air navigation. According to paragraphs 2.18 and 2.19 of Annex 11 to the 1944 Chicago Convention, the implementation of activities that create a potential hazard to civil aircraft must be coordinated in advance between the

air traffic services units and the military authorities of the State in order to ensure optimal conditions that will avoid creating a hazard to civil aircraft and minimize interference with the normal operation of their flights [7]. Standard 5.1 of Annex 15 to the Convention ("Aeronautical Information Services") requires States to issue NOTAM (Notice to Airmen) in the presence, among other things, of "...sources of danger to air navigation (including obstacles, military exercises...)" [8].

The ICAO Manual on Safety Measures Relating to Military Activities Potentially Hazardous to Civil Aircraft Operations, which provides guidance for the application of Annex 11 to the 1944 Chicago Convention [9], and Circular 330 "Civil/Military Air Traffic Management Cooperation" [10], developed by ICAO experts and containing recommendations and successful practical examples in the field of civil/military cooperation, also speak about the need for close coordination of military and civil air traffic services when hazards to civil aircraft operations arise, such as armed conflicts, and indicate that responsibility for initiating the coordination process lies with the State whose armed forces are involved in the conflict. There are a number of ICAO documents regarding aeronautical communications, establishing the methods and rules for the exchange of information. These include:

- Annex 11 ("Aeronautical Communications");
- Procedures for Air Navigation Services. ICAO Abbreviations and Codes (Doc 8400);
- Location indicators (Doc. 7910);
- Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services (Doc. 8585).

It can therefore be concluded that the ICAO documents establish the responsibility of the State in whose territory a conflict occurs for ensuring the safety of foreign civil aircraft. The ICAO notes that the safety measures to be taken depend on the State's assessment of the degree of danger to the passage of

foreign civil aircraft. Therefore, the State providing air traffic services is forced to make difficult decisions, taking into account the fact that an error may entail additional risks for civil aircraft.

On 27 October 2014, during the 1st meeting of the 203rd session, the Council considered working paper C-WP/14227, "Risk Assessment of Operations Over Airspace Affected by Armed Conflict – Responsibility of States for Ensuring the Flight Safety of Civil Aircraft Within Their National and Delegated Airspace over Armed Conflict Zones of Military Exercises", submitted by the State of Bolivia. In particular, the document noted that "The use of unreliable or deliberately distorted information on the existence of a risk in the airspace of third countries or in the airspace of third countries with great concern does not produce any results". On the contrary, the consideration of such assessments carried out on the basis of unreliable information may be the introduction of unjustified restrictions for the protection of those performing the functions of flights, or conversely, the unjustified continuation of flights in the airspace over zones where there are risks associated with the military zone, providing a dangerous for the occurrence of air waves. Also, the dissemination of unconfirmed information with a high probability can be used for the purposes of unfair competition." Thus, although the Chicago Convention enshrines the principle of complete and exclusive sovereignty of the state, including the sovereign right to act in this air zone of prohibited zones, it does not contain provisions expressly provided by the States Parties in certain cases, limiting restrictions or prohibitions for flights causing air flows in the airspace over all or part of their territory. Such implementation will obviously have a positive impact on the establishment by States of adequate restrictions on the use of sovereign or civil airspace and ensuring the objective conduct of investigations into the implementation of aviation accidents as a result of acts of gradual transition to civil

aviation activities. On the contrary, the absence of such obligations and responsibility on the part of States creates favorable grounds for the use of weapons against the movement of aircraft in flight, and does not encourage the State to cooperate in the investigation of aviation accidents. There are objective reasons to consider this incident in the context of aviation safety.

Following the tragic accident with the Malaysian Boeing, governments established an ICAO task force that developed a comprehensive program for civil aviation flights in conflict zones. In accordance with these recommendations, amendments were made to the Chicago Convention, as well as other international instruments regulating civil aviation safety. New regulations were also issued to reduce the risks of flights over conflict-affected areas. In 2023 ICAO issued updated guidance material to assist aviation regulators and operators in managing their airspace during conflicts, including deciding whether to allow or prohibit flights over or near conflict zones.

This article is a continuation of a number of publications by the authors devoted to the problems of civil aviation proactive safety & security risk management [1, 11 - 16].

Conclusions. The Republic of Azerbaijan and Ukraine support the efforts of ICAO and other international organizations that would contribute to the most complete and effective implementation of UN Security Council Resolution 2166, in order to ensure a comprehensive, thorough and independent investigation of the air crash in accordance with ICAO guidelines, as well as the development and implementation of measures aimed at ensuring civil aviation safety & security in order to prevent such incidents with civil aircraft, including in armed conflict zones.

The motto of ICAO, "Aviation Uniting the People of the World," encapsulates the ultimate goal of global civil aviation: the safe and secure movement of people and goods across borders, regardless of the geopolitical challenges that may arise.

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INNOVATIVE APPROACHES TO THE APPLICATION OF ROBOTICS IN ENSURING SUSTAINABLE AIRPORT DEVELOPMENT

Anton Borysiuk, Dmytro Bugayko. *«Innovative Approaches to the Application of Robotics in Ensuring Sustainable Airport Development».* Airports around the world are increasingly using the integration of artificial intelligence (AI) and robotics to streamline processes, enhance security, and improve customer service. The demand for automation, increased by the COVID-19 pandemic, has given rise to innovative solutions, from automated baggage handling to customer service robots that assist travelers in real time. Nearly half of the world's airlines and 32% of airports have announced plans to increase the deployment of robotic systems, highlighting the growing momentum of modernization in the industry. The purpose of this article is to identify the main promising areas of robotics in the process of sustainable development of airports, to study the history and determine the near-term prospects for the use of robots at airports, and to identify the advantages, disadvantages, and risks of such use.

Keywords: robotics, artificial intelligence, robots, airport, sustainable development

Антон Борисюк, Дмитро Бугайко. *«Інноваційні підходи до застосування робототехніки в забезпеченні сталого розвитку аеропорту».* Аеропорти по всьому світу все частіше використовують інтеграцію штучного інтелекту (ШІ) та робототехніки для оптимізації процесів, підвищення безпеки та покращення обслуговування клієнтів. Попит на автоматизацію, що збільшився у зв'язку з пандемією COVID-19, призвело до появи інноваційних рішень — від автоматизованої обробки багажу до роботів для обслуговування клієнтів, які допомагають мандрівникам у реальному часі. Майже половина авіакомпаній світу та 32% аеропортів оголосили про плани щодо більш інтенсивного впровадження роботизованих систем, що підкреслює динаміку модернізації в галузі, що зростає. Мета цієї статті – виявити основні перспективні напрямки

роботизації у процесі сталого розвитку аеропортів, вивчити історію та визначити найближчі перспективи використання роботів в аеропортах, а також виявити переваги, недоліки та ризики такого застосування.

Ключові слова: робототехніка, штучний інтелект, роботи, аеропорт, сталий розвиток

Introduction. Airports around the world are increasingly using the integration of artificial intelligence (AI) and robotics to streamline processes, improve security, and enhance customer service. The demand for automation, increased by the COVID-19 pandemic, has resulted in innovative solutions, from automated baggage handling to customer service robots that assist travelers in real time. Nearly half of the world's airlines and 32% of airports have announced plans to deploy robotic systems more intensively, highlighting the growing momentum of modernization in the industry [1], [2]. The rapid adoption of drone robotics in aviation has sparked debate about the safety and effectiveness of their use at airports. While some proponents argue that robotics improves operational efficiency and eliminates labor shortages and reduces the impact of "human error," there are concerns about various implications, particularly in areas such as data privacy and the balance between human and robotic interactions. Controversy has arisen over the use of facial recognition technology in airport security operations, as well as the potential job losses of airport personnel due to increasing automation. Stakeholders are trying to address these concerns, promising that technological advances will benefit both the industry and passengers [3], [4], [5].

The purpose of this paper is to identify the main innovative areas of robotics in the process of sustainable development of airports, to examine the history, current and future prospects of airport robots, and to identify the advantages, disadvantages and risks of such solutions.

Presentation of the main results. The main types of robots currently used at airports include:

- security robots,
- baggage handling robots,

- cleaning robots, and
- customer service robots, each designed to fulfil specific operational needs [6], [7], [8].

Innovations such as CoBRo for baggage handling and various autonomous vehicles for car parking illustrate the diverse capabilities of airport robotics. Experts predict that by 2030, robots will play a central role in processes such as check-in and security, revolutionizing airport technology by helping to improve the efficiency of flight, passenger, and cargo handling [9], [10]. As airports continue to adopt robotic technologies, the industry is poised for significant transformation driven by the dual goals of streamlining operations and improving the passenger experience. New advances and promising research in robotics not only address pressing issues such as increasing passenger volumes and labour shortages, but also put airports at the forefront of using technological advances in the transportation sector [11], [12].

History of Robotics in Airports. The integration of robotics into the operations of large and medium-sized airports is a modern trend that has gained momentum in the last few years as advances in robotics and artificial intelligence (AI) technologies allow them to be used in a variety of operations. Early implementations focused on improving the efficiency of traditional airport functions such as cleaning, security, and baggage handling, and were mostly limited to larger airports.

A survey conducted by Air Transport IT Insights found that by 2023, nearly half of the world's airlines and 32% of airports were actively seeking partnerships to expand their capabilities over the next three years [1]. These initial steps included deploying robots to perform tasks such as cleaning and providing information to passengers, thereby relieving some of the burden on human staff [13], [2].

The Covid-19 pandemic has accelerated this trend, resulting in increased demand for solutions to maintain hygiene standards through various protocols or other automated services [1], [2]. Airports have started to implement a wide range of different robotic solutions, including automated baggage handling, check-in and boarding pass scanning, and even valet parking services [2]. The range of airport robotics has changed significantly, especially with the development of AI technologies. SITA reports show a direct correlation between the development of generative AI and its growing adoption among airlines and airports [3], [4]. By 2023, the trend towards integrating AI-based solutions into airport operations has become evident, with over 90% of airlines and airports already planning to develop long-term programs that include this technology [4]. This demonstrates a dramatic shift towards using robotics not only to improve operational efficiency and reduce the impact of "human error", but also as advanced AI assistants for passengers.

Current trends and future prospects. The trend of implementing AI and robotics at airports is rapidly accelerating. Innovative solutions such as AI-powered chatbots to assist passengers and other robots to interact with travelers at various customer touchpoints have become more common [14]. In addition, the growing interest in robotics, illustrated by the rise in Wikipedia editing activity related to this topic, indicates

greater public participation and interest in the application of these technologies [15]. This trend suggests that robotics will continue to play a key role in the transformation of airport passenger and cargo handling operations, promising entirely new passenger experiences and a new level of optimization and automation of airport operations in the coming years [16], [3].

Types of robots used in airports. Types of Robots Used at Airports. Airport robots are autonomous machines designed to perform a variety of tasks to improve efficiency, accuracy, and passenger service. These robots use technologies such as artificial intelligence (AI), machine learning, and sensor suites to operate autonomously, performing a variety of functions ranging from baggage handling to customer service and security screening [6], [7].

There are several main categories of robots used at airports, each designed for a specific function:

- *Security robots.* Security robots are used to patrol airport premises and perimeters, identify potential threats, and ensure safety. They are equipped with advanced sensors and AI technology that allow them to detect suspicious behaviour, monitor unattended baggage or suspicious items, detect violations, and scan boarding passes. These robots provide real-time alerts to security personnel, thereby enhancing the overall security of the airport [6], [13].

