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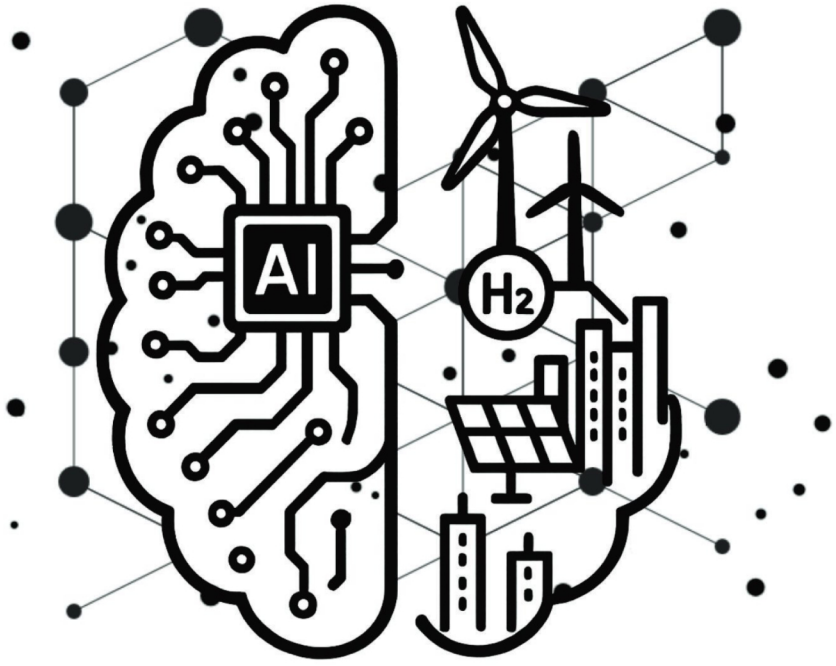

IN THIS ISSUE:

MORE ON INNOVATION, SUSTAINABILITY, AND STRATEGIC TRANSFORMATION.

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THE INTERNATIONAL JOURNAL OF PSYCHOLOGY AND STRATEGIC COMMUNICATION

THIS SECOND ISSUE OF THE INTERNATIONAL JOURNAL OF PSYCHOLOGY AND STRATEGIC COMMUNICATION ADDRESSES KEY CHALLENGES AT THE INTERSECTION OF DIGITAL TRANSFORMATION, ARTIFICIAL INTELLIGENCE, AND INTERNATIONAL COOPERATION. THE ARTICLES EXPLORE TOPICS SUCH AS ETHICAL AI IN BUSINESS, CROSS-CULTURAL MANAGEMENT, BEHAVIORAL FINANCE, GLOBAL LOGISTICS, AND STRATEGIC RESILIENCE.

DEVELOPED IN THEMATIC CONNECTION WITH THE INTERNATIONAL WEEK 2025 AT HOCHSCHULE MITTWEIDA, WHICH FOCUSED ON AI AND INTERNATIONALISATION, THIS VOLUME REFLECTS CURRENT TRENDS IN GLOBAL STRATEGY AND EDUCATION.

WITH STRONG CONTRIBUTIONS FROM UKRAINIAN AND EUROPEAN PARTNERS, THIS ISSUE HIGHLIGHTS THE VALUE OF CROSS-BORDER COLLABORATION AND APPLIED, INTERDISCIPLINARY RESEARCH. ALL ARTICLES ARE OPEN ACCESS AND DOI-ASSIGNED FOR MAXIMUM VISIBILITY AND IMPACT.

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VOLUME 01

ISSUE 02

International Journal of Psychology and Strategic Communication

Ukraine Digital – Enhancing Education through Digitalization

The second issue of the International Journal of Psychology and Strategic Communication (IJPSC) builds on the success of our inaugural volume and continues the journal's mission to foster interdisciplinary dialogue in times of disruption, transformation, and opportunity. While our first issue focused on digital education in crisis-affected regions, this volume turns to broader questions of strategic resilience, international management, and technological change, examined through the lenses of psychology, communication, and global strategy.

At the center of this issue is a shared understanding: lasting progress in education, research, and policy requires strong international cooperation and mutual trust. Many of the contributions featured here were developed in close collaboration with our partners, most notably Oles Honchar Dnipro National University, along with the National University of Economics in Odessa and Hochschule Mittweida in Germany.