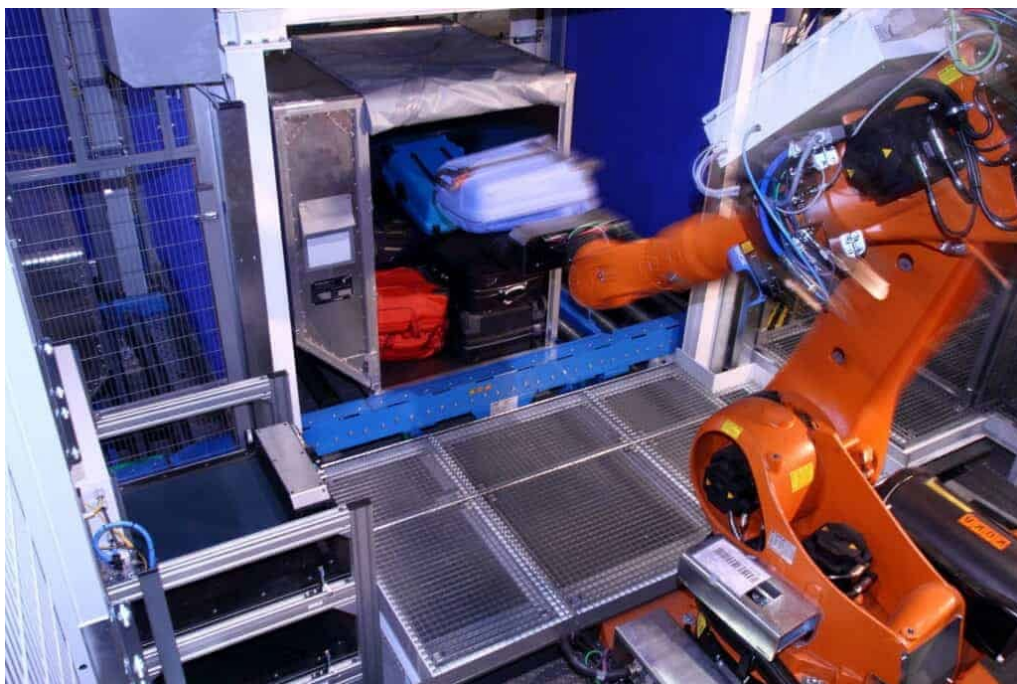


Pic.1. Texas airport to get a 420-pound security robot

Source: <https://www.digitaltrends.com/news/texas-airport-to-get-420-pound-security-robot/>

- *Baggage handling robots.* Baggage handling robots provide baggage check-in, handling, transportation from check-in counters to the aircraft and its loading/unloading. Using GPS and various sensors for navigation, these robots facilitate

baggage check-in and check-in without additional waiting, optimize and speed up the baggage handling process, significantly reducing the risk of improper handling and increasing the efficiency of the entire system [6], [7]. The use of robots in cargo handling is even more justified.



Pic.2. Robot loading luggage into a container.

Source: Vanderlande Industries. <https://innovationorigins.com/en/laio/airport-baggage-handling-automation-to-the-rescue/>

- *Cleaning robots.* Cleaning robots are designed to maintain hygiene in various areas of the airport. These autonomous machines can clean floors, carpets, and other surfaces, working on a schedule to minimize

disruptions. Equipped with sensors, cameras, and navigation technologies such as LiDAR, these robots can navigate crowded areas and avoid obstacles while performing their tasks, reducing the use of unskilled labour and the burden on staff [13], [8].

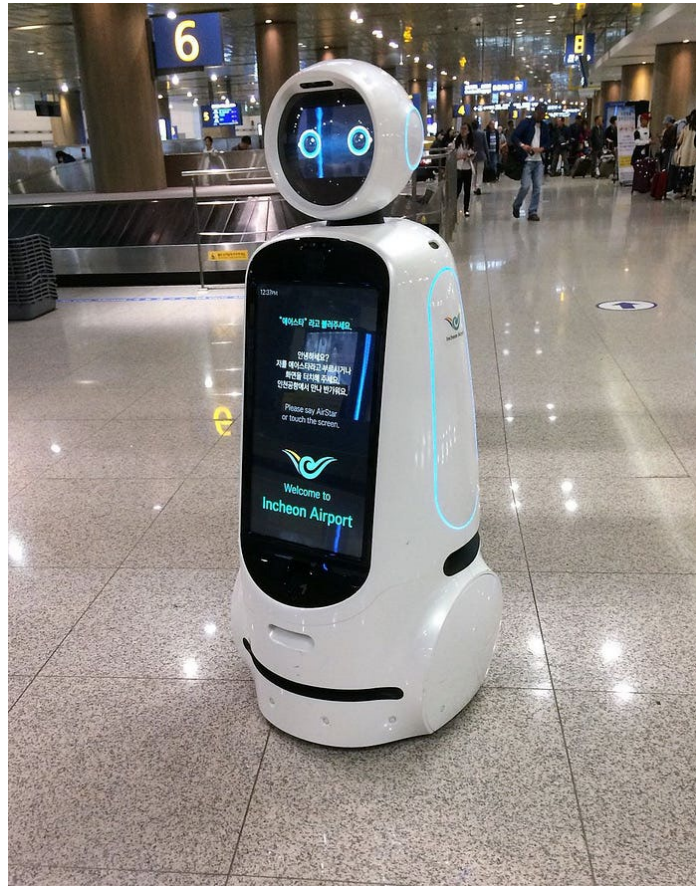


Pic.2. Birmingham Airport has installed cleaning collaborative robots (cobots)

Source: <https://www.roboticsandautomationmagazine.co.uk/news/cleaning-sanitation/birmingham-airport-introduces-ice-cleaning-cobots.html>

- *Customer service robots.* Customer service robots can act as information assistants for passengers, assisting with inquiries, navigation, and real-time flight information. They can communicate in

multiple languages, adapting to the passenger's needs, assisting with information, check-in operations, and navigating travellers at airports, directing them to boarding gates, duty-free shops, or restaurants [6], [7], [8].



Pic.3. AIRSTAR robot at Seoul Incheon International Airport.

Source: <https://jordanfraser.medium.com/the-robot-airport-workers-of-seoul-a08349f4f44e>

- *Specialized robots.* Beyond the core categories, airports have begun experimenting with specialized robots for unique applications. For example, parking robots, such as the droid Stan at Gatwick Airport, can autonomously park passenger

vehicles using advanced GPS systems. In addition, robots, such as Anbot at Shenzhen Airport, are equipped for security screening, with facial recognition technology and the ability to notify aviation security teams [13], [8].



Pic.4. London's Gatwick Airport parking robot Stan.

Source: <https://edition.cnn.com/videos/business/2019/01/28/stan-valet-parking-robot-orig.cnn-business>

As airports ramp up their adoption of robots and automation in an effort to provide high levels of safety and passenger experience while reducing operating costs, we can expect to see the development of more sophisticated robotic systems and highly specialized AI models in the near future. Predictions suggest that by 2030, robots will play a central role in processes such as check-in, boarding, and passenger assistance, thereby significantly transforming existing airport technology for both passengers and staff [9]. The integration of robotic technologies promises to improve productivity, service efficiency, and the passenger experience while enhancing safety.

Benefits of using robots in airports. The integration of robots into airport operations offers many benefits such as improved operational efficiency, passenger service levels, and safety. As airport volumes continue to grow, innovation and robotics play an increasingly important role in transforming aviation services.

Improving of passenger experience. Robots further contribute to the overall improvement

of the passenger experience. They assist in check-in processes, accompany passengers at the airport, participate in passenger service in restaurants and shops, and provide other services to passengers [1], [17]. The use of robots can reduce waiting times, speed up service, and improve passenger comfort. Surveys show that a significant proportion of airlines and airports are actively seeking to expand their robotic services to further improve passenger interactions and streamline operations [1].

Improving of operational efficiency. One of the main benefits of using robots at airports is a significant increase in operational efficiency. Robots are capable of performing various tasks such as cleaning, baggage handling, and security screening with high accuracy and minimal errors [18], [19]. Automating these processes will allow airports to reduce personnel costs and optimize resource allocation, which leads to significant cost savings in the long run [20]. For example, robots at airports can operate continuously with minimal errors and downtime, increasing productivity compared to human workers who need breaks [21]. In addition, the use of

advanced AI technologies allows robots to interact in real time, which greatly expands their application range and accuracy [18].

Improving of safety. Although the use of robots raises some concerns regarding human-robot interaction, they can improve safety at airports. Robots are designed to operate autonomously, are not susceptible to fatigue and emotions - which minimizes the risk of human error that can lead to accidents or injuries [6]. For example, baggage handling robots can reduce the likelihood of collisions with passengers, thereby improving safety in high-traffic areas [6]. With proper supervision and balanced integration - the use of robots can create a good environment for both passengers and airport staff [17].

Scalability and flexibility. The introduction of robots makes it easier for airports to adapt to daily or seasonal fluctuations in traffic. As global air traffic resumes following the pandemic, robotic operations are critical to handling the growing number of passengers without the additional costs of lengthy staff training [18]. Robots can be used to efficiently meet increasing demand while maintaining high service standards [20].

Cost savings. The integration of robots into airport operations results in long-term cost savings. Automated systems can operate with fewer operational constraints during peak periods, which is especially beneficial during periods of high demand [22], [20]. In addition, the precision and stability of robots results in reduced costs and minimized unit costs, and as a result, increases the financial efficiency of airport operations [19]. The savings can be reinvested in further ensuring its sustainable development.

Challenges and limitations. The integration of robotics and AI-based solutions at airports may have challenges and limitations. These barriers include financial, technical, regulatory and ethical aspects that stakeholders must consider in order to realize the existing potential of these technologies.

Technical challenges. Technical barriers play a significant role in the implementation of robotics. For example, the complexity of

existing airport operations often requires various stakeholders to effectively communicate to share data and coordinate processes. As experts highlight, achieving this level of integration can be challenging due to fragmentation of systems and the lack of common databases [23]. In addition, although some robotic solutions, such as CoBRo for baggage handling, have demonstrated successful implementation, these technologies remain rare in the industry due to the limited size of the Ukrainian market and regulatory restrictions that make innovation risky [24].

Financial considerations. One of the main challenges faced by airports is the financial investment required to implement robotics technologies. Initial costs can be significant, including the cost of acquiring and implementing robots, necessary accessories, software licenses. In addition, implementation costs must also be taken into account, including installation, setup, provision of infrastructure, staff training and compliance with regulatory standards [25]. Therefore, conducting a detailed cost-benefit analysis is essential to ensure that the long-term benefits outweigh the initial financial outlay, which may deter some airports from implementing such innovations [25].

Regulatory and compliance issues. Defining regulatory requirements is another important issue. Airports must ensure that any robotics and AI solutions comply with a multitude of regulations related to security, data privacy, legal regulations and ethical standards. Ensuring compliance often requires extensive cooperation with government agencies and adherence to strict data handling and privacy policies [26].

Ethical issues. The ethical implications of the implementation of AI technologies, especially those related to facial recognition, have always been highly sensitive and have generated considerable public debate. Concerns about data retention, its inappropriate use and the overall impact on passenger privacy are paramount. Vendors involved in these implementations are

generally prohibited from storing or selling data; however, public trust remains an ongoing issue, complicating the implementation of AI at airports [5]. Additionally, while AI has shown promise in improving operational efficiency, there are cases where its limitations have led to unsatisfactory results, particularly in scenarios where human empathy is critical, such as request handling where a human would need to be sympathetic [27].

Balance between automation and human factors. Ultimately, while automation offers numerous benefits in terms of efficiency and cost savings, achieving a balance between the implementation of new technologies and the human factor is paramount. The nuances of passenger interactions often require human involvement that AI cannot replicate, highlighting the need for continuous improvement of AI systems to complement, rather than replace, humans in customer service and other sensitive areas of airport operations [27]. As stakeholders address these challenges, successful integration of robotics and AI into airport systems will depend on thoughtful implementation, continuous improvement of technologies, and maintaining a healthy balance in the interactions between humans and robotic systems and AI.