This issue is closely linked to International Week 2025, which took place from June 2nd to 6th in Mittweida under the theme Integrated Internationalisation: Leveraging Artificial Intelligence. The event brought together students, researchers, and university leaders from Ukraine, Germany, and across Europe. During this inspiring week, conversations went far beyond academic exchange. New friendships were formed, shared projects were developed, and the foundation for future cooperation was strengthened. Participants explored how artificial intelligence, digital innovation, and physical mobility can be integrated into a forward-thinking internationalisation strategy.

The articles in this volume reflect that integrative spirit. They examine a wide spectrum of topics, including the ethical dimensions of AI in international business, behavioral finance, cross-cultural communication, crisis leadership, international logistics, and the transformation of global industries. External researchers further enriched the issue with contributions on smart cities, sustainable energy, and AI-supported infrastructure development.

This second issue of IJPSC highlights the value of open academic collaboration across institutions and borders. We remain especially committed to providing visibility for Ukrainian scholars and to supporting knowledge exchange that contributes to institutional resilience and innovation. The journal's open-access format, with assigned DOIs for all articles, ensures accessibility and academic transparency.

We thank all authors, reviewers, and institutional partners, especially our colleagues in Dnipro, for their trust, insights, and engagement in this shared academic journey.

Prof. Dr. Eckehard Krah, Prof. Dr. rer. oec. Serge Velesco, Prof. Oleksii Dzhusov, Prof. Dr. Johannes Stelling

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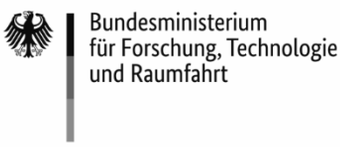

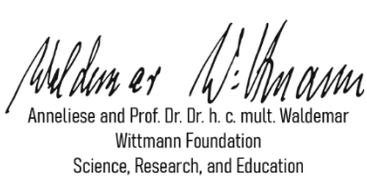

PREFACE

It is with great pleasure that I introduce this special issue of the International Journal of Psychology and Strategic Communication (IJPSC), published within the framework of the DAAD-funded initiative "Ukraine Digital: Ensuring Academic Success in Times of Crisis."

This project was launched to support Ukrainian universities in the implementation of digital teaching and helps Ukrainian students to continue their studies under extremely difficult conditions. Despite the challenges brought by war, Ukrainian students and educators have demonstrated outstanding dedication to science, innovation, and personal development.

The contributions featured in this journal are the result of collaborative efforts between Mittweida University of Applied Sciences and our partner institutions – Odesa National Economic University (ONEU) and Dnipro National University (DNU). These papers reflect not only academic quality, but also resilience, ethical reflection, and a forward-thinking spirit that lies at the heart of this journal's mission.

I would like to thank all authors, coordinators, and supporting staff for their efforts – and the DAAD for enabling this international collaboration. Let this publication stand as a testament to resilience and collaboration, even in times of uncertainty.

Prof. Dr. rer. oec. Serge Velesco
Project manager – Ukraine Digital
Hochschule Mittweida

First of all, I would like to express my deep gratitude to Professor Velesco (University of applied sciences Mittweida) and his team, thanks to whose efforts we had the pleasure of working on the project "Ukraine digital" for the last three years. One of its results is this journal, and this is already the second collection of student research papers.

The project "Ukraine digital", which actually began simply with financial support for some Ukrainian students who suffered from the war, but did not leave Ukraine and continued to live and study there, has expanded significantly and has become a serious tool for supporting and developing students' aspirations for scientific research.

This collection includes a number of student research papers that became possible precisely due to the motivating role of the project "Ukraine digital". The students chose the topics of their research independently and developed them together with their supervisors, and I really want to hope that many of the works presented in this collection will become a reliable basis for their further scientific research.

Prof. Dr. Oleksii A. Dzhusov
Coordinator of the project "Ukraine-Digital"
from the Oles Honchar Dnipro National University (Ukraine)

The International Journal of Psychology and Strategic Communication has become a strong academic platform for addressing the pressing issues of our time – from ethical innovation to strategic transformation. This special issue, shaped through the Ukraine Digital project, exemplifies the role of science in building bridges, empowering young researchers, and promoting dialogue across borders.