World Airport Robotics. Amsterdam Airport Schiphol: Fraim Initiative. Amsterdam Airport Schiphol has embraced innovation through the Fraim Initiative, a joint project with Delft University of Technology and KLM on baggage handling services. This five-year research effort aims to explore the future roles of humans and robots in baggage handling systems. By collecting information directly from employees about their challenges and experiences, the initiative aims to develop comprehensive projects that address pain points while building trust in robotic systems. The project takes a multidisciplinary approach, combining perspectives from design, psychology, organizational change and robotics to ensure that projects are

efficient, enjoyable and meaningful for all stakeholders [24].

San Sebastian Airport: Integrating Drones and AI. San Sebastian Airport has successfully demonstrated the use of drones and AI to improve operational efficiency. The project highlights the importance of collaboration between technology providers and airports in applying innovative solutions to specific operational needs. Integrating drones into airport operations not only streamlines processes but also improves overall productivity, demonstrating the potential benefits of such technology in real-world scenarios [28].

Gatwick Airport: AI-powered smart check-in kiosks. Gatwick Airport has pioneered the adoption of AI-powered smart check-in kiosks, which have shown significant promise for improving airport operations. These innovations are part of a wider trend towards automation, increasing passenger throughput and reducing wait times through self-service check-in kiosks and automated screening. Gatwick Airport aims to streamline processes, improving the overall passenger experience and making the most efficient use of staff and resources [29].

Toronto Pearson International Airport: Total Optimizer management tool. Total Optimizer, an airport management tool developed by SITA and unveiled at Passenger Terminal Expo 2024, has been implemented at Toronto Pearson International Airport. The tool uses AI to holistically optimize various airport functions, demonstrating how advanced technology can centralize data from multiple sources and integrate previously disparate workflows. This initiative is a step forward in airport management, enabling more effective strategic and operational decisions [28], [30].

Baggage Counting Solution: Japan Airlines. Japan Airlines tested an AI-based baggage counting solution to improve its baggage accounting system. This innovative approach enables more systematic baggage monitoring, which in turn facilitates the application of excess baggage fees. By using

AI to accurately assess and report baggage, Japan Airlines can not only improve operational efficiency but also create a transparent revenue stream for the airline, improving the customer experience during air travel [29].

The article is a logical continuation of the authors' research in the field of sustainable air transport [34 - 40].

Conclusions. The future of airports lies in the transformation through the integration of robotics and artificial intelligence (AI) into existing technologies, which aims to improve operational efficiency and enhance the passenger experience. Innovation in this field is driven by the need to address significant challenges such as labour shortages and the growing demand for air travel. The focus on integrating robots into operations highlights the desire to create a collaborative environment where humans and machines

work seamlessly together to improve the efficiency, safety and sustainability of civil aviation.

According to reports, by 2026, a significant percentage of airlines are expected to implement biometric digital identification technologies, which will ensure a seamless and contactless boarding of passengers. Similarly, AI technologies are expected to fundamentally transform the industry landscape, requiring airports to implement fully scalable solutions that legacy systems can no longer support. Focusing on innovation, including the implementation of robots and AI, is seen as a vital strategy for the sustainable development of global and regional civil aviation. Robotics and the introduction of artificial intelligence will also be important in the post-war development of Ukrainian civil aviation in the post-war period.

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CONTEMPORARY TENDENCIES OF THE MODERN LOGISTICS DEVELOPMENT

Volodymyr Reznik. "Contemporary Tendencies of the Modern Logistics Development". *Logistics is an important component of any business, which covers the processes of planning, organizing, managing and controlling the movement of resources, products and information. Its main goal is to ensure the optimal and efficient use of resources, satisfy the needs of consumers and achieve competitive advantages in the market. Logistics covers various activities related to material flows - from the purchase of raw materials to the delivery of the final product to consumers. In traditional logistics systems, the use of information technology was limited, and the main focus was on mechanical inventory management and transportation. In modern approaches, automation, information technologies, and artificial intelligence play a significant role, which allows predicting changes in demand, optimizing routes, and improving inventory management. These technologies make it possible to reduce costs, increase the accuracy and efficiency of decision-making.*

Keywords: logistics, transportation, multimodal transportation, supply chain, WMS, freight-forwarding, means of transport

Володимир Резнік. «Сучасні тенденції розвитку сучасної логістики». *Логістика є важливою складовою будь-якого бізнесу, яка охоплює процеси планування, організації, управління та контролю за переміщенням ресурсів, продукції та інформації. Її основна мета полягає в забезпеченні оптимального та ефективного використання ресурсів, задоволенні потреб споживачів і досягненні конкурентних переваг на ринку. Логістика охоплює різні види діяльності, пов'язані з матеріальними потоками – від закупівлі сировини до доставки кінцевого продукту споживачам. У традиційних логістичних системах використання інформаційних технологій було обмеженим, а основна увага приділялася механічному управлінню запасами та транспортуванню. У сучасних підходах значну роль відіграють автоматизація, інформаційні технології, а також штучний інтелект, який дозволяє передбачати зміни в попиті, оптимізувати маршрути і покращувати управління запасами. Ці технології дають змогу знижувати витрати, підвищувати точність і оперативність прийняття рішень*

Ключові слова: логістика, транспортування, мультимодальні перевезення, ланцюг поставок, WMS, експедирування, транспортні засоби

Introduction. Logistics, as a management function, has deep historical roots dating back to antiquity. Its original purpose was to ensure the efficient delivery of

goods and resources across different territories, which facilitated the development of trade and economic ties between different cultures. Already in Ancient Egypt,

Mesopotamia and the Roman Empire, logistics played an important role in ensuring the supply of materials for construction, military campaigns and expansion of territories. Transportation of goods, construction of roads and development of navigation were important elements of the logistics processes of that time.

The purpose of the article. The main aim of the article is to provide the research of the main challenges and problems of activity of Logistics development tendencies. This article will provide the accurate information on the history and contemporary tendencies of Logistics development. Also there were researched the comparison between traditional and contemporary logistics.

Presentation of the main results. In the Middle Ages, with the development of feudalism and the growth of international trade, logistics increasingly focused on the transportation of goods by sea and land. Trade routes were formed between Europe, Asia and Africa, and these routes ensured the supply of such important goods as spices, silk, metalwork and other raw materials. Simultaneously with the development of transport, the first concepts of inventory management began to take shape, as growing trade required efficient storage of goods in large volumes. Since the beginning of industrialization in the 18th and 19th centuries, logistics has acquired a new dimension. The advent of steam engines, railways and steamships significantly changed the possibilities of transporting goods. Transportation costs decreased, which made it possible to reduce the cost of goods and make them more accessible over greater distances. In addition, the development of factory production led to the need for more efficient inventory management to maintain a continuous production process. During this period, logistics began to focus on improving the processes of transportation and warehousing, as well as on the development of inventory management. Logistics processes have already begun to be considered an important part of business [1].

In the 20th century, logistics significantly changed its functions thanks to new technologies and management concepts. In the late 1940s and 1950s, scientists and businessmen began to consider logistics as a complex activity that includes not only the transportation and storage of goods, but also the management of information and finances. An important milestone was the development of inventory management theories, such as the Just-in-Time (JIT) model, which allowed to reduce inventory holding costs and minimize overproduction risks. This concept gained popularity thanks to companies such as Toyota, which used it to optimize production processes.

The 1950s also marked the beginning of the development of integrated supply chains. The growth of enterprises and the globalization of the economy required more and more complex management not only of goods, but also of information, finance and human resources. Logistics began to include not only the company's internal processes, but also external relations with suppliers and consumers [2-4].

In traditional logistics, the main emphasis was placed on the internal operations of the company, such as inventory management, transportation and storage of goods. It was focused on ensuring smooth operation within one country or region, as well as optimizing resources within the enterprise. Instead, modern logistics is focused on global supply chains, where companies interact with numerous partners around the world, which allows to gain access to new markets, reduce costs and increase efficiency [5].

In traditional logistics systems, the use of information technology was limited, and the main focus was on mechanical inventory management and transportation. In modern approaches, automation, information technologies, and artificial intelligence play a significant role, which allows predicting changes in demand, optimizing routes, and improving inventory management. These technologies make it possible to reduce costs,

increase the accuracy and efficiency of decision-making.

In traditional approaches, interaction with partners was minimal and information was exchanged directly through paper documentation or phone calls. In modern logistics, integration with partners has reached a high level thanks to the use of electronic platforms for information exchange. This allows you to receive relevant data in real time, synchronize work with suppliers and consumers, and optimize processes throughout the supply chain.

In traditional logistics, risk management was more reactive, when companies eliminated problems after they occurred. In modern logistics, it is important to predict

risks and implement proactive management. The use of big data and analytics allows you to predict potential problems (for example, delays in supplies, changes in demand, political or economic risks) and minimize them in time, which reduces the likelihood of significant losses (Table 1).

Therefore, modern logistics not only changes operational approaches, but also makes logistics processes more global, technologically advanced and integrated. It takes into account new business requirements for speed, flexibility and accuracy, which allows companies to work effectively in the conditions of globalization and a changing market environment.

Table 1. Comparison of traditional and modern logistics

Parameters	Traditional logistics	Contemporary logistics
Focus on	Inbound operations	Global supply chains
Technologies	It narrow spreading tendency	Automation of IT systems, artificial intelligence
Cooperation with partners	Minimal integration	High integration with partners
Working with risks(mitigation)	Reactive approach	Forecasting and proactive regulation

Developed by: Volodymyr Reznik

Thus, the evolution of logistics from the initial functions of transportation to modern high-tech and global supply and value chain management systems shows how this industry has adapted to a changing world and has become an important factor in maintaining business competitiveness in the global economy. The basis of logistics is the integration of management processes with the aim of optimizing the movement of goods, services and information. This allows businesses to reduce costs, reduce production and delivery times, and improve customer service. Logistics also ensures the rationalization of stocks, transport costs, which allows to improve the overall efficiency of business [6-7].

Thus, logistics is a complex discipline that covers not only the tactical aspects of managing material flows, but also strategic

planning that contributes to the achievement of long-term business goals. Logistics engages several main areas, each of which performs specific functions aimed at optimizing the movement of goods and services within the supply chain. Transportation logistics focuses on ensuring the delivery of goods between various supply chains, including the selection of vehicles and route planning to ensure timely and cost-effective transportation. It plays a key role in maintaining the continuous movement of goods from producers to consumers.

It promotes effective data exchange between process participants, from suppliers to end users, which allows to reduce risks, increase transparency and provide continuous control over operations in real time (Table 2).

Table 2. Types of logistics

Type of logistics	Characteristics
Transport logistics	Ensures delivery of goods between supply chains, selection of transport, routes
Warehouse management logistics	Management of storage of goods, location of warehouses, optimization of storage places
Supply management logistics	Determining the optimal level of stocks to avoid surpluses and shortages
Purchase logistics	Responsible for the purchase of raw materials and materials
Distribution logistics	Organization of product delivery to the final consumer
Information logistics	Management of information flows, ensuring communications in supply chains

Developed by: Volodymyr Reznik

The logistics supply chain is a sequence of interconnected stages that ensure the movement of goods from suppliers of raw materials to the final consumer. The process begins with the purchase of raw materials, which are supplied by various manufacturers or suppliers. After that, the raw materials are sent to enterprises for processing and production of finished products. At the production stage, raw materials are transformed into finished goods, which are subsequently transferred to warehouses for storage.