As Dean of the Faculty of Industrial Engineering at Hochschule Mittweida, I am proud to witness the results of an interdisciplinary collaboration that reaches far beyond economics. The articles presented here touch upon global challenges: sustainability, conflict, crisis management, digitalization, and cultural dynamics – all tackled with academic rigor and fresh insight by students and scholars.

In times when education systems are tested by external forces, this issue stands as a reminder that research and education must not only continue – they must evolve, connect, and inspire. I wholeheartedly thank everyone involved for their dedication and vision.

Prof. Dr. Johannes Stelling
Dean, Faculty of Industrial Engineering
Hochschule Mittweida

We are pleased to share with you the second issue of the International Journal of Psychology and Strategic Communication (IJPSC). Building on the strong foundation of our first volume, this new edition brings together diverse academic voices exploring how technological change, strategic thinking, and international cooperation intersect in today's global environment.

This issue focuses on some of the most pressing and forward-looking topics shaping our time: the ethical and strategic use of artificial intelligence in international business, the challenges of managing remote and multicultural teams, the transformation of global value chains, and the evolving nature of behavioral finance and crisis leadership. Other contributions examine how international marketing strategies must adapt to cultural differences, and how international logistics and trade structures are being redefined, especially in the context of European–Ukrainian relations and post-pandemic recovery.

We are especially pleased to include contributions from external scholars and experts who offer valuable perspectives on AI-driven innovation, smart cities, sustainable transformation, and energy systems. Their insights deepen the journal's reach across disciplines and reinforce its role as a platform for applied, globally relevant research.

This issue was completed in close proximity to International Week 2025, held from June 2nd to 6th at Hochschule Mittweida, under the theme Integrated Internationalisation: Leveraging Artificial Intelligence. I had the honour of attending this event in person and engaging in open, insightful conversations with students, professors, and international guests. It was a week marked not only by academic exchange but also by the formation of genuine friendships and lasting academic partnerships, particularly with our Ukrainian colleagues and students.

As Professor of Corporate Governance, Management, and Innovation at Hochschule Mittweida and Dean and Professor of International Business Administration at the Innovative University of Applied Sciences in Cologne (INU), I am privileged to witness firsthand how international academic networks are evolving. At both institutions, I work closely with students and faculty on topics ranging from business fundamentals and economics to digital transformation and intercultural cooperation. These perspectives are increasingly reflected in the contributions to this journal.

The discussions during International Week made it clear that internationalisation today is no longer limited to physical mobility or digital learning alone. Instead, it calls for an integrated approach where intercultural experience, technological development, and human connection come together to strengthen academic cooperation and mutual understanding. This philosophy resonates deeply with the vision and purpose of IJPSC.

All contributions in this issue are published open access and are assigned DOIs to ensure academic visibility and long-term impact. We extend our heartfelt thanks to all authors, reviewers, partners, and technical contributors, especially our Ukrainian collaborators whose support in developing the journal's platform and visual identity has been invaluable. We hope this volume offers new perspectives, practical insights, and meaningful inspiration. We warmly invite you to be part of the ongoing dialogue.

Prof. Dr. rer. pol. Eckehard Krah
Editor-in-Chief

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CRISIS MANAGEMENT IN INTERNATIONAL COMPANIES: HOW TO RESPOND TO GLOBAL CHALLENGES

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Abstract

The article examines key aspects of crisis management in international companies in the context of global challenges such as pandemics, political conflicts, and economic crises. It outlines strategies that help companies adapt to rapid changes in the global market and maintain business stability. Special attention is given to analyzing the impact of international crises on operational activities, supply chains, financial performance, and company reputation. The article also explores the role of leadership and proactive strategies in effectively overcoming crises.

Keywords

Crisis management, Global challenges, Stability, Management, Adaptation, International companies.

Problem statement

In today's world, international companies are facing increasingly complex and unpredictable global challenges, such as pandemics, political conflicts, economic crises, and changes in the regulatory environment. These crises not only jeopardize business stability but can also cause lasting damage, affecting supply chain operations, financial performance, and reputation.

The problem is that it is difficult for international companies to predict when and how such crises will occur, as well as to adapt quickly and effectively to new conditions. There is a need to develop reliable crisis management strategies that will allow companies not only to successfully overcome crises but also to maintain or even strengthen their positions in the global market.

Relevance of the chosen topic

The topic of crisis management for international companies is extremely relevant due to frequent global challenges, such as pandemics, political conflicts, and economic instability. The unpredictability of these events poses serious threats to the stable operation of the business, and companies are forced to respond quickly to crises to maintain their competitive advantage. Analyzing effective crisis management strategies will help businesses to better prepare for possible shocks and ensure sustainability in a changing environment.

Analysis of recent research and publications

Many scientists and economists are studying this topic. Companies regularly face significant challenges to remain competitive. This is the reason for writing many papers and conducting a large number of studies. In order to cover the topic from different angles, the article considers the works of Prodius O.I., Adyrova T.I., Rudnichenko E.M., Stangret A.M., Pushak Y.Y., Dzhur O.E. and others.

Purpose of the study

The purpose of the study is to identify and analyze effective crisis management strategies for international companies that allow them to adapt to the global challenges that enterprises face very often. The purpose of the article is to analyze the impact of crises, the variety of approaches in the process of adaptation, and to study ways to maintain stable business operations.

Presentation of the main research material and results obtained

1. Definition of crisis management in the context of international companies

In the context of the global increase in natural, economic and social disasters and their tangible, sometimes decisive impact on the fate of commercial organizations, the issues of analyzing the essence of the crisis and responding to it adequately are becoming extremely important for theorists and practitioners today. A modern specialist is forced to work in a dynamically changing reality due to digital technologies and globalization processes, in the face of crises, the frequency and variety of forms of which, according to experts, will only increase. In particular, a study by the British organization Oxfam, based on an analysis of data from the UN, the International Committee of the Red Cross and the University of Louvain in Belgium, showed that over the past 20 years, the number of annual natural disasters alone has increased 4 times. According to the EU, 2010 was the largest year in terms of the number of natural disasters and the economic losses caused by them at $109 billion, which is three times more than in 2009. In this context, a number of the world's leading companies (Parmalat, Enron, WorldCom) have ceased to exist at different times because they failed to respond adequately and timely to the development of crisis situations. And this is just one of the types of crises that companies can face. Different crises have different impacts on macro- and microeconomic processes. Their typology is discussed below.

2. Overview of the main types of crises affecting international business

Table 1 (see Appendices) shows the classification of crises by their characteristics. According to the structure of relations in the socio-economic system and the differentiation of the problems of its development, separate groups of economic, social, organizational, technological, and psychological crises can be distinguished.

Economic crises are the result of sharp contradictions in the country's economy or the economic condition of an individual enterprise. They mean a sharp deterioration in the country's economic situation, which is manifested in a significant decline in production and sales, disruption of existing production ties, loss of competitive advantages, bankruptcy of enterprises, increased unemployment and, as a result, a decline in living standards and welfare. A special case within this group can be considered financial crises - a deep disruption of the country's financial system, accompanied by inflation, non-payments, currency instability, and a crisis in the Central Bank. These signs characterize contradictions in the state of the financial system or the financial capabilities of the state or other business actors. Financial crises can be considered crises of monetary expression of economic processes.

Social crises arise when the interests of different social groups or entities clash: employees and employers, trade unions and entrepreneurs, etc. This group also includes political crises, i.e., troubles in the political structure of society, crises of power, crises of realization of interests of different social groups, classes, and in the management of society. Very often, social crises are a continuation and addition to economic crises, although in some cases they can arise on their own (for example, over the style of management, dissatisfaction with working conditions, attitude to environmental problems, etc.

Organizational crises manifest themselves as crises in the distribution of responsibilities and integration of activities of individual units (branches of administrative units, regions, branches or subsidiaries). Very often, such crises paralyze organizational activities or cause excessive bureaucratization due to the wrong selection of managers for regional teams.

Technological crises arise when there is a clear need for new technologies in the form of problems with new technological ideas. They can be a crisis of technological incompatibility of products or a crisis of rejection

of new technological solutions. More generally, such crises can be viewed as crises of scientific and technological progress (STP), i.e., as an aggravation of contradictions between its trends, opportunities, and consequences.

Psychological crises are manifested in the form of widespread stress, uncertainty, panic, fear for the future, dissatisfaction with work, legal security, and social status. They arise in the social and psychological climate of a society, a team, or a separate group.

Almost every company has faced some difficult situation during its operations that hindered its further development. But there are crises in history that have left their mark on both the economy as a whole and the success of individual companies. Such global crises have also brought many innovations, which can be considered a positive effect. The 21st century has seen such large-scale crises.