After production, finished products are moved to warehouse facilities, where stocks are managed and prepared for further transportation. Warehouses can be located near production facilities or closer to sales markets, depending on the company's logistics strategy. At this point, the products may also undergo packaging or labelling in accordance with the requirements of customers or legislation [8].

The next stage includes the transportation of products, which can be carried out by various modes of transport (road, rail, sea or air) depending on the distance and urgency of delivery. Logistics companies choose the most optimal routes, taking into account costs, delivery time and the specifics of the goods.

The final stage of the logistics chain is the distribution of products and their delivery to the final consumer. Products may pass through several intermediaries, such as

wholesalers or retail distributors, before reaching the final customer. At this stage, it is important to ensure timely delivery, as well as to satisfy all consumer requirements regarding the quality and quantity of goods.

All this requires active management of information flows at each stage to ensure accurate accounting of goods, coordination of actions between chain participants and control over the efficiency of logistics operations (Fig. 1).

A number of scientists claim that the process of strategic logistics management can be considered as a sequence of five key stages, each of which has a significant impact on the formation of an effective logistics system. The first stage, according to the researchers, is the analysis of the logistics chain, which includes a detailed study of all elements and processes related to the movement of goods. As the authors note, this stage involves evaluating suppliers, transportation routes, warehouses, and distribution channels to identify weaknesses and opportunities for improvement. The researchers indicate that a detailed analysis of the logistics chain allows to identify those aspects of logistics activities that need to be optimized to increase the overall efficiency of the system. This approach, according to scientists, makes it possible to get a complete picture of how the company's logistics network functions, as well as to identify key areas for improvement [9].

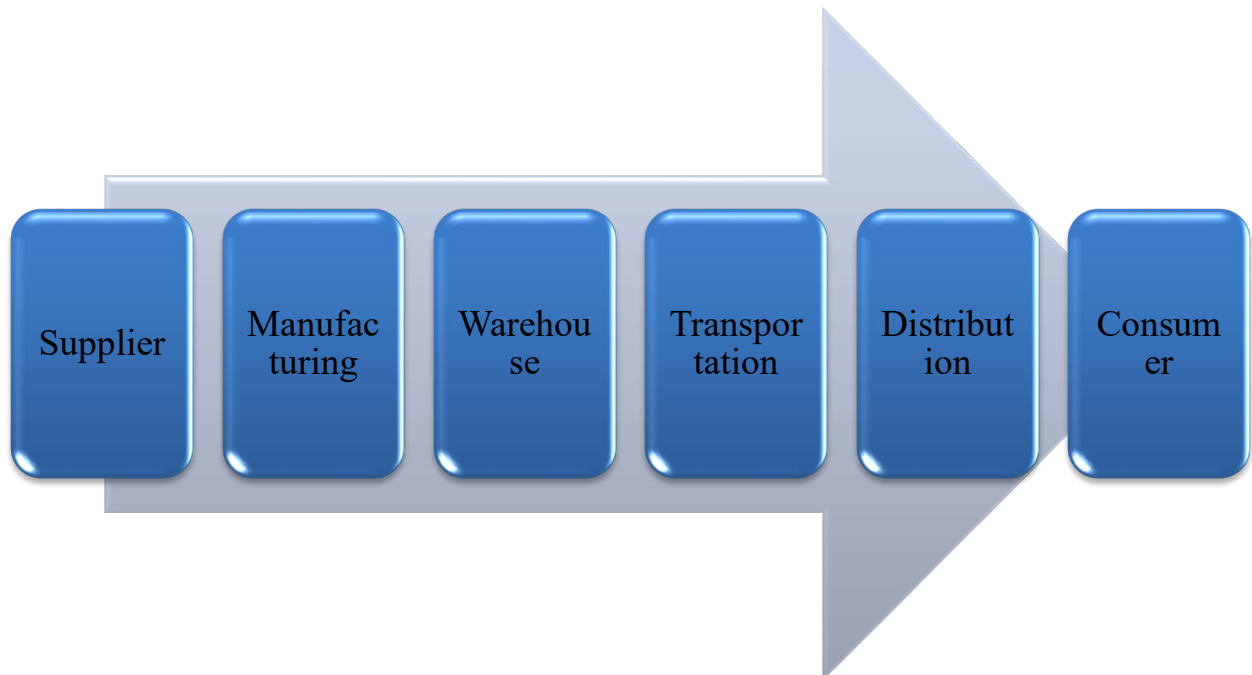


Figure 1. Logistics supply chain
Developed by: Volodymyr Reznik

Some specialists, such as L.M. Achkasova T.O., Vodolajska (2022), O.M. Tymoshchuk (2018) and others. emphasize that supplier relationship management (SRM) is critical to ensuring uninterrupted supply of raw materials, components or finished products. As scientists note, the use of SRM systems helps companies achieve transparency in procurement processes, reduce the risks of supply interruptions, and quickly respond to changing market needs. Researchers emphasize that SRM systems allow to analyse the performance of suppliers, estimate the cost of supply and manage risks, which contributes to the optimization of procurement processes [10-11].

Also, the works of Poznyak O. [15], Savchenko L. [16], Bugayko D. [16, 17, 20 - 22], Smerichevska S. [16], Kovalishyn S. [18], Ohrenych Yu., Ohrenych Y., Dibrova V. [19] are devoted to the study of modern trends in the development of logistics.

Conclusions. Also, many scientists, in particular N.B. Ilchenko (2016) and others emphasize the importance of coordination

between suppliers and customers. They indicate that transparent information exchange between all participants in the supply chain is key to agreeing delivery times, order volumes and adapting to changes in demand. Some researchers believe that logistics today is a strategic tool for coordinating the interests of suppliers, companies and customers [13].

In addition, as stated by O.M. Kryvoruchko (2022), effective management of relations with suppliers and customers allows to reduce the risks arising in the process of supplying goods or services. Early detection of potential problems and joint discussion of solutions between partners, according to scientists, helps to avoid crisis situations in supply chains [14].

Therefore, the scientific community agrees that the integration of modern technologies, such as SRM and CRM, is an important factor in increasing transparency, predictability of risks and maintaining a high level of service, which is critical for achieving competitive advantages in today's market.

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ETHICAL LEADERSHIP IN AVIATION: SHAPING ORGANIZATIONAL CULTURE AND DRIVING POST-WAR RECOVERY

Podrieza Mykhailo. "Ethical leadership in aviation: shaping organizational culture and driving post-war recovery". *The aviation industry plays a critical role in globalization and economic development, but it also faces significant challenges related to sustainability, technological disruption, and regulatory compliance. As the industry evolves, ethical leadership becomes increasingly vital to ensure long-term success and societal trust. This paper explores the importance of ethical leadership in aviation, examines emerging trends and challenges, and proposes pathways for fostering ethical decision-making and accountability in future aviation leadership. The future of aviation depends on leaders who prioritize ethics, sustainability, and societal well-being alongside innovation and profitability. In the context of post-war recovery, as exemplified by Ukraine, ethical leadership is a cornerstone of rebuilding efforts, ensuring that aviation contributes to long-term peace, stability, and resilience. By fostering accountability, transparency, and inclusivity, aviation leaders can create an industry that remains resilient, sustainable, and trusted by society.*

Thus, the topic of ethical leadership at the enterprises of the aviation industry of Ukraine after the war is extremely relevant, because after the end of hostilities, the restoration of enterprises of the aviation industry will become one of the priority tasks. Ethical leadership will help create trust among consumers of aviation services, investors and employees, which is necessary for the successful restoration and further development of the industry.

Keywords: economic development, aviation enterprises, stability and development, ethical leadership, adaptive situation, post-war recovery, innovation

Михайло Подреза. «Етичне лідерство в авіації: формування організаційної культури та драйвери післявоєнного відновлення». *Авіаційна промисловість відіграє вирішальну роль у глобалізації та економічному розвитку, але вона також стикається зі значними проблемами, пов'язаними зі стійкістю, технологічними порушеннями та дотриманням нормативних вимог. По мірі розвитку галузі, етичне лідерство стає все більш важливим для забезпечення довгострокового успіху та довіри суспільства. У цій статті досліджується важливість етичного лідерства на підприємствах авіаційного сектору, досліджуються нові тенденції та виклики, а також пропонуються шляхи сприяння етичному прийняттю рішень і підзвітності майбутніх керівників авіаційних підприємств. Майбутнє авіації залежить від лідерів, які віддають пріоритет етиці, стійкості та суспільному добробуту поряд з інноваціями та прибутковістю. У контексті післявоєнного відновлення, прикладом якого є Україна, етичне лідерство є гарантом, що авіаційна складова сприятиме довгостроковому миру, стабільності та стійкості. Сприяючи підзвітності,*

прозорості та інклюзивності, авіаційні лідери можуть створити галузь, яка залишиться стійкою та буде користуватися довірою суспільства.

Таким чином тема етичного лідерства на підприємствах авіаційної галузі України після війни є надзвичайно актуальною, тому що після закінчення бойових дій, відновлення підприємств авіаційної галузі стане одним з пріоритетних завдань. Етичне лідерство допоможе створити довіру серед споживачів авіаційних послуг, інвесторів та співробітників, що є необхідним для успішного відновлення та подальшого розвитку галузі.

Ключові слова: економічний розвиток, авіаційні підприємства, стабільність і розвиток, етичне лідерство, адаптивна ситуація, повоєнне відновлення, інновації

Introduction. The aviation sector has long been synonymous with innovation and connectivity, facilitating economic and cultural exchanges worldwide. However, alongside its benefits, aviation has raised concerns regarding environmental impact, employee welfare, and safety regulations. Ethical leadership, defined as the consistent demonstration of integrity, fairness, and accountability, is central to addressing these concerns while driving sustainable growth. The purpose of the article is to analyze how the principle of ethical leadership can affect the successful restoration and development of enterprises of the Ukrainian aviation industry after the end of the war. To show how the theories of ethical leadership can be applied to the specific context of enterprises of the aviation industry, especially in the conditions of post-war reconstruction. To investigate how Ukrainian enterprises and their leaders are already applying the principles of ethical leadership, or what opportunities exist for this.

Materials and methods. The materials of the study are the works of domestic and foreign scientists who were engaged in solving the problem of implementing ethical leadership in the field of economics.

Presentation of the main results. This article examines various aspects of ethical leadership in the aviation industry, including the role of ethics in business, which is a topical topic in Ukraine.

Ukrainian scholars are actively researching the ethical aspects of business, emphasizing the importance of transparency, social responsibility, and adherence to moral principles in entrepreneurial activity.

In particular, the article by T. V. Botsyan "Business Ethics in Ukraine through the Lens of Non-Financial Reporting" states that more and more enterprises are positioning themselves as ethical, confirming this by preparing non-financial reporting.[2]

However, an analysis of the quality of such reports revealed certain shortcomings, in particular, incomprehensibility, unreliability, and incomparability of information.

These conclusions are consistent with your reflections on the importance of transparency and accountability in the aviation industry.

In addition, the textbook "Business Ethics" edited by I. V. Sushik and others consider issues of professional ethics, the formation of corporate culture and the establishment of relationships between business partners. [1]

In modern economic literature, there are several approaches to defining business ethics. They all boil down that this is the concept of harmonizing and linking the interests of the organization, consumers and society as a whole. In world literature, much attention is paid to the issue of ethical business conduct, in particular, it was studied by such famous scientists as A. Smith, M. Friedman, P. Drucker, G.

Kessem. It is worth noting that the very concept of ethical business conduct is the result of scientific works, and not the practical achievements of entrepreneurs, as is usually the case.

In particular, G. Kessem formed 5 axioms of business conduct, the very first of which relate to the issue of business ethics. He said:

a clean business will outlive a less clean one, and honesty will receive more income than fraud. Therefore, no company could survive for a long time with the help of fraud and unethical behavior. One skill for doing business is not enough. The main principles of business ethics were developed on the basis of the philosophy of pragmatism. The theorist of pragmatism W. James proceeds from the understanding of a person as one who is guided by emotions, not reason, and the subject of emotional experience is one's own person. On this basis, the ethics of pragmatism based morality on action, not on the choice of action and reflection on it. T.M. Garrett and R.J. Klonosky determine that business ethics considers primarily the relationship between the goals and means of business and specifically human goals. Business ethics studies the impact of individual actions on the position of the individual, the firm, the economic structure and society as a whole. It should study generally accepted moral norms in business.[3]

Companies may often be tempted to compromise their ethics in pursuit of short-term success, but this approach can be very harmful in the long run. Excessive violation of ethical principles can lead to a distortion of the company's image and a loss of trust from consumers and partners. Reputation is one of the most valuable assets of a company. When it is negatively affected by ethical violations, it can require significant efforts and resources to restore.

In addition, the legal consequences of violating ethical standards can also be extremely serious. Companies that act unethically can face legal sanctions, fines and lawsuits, which can significantly damage their financial stability and existence in general. It is important to emphasize that adhering to ethical principles is not just a moral obligation, but also a strategically sound business approach. Building business relationships based on honesty, responsibility, and ethics contributes to the long-term development of a company,

helping it avoid negative consequences, preserve its reputation, and ensure stability in a dynamic business environment. Adherence to ethical standards helps companies avoid the risks associated with lawsuits, fines, reputational damage, and other negative consequences of unscrupulous activities.

First, adherence to ethical standards helps companies avoid lawsuits and legal conflicts. Legislation often establishes norms and requirements that regulate ethical behavior in business, and violation of these standards can lead to legal consequences. Companies that adhere to ethical principles in their activities are usually less likely to get into legal trouble and conflicts with the law.

Second, adherence to ethical principles helps avoid fines and financial losses associated with the negative consequences of unscrupulous activities. In many cases, violation of ethical standards can lead to serious financial losses that can affect the financial condition of the company. In addition, adherence to ethical standards helps avoid reputational damage, which can be critical to the success of the company. Reputational image in the modern world is a very valuable asset, and any violation of ethical principles can lead to a loss of trust from customers, investors and other stakeholders.

Therefore, compliance with ethical standards in business is extremely important for reducing risks and ensuring the sustainable functioning of the company. Compliance with ethical standards helps to avoid legal problems, financial losses and loss of reputation, which makes it more competitive and sustainable in the modern business environment.

These aspects are key to the development of ethical leadership in any industry, including aviation.

Given these studies, we can conclude that ethical leadership in aviation should be based on the principles of transparency, social responsibility and adherence to moral standards, which will contribute to increasing

public trust and sustainable development of the industry.

As technological advancements such as artificial intelligence, electrification, and automation transform aviation, leaders must navigate complex decisions involving safety, environmental sustainability, and corporate responsibility. This paper investigates the future role of ethical leadership in aviation, addressing the pressing need for integrity and ethical foresight in an industry undergoing rapid transformation.

Ethical leadership involves prioritizing transparency, fairness, and the well-being of stakeholders, including employees, customers, and the environment. In aviation, the consequences of unethical leadership can be catastrophic, as evidenced by historical safety failures, emissions scandals, and labor disputes. Key components of ethical leadership in aviation include:

- Safety and Accountability (ensuring safety protocols are followed without compromise, even under economic pressures);
- Environmental Stewardship (addressing the aviation sector's carbon footprint and innovating sustainable solutions);
- Workforce Inclusivity and Welfare (promoting fair labor practices and fostering diverse, inclusive workplaces)[4,8].

By prioritizing these pillars, ethical leaders can build trust and legitimacy while mitigating risks inherent in the industry. The war in Ukraine has had devastating consequences on infrastructure, human capital, and economic stability.[5,7] Aviation, a critical pillar for reconstruction, plays an essential role in restoring connectivity, rebuilding supply chains, and facilitating humanitarian aid. Ethical leadership is vital to ensuring that aviation's contribution to Ukraine's post-war recovery is sustainable, transparent, and inclusive.

Rebuilding infrastructure post-war recovery requires ethical decision-making in rebuilding airports, air traffic systems, and logistics networks. Leaders must prioritize

sustainable, modernized infrastructure that aligns with global environmental goals while fostering economic resilience. The aviation sector has been instrumental in delivering humanitarian aid during the war. Ethical leadership must focus on expanding humanitarian logistics, ensuring that aid reaches those in need efficiently, and rebuilding trust in aviation systems.

The war has displaced many aviation professionals. Ethical leadership must prioritize reintegration and retraining programs, offering employment opportunities and fostering inclusive policies that support displaced workers, veterans, and underrepresented communities.

Global partnerships for recovery ethical aviation leadership in post-war recovery relies on multi-stakeholder partnerships involving governments, NGOs, and international organizations. These partnerships must be guided by transparency, mutual benefit, and a shared commitment to rebuilding Ukraine's aviation sector responsibly.

The urgency of economic revival can tempt leaders to prioritize short-term gains over long-term sustainability. Ethical leadership requires balancing economic recovery with investments in green technologies, such as sustainable fuels and energy-efficient infrastructure. The future of aviation depends on leaders who prioritize ethics, sustainability, and societal well-being alongside innovation and profitability. In the context of post-war recovery, as exemplified by Ukraine, ethical leadership is a cornerstone of rebuilding efforts, ensuring that aviation contributes to long-term peace, stability, and resilience. By fostering accountability, transparency, and inclusivity, aviation leaders can create an industry that remains resilient, sustainable, and trusted by society.

The integration of artificial intelligence, automation, and electric propulsion presents ethical dilemmas regarding safety, job displacement, and technological accountability. Leaders must address concerns around human oversight, ethical programming of AI systems, and equitable

workforce transition strategies. Environmental sustainability aviation is under increasing pressure to align with global carbon-reduction targets. Ethical leadership will require bold decisions to adopt sustainable aviation fuels, invest in electric and hydrogen technologies, and balance short-term economic gains with long-term environmental imperatives. The COVID-19 pandemic exposed vulnerabilities in the aviation sector, highlighting the need for ethical decision-making during crises. Leaders must balance public health priorities, workforce well-being, and financial stability without compromising ethical standards.

As aviation continues to connect the world, ethical leadership must address disparities in access to air travel, particularly in developing regions. Leaders must advocate for equitable growth and ensure emerging economies benefit from aviation advancements.

Conclusions. Studies of the essence and basic principles of business ethics in the

present day prove that in modern conditions the world functions thanks to those existing, special rules, norms and moral values that are inherent in each state. Taking them into account is an important factor in the formation of effective relationships not only in the business environment of aviation enterprises, but also in everyday life. Business ethics as a system aimed at establishing and regulating relations between subjects of the business market of the aviation sector requires taking into account the values of all participants. By introducing an ethical "complex" into business practice, this idea will help to determine a socially-oriented concept that will address issues related to improving social responsibility in business, business reputation, regulating social and labor relations, increasing employee motivation, improving environmental protection requirements, increasing the investment attractiveness of Ukrainian aviation enterprises, and creating a European-style code of ethics.

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STRATEGIC MANAGEMENT OF UKRAINIAN AVIATION ENTERPRISES: CHALLENGES AND OPPORTUNITIES FOR POST-WAR RECOVERY

Gurina Ganna, Podrieza Serhii, Novak Valentyna, Liskovych Nazarii. *"Strategic management of Ukrainian aviation enterprises: challenges and opportunities for post-war recovery". The brutal full-scale war of the Russian Federation against sovereign Ukraine, launched in February 2022, caused deep human suffering, colossal destruction and damage to the national economy, raised the question not only of the political existence of the country, but also of the physical survival of Ukrainians. However, sooner or later the war must end with our victory and the question of the post-war reconstruction of the destroyed cities and the national*

economy will arise. Today, there are many opinions on the directions and policies of such reconstruction, but what these opinions have in common is the awareness of the need to build a qualitatively different economic system compared to the one that existed before the war and caused the country's significant economic, technological and military backwardness, its inability to independently provide worthy resistance to the aggressor. It is obvious that without the restoration and development of our own industrial production, capable of overcoming this backwardness, we cannot do without it. Before the beginning of the Russian-Ukrainian war, domestic scientists paid a lot of attention to the development of industrial production. However, the war and the destruction of aviation enterprises caused by it force us to reconsider traditional peacetime approaches to the policy of developing the domestic aviation industry. The full-scale military aggression of the Russian Federation against Ukraine from the first minute dealt a devastating blow to the activity of the aviation transport of Ukraine as a whole and the activity of all its components: airlines, airport and airfield systems, air traffic control systems, aviation industry systems of Ukraine, aviation systems education and science. The industry faced unforeseen force majeure challenges and threats to its existence. Under such conditions, the development and substantiation of strategic scenarios for the sustainable development of air transport in Ukraine in the conditions of the post-war economic recovery acquire undeniable relevance and is of practical importance for the further development of both air transport and the national economy, as a whole.

Keywords: strategic management, aviation enterprises, opportunities, sustainable development, post-war recovery, modernization, industrial production

Гуріна Ганна, Подреза Сергій, Новак Валентина, Ліскович Назарій.. «Стратегічне управління авіапідприємствами України: виклики та можливості післявоєнного відновлення». Повномасштабна війна, яку російська федерація розпочала проти суверенної України у лютому 2022 року, спричинила значні людські втрати, масштабні руйнування та завдала серйозної шкоди національній економіці. Вона поставила під загрозу не лише політичне майбутнє країни, а й фізичне виживання українського народу. Однак війна неминуче завершиться нашою перемогою, і перед державою постане завдання післявоєнного відновлення міст та економіки. Нині існує багато поглядів на те, якими мають бути напрямки та підходи до відбудови. Водночас, усі ці думки об'єднують розуміння необхідності створення принципово нової економічної системи, яка б відрізнялася від тієї, що існувала до війни та стала однією з причин економічної, технологічної та військової вразливості країни. Очевидно, що ключовим елементом післявоєнного розвитку має стати відновлення та модернізація національного промислового виробництва, що дозволить подолати попереднє відставання та забезпечити економічну незалежність. До початку війни українські науковці приділяли значну увагу розвитку промислового сектору. Однак унаслідок бойових дій та знищення авіаційних підприємств традиційні мирні підходи до розвитку авіаційної галузі потребують перегляду. російська військова агресія завдала нищівного удару по всіх складових авіаційного сектору України, зокрема по авіакомпаніях, аеропортах, системах управління повітряним рухом, авіаційній промисловості, а також по освітніх і наукових установах галузі. Перед авіаційним сектором постали безпрецедентні виклики та загрози його подальшому існуванню. У такій ситуації розробка стратегічних сценаріїв сталого розвитку авіаційних підприємств в умовах післявоєнного відновлення є вкрай важливою. Вона має не лише теоретичне, а й практичне значення, оскільки визначатиме майбутнє української авіації та сприятиме загальному економічному відродженню країни

Ключові слова: стратегічне управління, авіаційні підприємства, можливості, сталий розвиток, повоєнне відновлення, модернізація, промислове виробництво

Introduction. The research for this article is based on a comprehensive analysis of

secondary data sources, expert opinions, and case studies from countries that have

experienced post-war aviation recovery. A qualitative approach was used to assess the challenges and opportunities faced by Ukrainian aviation enterprises, incorporating insights from economic reports, policy documents, and industry analyses. Key methods employed include comparative analysis, which examines historical aviation recovery models, and a strategic assessment of potential pathways for Ukraine's aviation sector. Additionally, a policy evaluation framework was used to analyze the role of governmental and international support mechanisms in aviation reconstruction. The combination of these methodologies ensures a thorough understanding of the factors influencing post-war aviation recovery and provides actionable recommendations for strategic management in Ukraine's aviation industry.