3. Examples of recent global crises

The global financial crisis of 2008 resulted in a significant increase in unemployment and a growing number of financially insolvent enterprises in every sector of the economy in Ukraine and other countries. Demand for Ukrainian exports declined significantly, and foreign capital inflows almost stopped. Banks lost their ability to attract syndicated loans, and their ability to refinance old debts remained limited. As a result, banks in many countries have significantly reduced lending to both legal entities and individuals, which had been one of the most important sources of investment and consumption before the crisis. As a result, demand for cars, housing and a number of consumer goods decreased, which can be explained by objective macroeconomic instability and a number of subjective factors, including the inability of management to carry out effective crisis management, the ability to identify problems in a timely manner and take the necessary measures. Financial difficulties at enterprises are caused by a synergistic combination of the negative effects of the global financial crisis, certain imbalances in the development of all types of activities, and a number of internal problems that are typical for most domestic business entities. In general, the crisis of 2008 pushed international companies to search for new strategies for survival and recovery, focusing on efficiency, sustainability and risk management.

COVID-19 has also had a significant impact on international companies:

- Disruptions in supply chains: The shutdown of production and border closures have disrupted global supply chains, especially in the automotive and electronics industries.
- Shift in consumer demand: Demand for goods and services has shifted, with online sales and need for technology going up, while tourism and retail are among those which are badly hit.
- Remote working: The switch-over to working from home has forced many companies, and thus, the productivity and work structure of the companies are affected.
- Lessened income and financial losses: Lockdowns resulted in economic shutdowns of businesses, leading to bankruptcies and reduction of staff.
- Accelerating digitalization: The crisis has pushed companies to actively implement digital technologies and online platforms to support operations and customer interaction.

As we can see, Covid-19 has had a significant impact on many areas of business operations. International companies were under particular pressure from such crises, and not all of them were able to withstand it. Many companies ended up in bankruptcy, but some managed to avoid this scenario.

Examples of companies that have suffered from such challenges:

1. Lehman Brothers (Financial crisis of 2008)

The American investment bank Lehman Brothers became a symbol of the global financial crisis of 2008. As a result of massive losses related to mortgage loans, the bank declared bankruptcy. This led to a large-scale chain effect on financial markets around the world (MyFin, 2021b).

2. General Motors (Financial crisis of 2008)

During the 2008 crisis, the American automotive giant General Motors (GM) experienced serious financial difficulties due to a sharp drop in demand for cars. The company was forced to declare bankruptcy and receive financial assistance from the US government to avoid a complete collapse (MyFin, 2021a).

3. Airlines Industry (COVID-19 pandemic)

The aviation industry has been hit by the COVID-19 pandemic as international flights have been suspended and travel demand has plummeted. Companies such as British Airways, Delta, Lufthansa, and Emirates have suffered huge losses, forcing them to lay off thousands of employees, suspend flights, and receive government support (Garrow, 2020).

4. Boeing (COVID-19 pandemic)

The American aircraft manufacturer Boeing has experienced serious problems during the COVID-19 pandemic. Declining demand for airplanes and logistics problems have severely hit the company's finances. The pandemic was compounded by the continuing effects of the crisis due to the suspension of the Boeing 737

MAX model after several plane crashes (Garrow, 2020).

5. ExxonMobil (Oil price decline in 2020)

Due to the COVID-19 pandemic, oil demand has fallen sharply, leading to lower oil prices in 2020. ExxonMobil, one of the largest oil and gas companies in the world, suffered significant losses and made a loss for the first time in a decade. The company was also forced to reduce investments and the number of employees (BBC, 2021).

6. Nokia (Technological and market changes)

The Finnish company Nokia, once a leader in the mobile phone market, has lost its position due to global changes in technology. The shift to smartphones and changes in consumer preferences, including the emergence of the Apple iPhone and Google Android, led to a sharp decline in sales and the company's market influence (Minds, 2018).

These examples show how international companies can be vulnerable to global economic, political and natural crises, and how these crises can significantly change their business. Businesses operating globally are more sensitive to market fluctuations and crises, and the reasons for this are discussed below.