The formulation of the goals of the article. The primary goal of this article is to analyze the strategic management challenges and opportunities for Ukrainian aviation enterprises in the post-war recovery period. The study aims to identify key factors influencing the reconstruction of the aviation sector, including infrastructure restoration, financial stabilization, regulatory adjustments, and market competitiveness. Additionally, the article seeks to explore the role of government policies, international cooperation, and technological advancements in ensuring a resilient and sustainable recovery. Another important objective is to evaluate global best practices in post-war aviation recovery and assess their applicability to Ukraine's unique economic and geopolitical context. By providing a comprehensive analysis of potential development pathways, this article aims to offer practical recommendations for policymakers, industry leaders, and investors on how to effectively rebuild and modernize Ukraine's aviation industry.

Ultimately, this research aspires to contribute to the broader discourse on post-war economic reconstruction by emphasizing the strategic importance of aviation as a

driver of national recovery and integration into global markets.

Analysis of recent research and publications. The issue of post-war economic recovery, particularly in the aviation sector, has been widely discussed in global academic and policy-oriented research. Studies on the reconstruction of aviation industries in war-affected regions highlight the necessity of strategic planning, international cooperation, and financial investment to ensure a successful recovery. Many researchers emphasize the role of government policies and external support in rebuilding critical infrastructure and restoring operational capacities.

Prior to the Russian invasion, Ukrainian scholars and industry experts extensively analyzed the development of the national aviation sector, focusing on modernization, competitiveness, and integration into the global market. However, the full-scale war has necessitated a revision of these approaches. Recent research has shifted toward examining the impact of military conflicts on aviation enterprises, the challenges of post-war recovery, and the adaptation of global best practices to Ukraine's current situation. International publications, including reports from organizations such as the International Civil Aviation Organization (ICAO) and the European Union Aviation Safety Agency (EASA), provide insights into post-crisis aviation recovery strategies. These studies stress the importance of sustainable development, digital transformation, and the adoption of innovative technologies in rebuilding aviation infrastructure.

Despite the growing body of research, there remains a significant gap in studies focused specifically on Ukraine's aviation sector within the context of post-war economic recovery. This article seeks to bridge this gap by synthesizing existing research findings, analyzing successful international experiences, and proposing strategic recommendations tailored to the unique challenges and opportunities faced by Ukrainian aviation enterprises.

Presentation of the main results. The Ukrainian aviation sector has faced unprecedented challenges due to the ongoing war, which has severely impacted infrastructure, financial stability, and operational capacities. However, the post-war recovery period presents an opportunity to rebuild the industry in a way that is more resilient, sustainable, and competitive. Effective strategic management will be essential in overcoming the current crises and shaping a new future for Ukrainian aviation enterprises.

Challenges Facing Ukrainian Aviation Enterprises:

1. Infrastructure damage and reconstruction needs. One of the most pressing issues is the extensive damage to airports, air traffic control facilities, and aviation hubs. Rebuilding infrastructure requires significant investment, both domestic and international, and a clear strategy for modernization to meet global standards.

2. Financial instability and economic constraints. With economic downturns and the loss of revenue due to grounded fleets and disrupted operations, Ukrainian airlines are struggling with liquidity and debt management. Access to funding from international financial institutions and government support will be crucial in ensuring financial stability during the recovery phase.

3. Workforce and talent retention. The aviation sector has suffered a substantial loss of skilled professionals due to displacement and the general economic downturn. Retaining and attracting a skilled workforce will require strategic investment in training programs, competitive salaries, and stable working conditions.

4. Regulatory and safety concerns. Ensuring compliance with international safety standards while rebuilding operations is another major challenge. Ukrainian aviation enterprises must work closely with global regulatory bodies such as ICAO (International Civil Aviation Organization) and EASA

(European Union Aviation Safety Agency) to restore confidence in air travel safety and security.

5. Market competitiveness and customer confidence. Rebuilding trust among passengers and businesses will be a key factor in the recovery process. The aviation industry will need to focus on competitive pricing, enhanced service quality, and digital transformation to regain market share.

Opportunities for Post-War Recovery:

1. Modernization and sustainable development. Rather than simply rebuilding pre-war infrastructure, Ukraine has the opportunity to implement modern, eco-friendly, and efficient aviation solutions. This includes upgrading airports with green technologies, optimizing flight routes to reduce carbon emissions, and investing in fuel-efficient aircraft.

2. Strategic partnerships and foreign investment. International cooperation will be crucial in the recovery of Ukraine's aviation industry. By forming alliances with foreign carriers, leasing modern aircraft, and securing investment from global financial institutions, Ukrainian enterprises can accelerate their return to the market.

3. Digital transformation and innovation. The integration of digital solutions such as AI-driven logistics, smart airport systems, and contactless passenger services will enhance efficiency and customer satisfaction. Embracing technological advancements can make Ukrainian aviation enterprises more competitive on a global scale.

4. Expansion into new markets. Post-war economic recovery presents an opportunity for Ukrainian airlines to explore new markets, particularly in cargo and logistics. Strengthening Ukraine's role as a regional transit hub could drive economic growth and attract international trade.

5. Government and policy support. A well-structured government aviation policy, including tax incentives, subsidies, and investment-friendly regulations, can significantly aid the sector's recovery. Strategic management must align with

national economic plans to ensure sustainable growth.

Conclusions. The post-war recovery of Ukrainian aviation enterprises is fraught with challenges but also presents unique opportunities for modernization and growth. By focusing on strategic management principles - such as rebuilding infrastructure with resilience, ensuring financial sustainability, fostering international partnerships, embracing digital transformation, and exploring new markets - Ukraine can emerge with a stronger, more competitive aviation industry. The commitment of both the public and private sectors will be instrumental in ensuring a successful and sustainable recovery. The Russian aggression against Ukraine has persisted for a decade, resulting in immense human losses and widespread destruction. Ukrainian cities, villages, civilian infrastructure, industrial facilities, and a significant portion of the country's energy sector have been devastated. These colossal damages have led to a severe decline in Ukraine's economic potential. Despite these challenges, Ukrainian society continues to demonstrate remarkable resilience across all sectors, relying on various adaptation mechanisms to cope with the consequences of military aggression and terrorism.

While some steps toward economic recovery have already begun, full-scale reconstruction can only be achieved once the war concludes. Therefore, it is crucial for Ukraine and its allies to develop comprehensive strategies for post-war

economic recovery now. This process is of global significance, as Ukraine's successful reconstruction will serve as a testament to the resilience and effectiveness of democratic socio-economic models in countering authoritarian regimes. It will prove that democracies can withstand external shocks, rebuild, and strengthen their presence in the global economy.

Euro-Atlantic economic and military solidarity with Ukraine is essential for implementing this vast and resource-intensive reconstruction process. The successful recovery of Ukraine will depend on the efficient integration of both internal and external factors.

A large-scale economic recovery in Ukraine will enable the creation of a modern industrial and technological base, revitalizing the national economy and fostering new competitive advantages in regional and global markets. Additionally, this process presents an opportunity to continue structural reforms across various sectors and accelerate Ukraine's integration into key European and transatlantic institutions such as the EU and NATO.

Given the urgency of these challenges, a thorough conceptual analysis and practical recommendations from leading Ukrainian economists are crucial. Identifying the key prerequisites, directions, stages, mechanisms, and expected outcomes of post-war economic recovery is essential to ensuring Ukraine's successful and sustainable development in the years ahead.

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THE EVOLUTION OF STATE ECONOMIC REGULATION: THEORETICAL APPROACHES AND CONTEMPORARY CHALLENGES

Vladyslav Khurtovskyi. "The Evolution of State Economic Regulation: Theoretical Approaches and Contemporary Challenges". This article provides a comprehensive analysis of key theoretical approaches to state economic regulation, including Keynesian theory, monetarism, supply-side economics, growth pole theory, and indicative planning.

The historical background and evolution of state intervention in economic processes throughout the XX-th and XXI-st centuries are examined. The paper discusses the arguments for and against government regulation, particularly in the context of overcoming economic crises, ensuring sustainable development, and maintaining a competitive environment.

The role of the state in stimulating economic activity through tax, fiscal, and monetary policies is analyzed, along with contemporary trends in economic regulation under globalization.

Special attention is given to the transformation of economic systems from non-market to market models and the influence of state policies on this transition.

Keywords: state economic regulation, Keynesianism, monetarism, supply-side economics, growth poles, indicative planning, tax policy, fiscal regulation, economic crises, market mechanism

Владислав Хуртовський. «Еволюція державного регулювання економіки: теоретичні підходи та сучасні виклики». У статті здійснено комплексний аналіз основних теоретичних підходів до державного регулювання економіки, серед яких кейнсіанська теорія, монетаризм, економіка пропозиції, теорія полюсів зростання та індикативне планування. Досліджено історичні передумови розвитку державного втручання в економічні процеси та його еволюцію у XX – XXI століттях.

Розглянуто аргументи на користь і проти державного регулювання, особливо в контексті подолання економічних криз, забезпечення сталого розвитку та підтримки конкурентного середовища.

Проаналізовано роль держави у стимулюванні економічної активності через податкову, бюджетну та грошово-кредитну політику, а також визначено сучасні тенденції державного регулювання в умовах глобалізації.

Окрему увагу приділено питанням трансформації економічних систем від неринкових до ринкових моделей та впливу держави на цей процес.

Ключові слова: державне регулювання економіки, кейнсіанство, монетаризм, економіка пропозиції, полюси зростання, індикативне планування, податкова політика, бюджетне регулювання, економічні кризи, ринковий механізм

Introduction. The role of the state in regulating economic processes has been one of the most widely debated topics in economic theory and practice. The XX-th century was marked by significant transformations in the approach to state economic regulation, driven by rapid industrialization, technological advancements, economic crises, and shifts in socio-political structures. The increasing complexity of economic systems necessitated government intervention to address market failures, promote economic stability, and ensure social welfare.

Classical economic theory, particularly the liberal economic principles developed by Adam Smith, emphasized minimal government interference, arguing that the "invisible hand" of the market could efficiently allocate resources and sustain economic growth.

However, the Great Depression of the 1930's exposed significant limitations of free-market mechanisms, leading to the rise of Keynesian economics, which advocated for active state intervention to stimulate aggregate demand and reduce unemployment. Keynesian policies dominated economic thought for much of the mid-20th century, shaping the fiscal and monetary policies of many developed nations.

In contrast, the late XX-th century saw the resurgence of market-oriented approaches, such as monetarism and supply-side economics, which emphasized the importance of controlling the money supply, reducing government intervention, and creating favorable conditions for private enterprise. Scholars like Milton Friedman and Arthur Laffer argued that excessive state regulation could distort market dynamics and hinder economic efficiency. Despite these

opposing perspectives, modern economic systems generally adopt a mixed approach, balancing state regulation with market-driven mechanisms.

This study aims to analyze the theoretical foundations of state economic regulation, examining the key economic schools of thought and their impact on policy-making. It explores the evolution of government intervention in economic processes, the rationale behind different regulatory approaches, and the effectiveness of various policies in achieving economic stability and growth. Special attention is given to the transition of economies from non-market to market models and the role of the state in facilitating this process. By providing a comprehensive review of theoretical perspectives and practical applications, this paper contributes to the ongoing discourse on the optimal level of government involvement in economic regulation.