4. Why international companies face greater risks due to global challenges

International companies face greater risks due to global challenges for several key reasons:

1. Variety of market conditions
   Each market in which an international company operates has its own economic conditions, legal requirements and competition. Vulnerability to economic downturns or regulatory changes in each country increases the risks for companies operating in the international market [4].
2. Political instability
   International companies operate in different political environments, which can lead to risks associated with changes in governments, political regimes, or the introduction of new laws. Trade wars, changes in tariffs, or sanctions can also directly affect business.
3. Currency fluctuations
   Operations in different countries involve the use of several currencies, which exposes companies to currency risk. Exchange rate fluctuations can significantly affect the company's profitability and asset value.
4. Cultural and social differences
   International companies need to adapt their products, services, and marketing strategies to different cultures and social customs. This adds complexity to brand and performance management in different markets.
5. Disruptions in the supply chain
   Global companies depend on complex supply chains spanning many countries. Disruptions due to natural disasters, political crises, or global pandemics can paralyze production and supply, as happened during COVID-19.
6. Geopolitical risks
   Conflicts between countries, international sanctions, terrorism or instability in certain regions can pose significant threats to international companies. They may be forced to reduce their business or shut it down completely in certain regions.
7. Environmental and climate change
   Climate change and natural disasters, such as floods, hurricanes, and fires, can affect companies' operations, especially in the agricultural and manufacturing sectors. In addition, international companies are facing pressure to implement environmentally sustainable practices around the world.
8. Changes in consumer preferences
   Globalization facilitates the rapid spread of trends and changes in consumer preferences. Companies need to constantly adapt to changes in demand in different markets, which adds unpredictability to planning and production.
9. Global competition
   International companies are facing stiffer competition not only locally but also globally. Competition from local or other international players requires continuous improvement and optimization of business processes.
10. Technological risks and cyber threats
    International companies often depend on complex information systems that can be vulnerable to cyberattacks. In the context of globalization and digitalization, the risk of data loss, disruption of

operations, or theft of intellectual property is higher.

Thus, the global nature of international companies increases the number of external factors that can affect their stability and development, making them more vulnerable to various risks.

The main types of external risks to business are shown in Fig. 1, and the diagrams of strategic risks and hazards are shown in Fig. 2 and Fig. 3.

If you look at the list of such risks, the question arises: How to protect your business from them? It is for this purpose that a separate category of management has been created, which includes many aspects and is characterized by a variety of choices for company executives. After analyzing their situation, they choose a specific crisis management strategy.

5. Crisis management strategies for international companies

Risk management is a specific branch of management that requires knowledge of firm theory, insurance, analysis of business activities, mathematical methods of optimizing economic tasks, etc. Risk management is a set of methods, techniques and measures that allow to predict the occurrence of risk events to a certain extent and take measures to reduce them. Risk management (RM) is a system of risk management and economic (financial) relations arising in the course of this management. RM is based on the purposeful search and organization of work to reduce the degree of risk, the art of obtaining and increasing income in an uncertain economic situation.

A risk management strategy is the art of managing risk in an uncertain business situation, based on risk forecasting and the application of risk mitigation techniques.

The following rules apply to the risk management strategy:

- maximum winnings.
- optimal probability of the outcome.
- the optimal combination of gain and risk.

Approaches to risk management have changed and continue to change. Fig. 4 shows the evolution of risk management systems. Fig. 5 shows the main aspects of crisis management.

Depending on the type of risk and crisis, company leaders apply different methods of protection or control. The main strategies for companies in crisis situations are:

1. Avoidance

Refusal to implement a risk-related activity (project). Such a decision is made in case of non-compliance with the specified risk management principles. For example: the level of possible losses, as well as additional costs associated with risk mitigation or risk transfer to another person, are unacceptable to the entrepreneur; the level of possible losses significantly exceeds the expected return (profit), etc. Risk avoidance is the simplest and most radical direction in the risk management system. It makes it possible to avoid possible losses and uncertainty entirely. At the same time, risk avoidance usually means that an entrepreneur gives up profits. Therefore, in case of an unjustified refusal to undertake a risk-related activity (project), there are losses from unused opportunities.

2. Aggressive strategy

The process of crisis management is aimed not at maintaining market positions, but at gaining new ones where competitors have suffered the most damage from the crisis.