Analysis of recent research and publications. The issue of state economic regulation has been extensively studied by scholars from various economic schools, each offering distinct perspectives on the role of government in market processes. Theoretical and empirical research on this subject has evolved significantly over time, reflecting changes in economic structures, technological progress, and global economic conditions.

Classical economic thought, represented by A. Smith and D. Ricardo, emphasized the self-regulating nature of markets, arguing that minimal government intervention ensures economic efficiency. This perspective was later expanded upon by proponents of laissez-faire policies, who believed that state interference distorts market equilibrium and impedes economic growth.

The Keynesian revolution, led by J. M. Keynes, fundamentally altered the understanding of government intervention in economic processes. Keynes argued that market economies are prone to instability, requiring active fiscal and monetary policies to stimulate aggregate demand, reduce unemployment, and mitigate economic downturns. His theories became the foundation for post-war economic policies in many developed countries, particularly during periods of economic crisis. Notable scholars such as G. Myrdal and J. Tinbergen further developed Keynesian ideas, advocating for indicative planning and state-led economic stabilization.

Contrasting with Keynesianism, monetarist theories, pioneered by M. Friedman and scholars of the Chicago School of Economics, emphasized controlling the money supply as the primary tool for economic regulation. Monetarists argue that excessive government intervention leads to inflation and inefficiencies, advocating instead for free-market mechanisms and limited state involvement.

Another influential approach is supply-side economics, developed by A. Laffer, M. Feldstein, and J. Gilder, which prioritizes reducing tax burdens, deregulation, and incentivizing production. Supply-side theorists contend that stimulating production and investment leads to economic expansion and increased employment, rather than focusing solely on demand-side policies.

In recent decades, the concept of state economic planning has also gained attention, particularly in the form of indicative planning. Researchers such as F. Perroux introduced the growth pole theory, emphasizing the strategic role of government in fostering regional economic hubs that drive national development. This perspective aligns with contemporary economic strategies that seek to balance market forces with strategic state planning.

Modern research on state regulation of the economy focuses on the interplay between market mechanisms and

government policies in different economic environments. Studies highlight the necessity of state intervention to address market failures, income inequality, environmental concerns, and global financial crises. Additionally, recent works emphasize the role of governments in managing digital transformation and economic globalization, ensuring that regulatory frameworks adapt to evolving economic conditions.

Overall, the analysis of recent research and publications underscores the continuing debate over the appropriate level and forms of state economic regulation. While some economists advocate for reduced government intervention in favor of free-market principles, others emphasize the need for strategic regulation to ensure economic stability, social welfare, and sustainable development. This article aims to contribute to this ongoing discussion by examining various theoretical perspectives and evaluating the effectiveness of state economic policies in different contexts.

The formulation of the goals of the article is to analyze the theoretical foundations and practical applications of state economic regulation, considering the evolution of economic thought and policy approaches.

Presentation of the main results. The twentieth century was characterized by trends of increasing regulatory influence of the state on economic processes. The growing need for active state regulation of macroeconomic trends and economic cycles was driven by the accelerated pace of scientific and technological development, profound changes in productive forces, the emergence of new industries, the deepening of social division of labor, and a number of other factors. The development of monopoly structures necessitated the formulation and implementation of antitrust legislation. There arose a need to ensure state responsibility for the possible social consequences of the economic policies implemented in practice, the development of competitive forces, and,

where possible, the limitation of the positions of large monopolies and corporations [13].

State regulation of the economy became essential for the implementation of social policy, and its significance in the area of active environmental protection has grown. Within any socio-political and socio-economic system, economic processes are regulated by the state to some extent. The most common justification for state intervention is the argument of market imperfections and its inability to cope with economic crises [10].

The approach developed by A. Smith, known as economic liberalism, limited the role of the state to that of a "night watchman," maintaining order, protecting, and safeguarding private property and competition [11]. Classical economic theory recommends that the state minimize its intervention in the market and allow the so-called "invisible hand of the market" to operate freely. However, there are equally compelling reasons for the necessity of state regulation of the economy. First and foremost, these include the existence of externalities and the provision of public goods, which private business does not always manage effectively.

The development of neoclassical views by scholars of the University of Chicago in the United States shaped a school of supporters of liberal economics and liberal methods of state economic policy. M. Friedman was a staunch opponent of state intervention in the economy, which he viewed as a threat to the free market. In his books *Capitalism and Freedom* [4] and *Free to Choose* [3], he argues against government intervention in the economy.

Supporters of monetarism believe that a market economy with a certain level of competition is in a state as close as possible to full market equilibrium, which implies the most comprehensive use of available public production resources and thus ensures compliance with the Pareto optimality criterion. Therefore, representatives of monetarism consider it necessary to limit the

level of state intervention in the functioning of the market economy [7].

They explain this by asserting that the economy is capable of self-regulation due to the fact that competitive relationships within it naturally establish an equilibrium between supply and demand, and the very possibility of any long-term disruption of this equilibrium is categorically excluded. In their view, it is precisely government intervention that creates disruptions in the equilibrium of the market system.

In this regard, they consider the state's priority task to be the creation of optimal conditions for the functioning of market mechanisms of competitive price regulation by supporting competitive conditions of economic activity while preventing monopolization of the economy. This, in their view, should help smooth out potentially severe fluctuations in business activity.

In the practice of state economic regulation, the neoclassical theory of A. Laffer [6], M. Feldstein [2], and J. Gilder [5] was also applied. These economists placed special emphasis on supply-side analysis and considered tax policy to be the most important tool for stimulating entrepreneurship. Representatives of this theory rejected the system of counter-cyclical state regulation of the economy, which aimed at ensuring demand and full employment, and instead advocated for supply-side economics.

Research conducted by various economic schools does not fundamentally deny the necessity of state intervention in economic processes for the purpose of regulation. The main point of debate lies in determining the nature of this intervention, justifying its scale and possible forms, as well as its degree of intensity.

In this regard, Keynesians hold the view that the state should strengthen its regulation of economic processes, reducing the spontaneous self-regulation of the market. As a result, the level of social production and consumption would increase. The direct source of growth in public consumption is the

consistent increase in government spending, which leads to further tightening and expansion of the taxation system.

J. M. Keynes expressed confidence in the existence of mechanisms that "extinguish" market demand, leading to its acute deficiency. Consequently, a self-regulating market economy is inherently prone to stagnation, a decline in production volumes, and a decrease in employment levels [4].

The ideas of J. M. Keynes formed the foundation of programs aimed at the permanent expansion of market demand through a series of fiscal and monetary instruments during the recovery of economies from the global economic crisis of the 1930's. Certain expectations were associated with the potential implementation of state budget deficit financing, covered by borrowed credit resources. In this case, the state acts as the primary driver of dynamically increasing business activity among economic entities.

From the Keynesian perspective, "it is precisely the state apparatus that, by utilizing the financial system, must "create" the missing purchasing power and "channel" it

into economic circulation" [4]. The proposed methods for increasing market demand to overcome economic downturns, as suggested by representatives of this school, are recognized as the most radical.

Keynesian economists consider state involvement in the economy as a natural regulatory function, accompanied by an increasing share of public production [14]. Meanwhile, existing liberal-oriented economic systems, as well as revised social-democratic models, are fundamentally based on the widespread (to varying degrees) practice of state regulation and economic planning [14].

The conceptual principles of J. M. Keynes's theories on state regulation continue to develop in the works of F. Perroux [8], who argues that the goal of state economic regulation is not macroeconomic stimulation but rather a policy aimed at creating and supporting growth poles ("pôles de croissance"—centers of decision-making and profit generation) and expanding their sphere of influence [8].

Table – 1. Main Conceptual Approaches to Defining the Notion of "State Economic Regulation"

Approach	Key Characteristics	Representative Scholars
Keynesian Approach	Focuses on stimulating aggregate demand, increasing government spending, and reducing unemployment through active fiscal and monetary policies.	J. M. Keynes, G. Myrdal, J. Tinbergen
Monetarist Approach	Emphasizes controlling the money supply, minimizing government intervention, and maintaining price stability.	M. Friedman
Supply-Side Economics	Prioritizes tax cuts, deregulation, and incentives for production and investment.	A. Laffer, M. Feldstein, J. Gilder
Growth Pole Theory	Advocates for the creation and support of economic growth centers to drive regional and national development.	F. Perroux
Indicative Planning	Involves strategic state planning to guide market behavior without direct control, relying on forecasting and economic incentives.	J. Tinbergen, G. Myrdal
Mixed Economy Approach	Suggests a balance between market mechanisms and state intervention to ensure stable economic growth and social welfare.	Various modern economists

Source: compiled by the author.

In the post-war period, scholars from many Western European countries (J. Tinbergen, G. Myrdal, and others) contributed

to the development of a new concept that involved the use of elements of market process management. This concept of state

economic planning became known as "indicative planning," which implied deliberate state intervention and its influence on the behavior of economic agents.

Many modern economists justify the need for a transition to a mixed economic policy that ensures the dynamic development of the real sector based on a state-regulated and socially oriented market economy [1]. Summarizing the conceptual approaches to the paradigm of state regulation, the following key concepts can be distinguished.

This table presents a comparative overview of key theoretical perspectives on state economic regulation, highlighting their core principles and leading scholars.

The generalization of various interpretations of the concept of state economic regulation has allowed us to provide a refined definition.

State economic regulation is a comprehensive system of coordinated actions carried out by government authorities in interaction with economic entities, influencing economic processes to ensure the stable functioning of the economy under the dynamic and multidirectional influence of macro-, meso-, and micro-environments [9].

The issue of state involvement in regulating economic processes at the micro, macro, and international levels is one of the most widely discussed topics in economic literature, highlighting its significance and relevance. This topic is frequently addressed, with particular emphasis on the role of the state in the transition of countries from a non-market to a market economy [12].

Conclusions. The twentieth century witnessed an increasing role of state regulation in economic processes, driven by scientific and technological advancements, structural changes in production, and the rise of monopolies. The need for government intervention was justified by market

imperfections, economic crises, and social policy objectives.

Economic thought on state regulation has evolved through multiple theoretical frameworks. Classical liberalism, as advocated by A. Smith, emphasized minimal government intervention, allowing the market's "invisible hand" to function freely. However, Keynesianism, developed by J. M. Keynes, argued for active state intervention to stimulate demand, mitigate economic downturns, and ensure full employment. Keynesian policies significantly influenced economic recovery strategies, particularly during the Great Depression.

In contrast, monetarists, led by M. Friedman, promoted minimal government involvement, emphasizing monetary stability and market self-regulation. Supply-side economists, including A. Laffer and M. Feldstein, prioritized tax policies and deregulation to foster economic growth. Additionally, theories such as growth pole development (F. Perroux) and indicative planning (J. Tinbergen, G. Myrdal) introduced structured state interventions aimed at fostering economic expansion and stability.

Modern economic thought increasingly supports a mixed economic model that integrates market mechanisms with strategic state intervention to ensure sustainable growth and social welfare. The debate on the extent and nature of government involvement remains central in economic discourse, particularly in the context of transitioning economies and global economic fluctuations.

Ultimately, state economic regulation serves as a crucial tool for maintaining economic stability, addressing market failures, and guiding long-term development. The challenge lies in determining the optimal balance between market freedom and government intervention to achieve economic efficiency and social well-being.

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AUTOMATION AS THE FUTURE OF LOGISTICS

Danylo Grabovsky. Dmytro Bugayko. "Automation as the Future of Logistics". *In the fast-paced, interconnected world of commerce and trade, automation has emerged as a transformative force within the logistics industry. Automation technologies are revolutionizing the way businesses manage their supply chains, offering unparalleled opportunities for efficiency, accuracy, and cost-effectiveness. As the global marketplace becomes increasingly complex and competitive, logistics plays a pivotal role in ensuring that products reach their intended destinations swiftly and seamlessly. The integration of automation, encompassing a spectrum of cutting-edge technologies, is ushering in a new era for logistics, redefining every aspect of the supply chain, from warehouse management to last-mile delivery. In this article we will delve into the profound impact of automation in logistics, exploring the benefits, challenges, and the evolving landscape of this transformative paradigm shift.*

Keywords: automation, logistics, paradigm shift, supply chains

Данило Грабовський. Дмитро Бугайко. «Автоматизація як майбутнє логістики». У швидкоплинному, взаємопов'язаному світі комерції та торгівлі автоматизація стала трансформаційною силою в галузі логістики. Технології автоматизації революціонізують спосіб управління своїми ланцюжками поставок, пропонуючи неперевершені можливості для ефективності, точності та рентабельності. Оскільки глобальний ринок стає дедалі складнішим і конкурентоспроможнішим, логістика відіграє ключову роль у забезпеченні того, щоб продукти швидко й безперешкодно досягали призначених місць. Інтеграція автоматизації, що охоплює спектр передових технологій, відкриває нову еру для логістики, переосмислюючи кожен аспект ланцюга постачання, від управління складом до доставки на останню милю. У цій статті ми заглибимося в

глибокий вплив автоматизації на логістику, досліджуємо переваги, проблеми та зміну ландшафту цієї трансформаційної зміни парадигми.

Ключові слова: автоматизація, логістика, зміна парадигми, ланцюги постачання

Introduction. In the fast-paced, interconnected world of commerce and trade, automation has emerged as a transformative force within the logistics industry. Automation technologies are revolutionizing the way businesses manage their supply chains, offering unparalleled opportunities for efficiency, accuracy, and cost-effectiveness. As the global marketplace becomes increasingly complex and competitive, logistics plays a pivotal role in ensuring that products reach their intended destinations swiftly and seamlessly. The integration of automation, encompassing a spectrum of cutting-edge technologies, is ushering in a new era for logistics, redefining every aspect of the supply chain, from warehouse management to last-mile delivery. In this article we will delve into the profound impact of automation in logistics, exploring

the benefits, challenges, and the evolving landscape of this transformative paradigm shift.

The purpose of the article: to analyze the impact of automation processes on the development of logistics and global supply chains, identify the main challenges and obstacles to this process and outline the paths for further development.

Presentation of the main research material. Warehouses, traditionally the epicenters of logistics operations, are among the first to experience the groundbreaking influence of automation. Automated storage and retrieval systems (AS/RS) have become the backbone of modern warehouses, employing robotics to efficiently manage inventory.

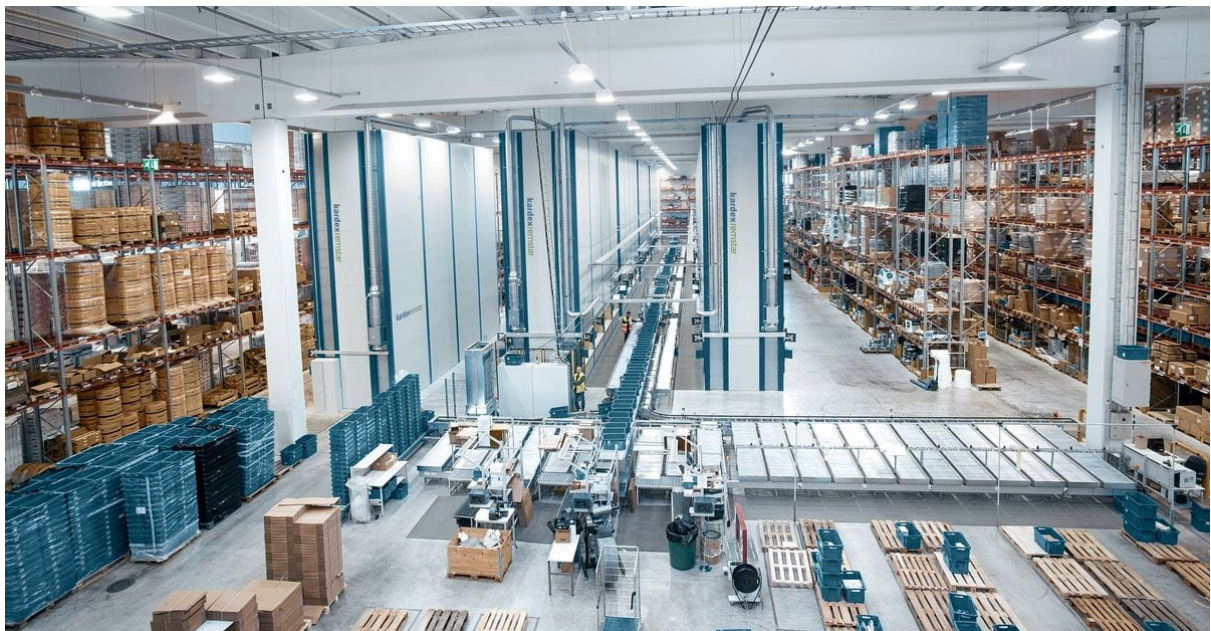


Fig.1. ASRS 101: Automated Storage and Retrieval Systems

Source: <https://us.blog.kardex-remstar.com/automated-storage-and-retrieval-systems-asrs> [1]

These systems boost storage capacity, cut labor costs, and dramatically improve inventory accuracy. The integration of automated guided vehicles (AGVs) and

drones within warehouse facilities facilitates seamless internal transportation, reducing reliance on manual labor and enabling round-the-clock operations. The result is accelerated

order fulfillment, enhanced accuracy, and ultimately, greater customer satisfaction.

Automation has fundamentally transformed the transportation of goods, introducing innovative solutions that

enhance efficiency and safety. Autonomous vehicles, including self-driving trucks and delivery drones, have significantly reduced the need for human intervention during transit.



Fig.2. Volvo and Aurora Launch Level 4 Self-Driving Trucks

Source: <https://www.carscoops.com/2024/05/the-future-is-here-volvo-and-aurora-launch-level-4-self-driving-trucks>[2].

Equipped with advanced sensors and AI algorithms, these vehicles optimize routes, reduce fuel consumption, and contribute to sustainability by minimizing emissions. Automation in transportation not only lowers operational costs but also enhances the reliability and predictability of deliveries.

Artificial intelligence (AI) and machine learning are pivotal components of logistics optimization. These technologies analyze vast datasets to forecast demand patterns, manage inventory levels, and determine optimal routing. AI enables just-in-time inventory management, resulting in reduced

carrying costs and mitigated risks of overstock or stockouts. Furthermore, AI has ushered in a new era of risk management, constantly monitoring for potential disruptions and offering alternative routes or solutions to maintain the flow of goods. Overall, the use of AI in ecommerce logistics is becoming increasingly essential in today's fast-paced business environment; however, research shows that not everyone in the logistics space is ready to adopt AI based strategies. Graph showing adoption of AI by logistics companies (see Fig.3) [3].

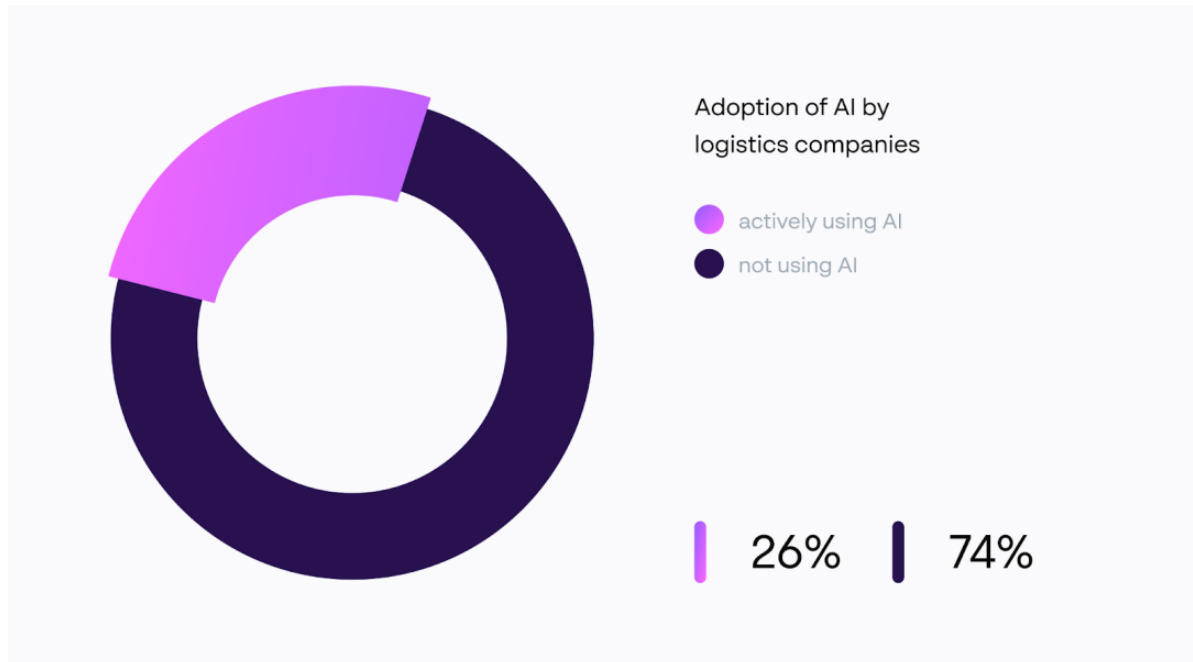


Fig.3. Challenges in AI adoption

Source: <https://en.codept.de/blog/5-ways-to-use-artificial-intelligence-in-logistics> [3].

The last mile of delivery, known for its complexity and high costs, is a prime beneficiary of automation. Drones and autonomous delivery vehicles have the potential to offer same-day or even same-hour delivery, reducing operational expenses

and significantly enhancing the customer experience. Innovative technologies, such as sidewalk-navigating delivery robots, have emerged to tackle the unique challenges of last-mile logistics, expanding delivery capabilities and efficiency.



Fig.4. Autonomous delivery vehicles

Source: https://www.freepik.com/premium-ai-image/delivery-robots-navigating-sidewalks-streets-package-delivery_321403507.htm [4].

While the benefits of automation in logistics are clear, there are challenges to be addressed. The initial cost of implementing automation technologies can be substantial, necessitating careful financial planning and investment. Concerns about job displacement, as certain manual positions are replaced by automation, need to be addressed through workforce retraining and reskilling initiatives. Security and privacy issues related to the use of drones and AI require ongoing regulatory scrutiny to ensure ethical and safe practices.

The logistics industry is undergoing a profound transformation, driven by the increasing integration of automation technologies. Smaller businesses can now compete on a more level playing field with industry giants, leveraging automation solutions provided by third-party logistics providers. Logistics hubs and facilities are being reimaged to accommodate the needs of automation, and regulatory frameworks are evolving to address safety, ethical, and privacy concerns in this rapidly changing landscape.

Conclusions. Automation in logistics represents a seismic shift in the industry, offering the potential for enhanced efficiency, cost reduction, and superior customer satisfaction. To remain competitive in the global marketplace, businesses must embrace and invest in automation. The integration of automation in logistics is not just a trend; it is a necessity in today's fast-paced, interconnected world of commerce. It is reshaping the industry, setting new standards for efficiency and accuracy while challenging us to address ethical and regulatory considerations.

Automation will play a special role in the process of post-war restoration of the logistics sector of Ukraine, responding to the challenges of the reduction in the number of highly qualified personnel during the war period [5].

Logistics automation is not merely a transformation; it is a redefinition of how goods are moved, stored, and delivered, shaping the future of commerce and trade.

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