Crisis management consists of the following stages:

- Diagnosing and assessing the parameters of the crisis;
- Development of crisis management concepts aimed at planning strategic and operational measures;
- Implementation of the adopted concept to overcome the crisis;
- Continuous monitoring of external and internal factors.

Given the need to shift the emphasis of crisis management towards more aggressive management, we propose the following sequence of stages in the deployment of crisis management:

- preparing to study the situation and further diagnose it;
- diagnosing and assessing the parameters of a crisis or pre-crisis state;
- development of concepts for using the crisis to one's advantage, aimed at planning strategic and operational measures for active counteraction;
- Implementation of the adopted concept of using the crisis to one's advantage;
- continuous monitoring and control of external and internal factors.

The main difference, as we can see, is the development of the concept of using the crisis to one's advantage.

3. Diversification

It is one of the key tools for mitigating risks in the operations of international companies. This strategy is

preventive. The essence of diversification is not to rely on one source of income, market, product or partner, but to expand the business in different directions to minimize the impact of possible crises.

Types of diversification:

1. Geographical diversification
   This is the expansion of business to new markets or countries. This is especially important for international companies, as a crisis in one region (e.g., political instability or economic downturn) will not affect the entire company if it is represented in several markets. For example, a company that has production facilities and sales markets in Europe, Asia, and North America can smooth out the effects of a crisis in one of these areas.
2. Product diversification
   This is the development of new products or services that reduce dependence on one segment. For example, a company that used to produce only electronics can start producing home appliances or software. This allows the company to stay afloat even if the demand for one product falls due to the crisis.
3. Diversification of suppliers
   Providing the company with materials and components from several different suppliers from different regions helps to avoid supply chain disruptions that can occur during crises. For example, if one supplier experiences difficulties (due to natural disasters, wars, or sanctions), the company can switch to other partners.
4. Financial diversification
   This is the distribution of a company's financial assets among different instruments and markets to reduce risks. For example, investing in different currencies, shares of different companies, or using different banking institutions. This allows the company to remain financially stable in the face of currency fluctuations or financial crises in different countries.

Each type of diversification has its own advantages and disadvantages and reduces risks in certain ways, which can help a company survive difficult times. Companies that diversify their business operations can adapt to changes more quickly and have a better chance of surviving in the face of global challenges. Ultimately, a well-designed diversification strategy can be a powerful growth tool that will allow companies to emerge from the crisis stronger (Tkachenko & Bondarenko, 2024).

It is also important to constantly monitor the situation in the external economy, systematically assess the risks to the company and develop an effective response method. Of course, there are many more scenarios that managers can follow to keep their company successful. We will analyze them in more detail.

6. Crisis management trajectories

The trajectory of crisis management (CM) is the path along which management moves, enabling an enterprise in a crisis to create new and new prerequisites for increasing its efficiency. The trajectory of crisis management as a way of developing the efficiency of an enterprise is closely intertwined with the concepts of "strategic management" and "strategy".

Fig. 6 shows the types of trajectories of enterprise crisis management.

Unnumbered lists are formatted as follows:

1. The trajectory of "rapid rise and excessive costs".
   A company in crisis, using aggressive crisis management, uses a minimum of management costs to achieve its goals and increase profitability. However, over time, such costs increase, reducing the effectiveness of crisis management.
2. The trajectory of "rapid growth and efficiency growth".
   A company in crisis, through aggressive crisis management, uses a minimum of management costs to achieve its goals and increase profitability. Over time, such costs are reduced, increasing the effectiveness of crisis management.
3. The trajectory of "slow takeoff and excessive costs".
   A company in crisis, while implementing aggressive crisis management, uses maximum management costs to achieve its goals and increase profitability. However, over time, such costs increase, significantly reducing the effectiveness of crisis management.
4. The trajectory of "slow rise and increasing efficiency".
   A company in crisis, through aggressive crisis management, uses maximum management costs to achieve its goals and increase profitability. Over time, such costs are reduced, significantly increasing the effectiveness of crisis management.
5. The trajectory of "reactive success".

The company succeeds without incurring additional costs to overcome the crisis. This is due to the new quality that was obtained earlier but was not relevant, the growth of the company's image and, as a result, the growth of the value of the company's securities on the stock market.

Under modern forms of business management, in order to reduce the degree of risk, increase competitiveness and stability, enterprises should constantly have a consolidated picture of the results of all types of activities, which is possible only after their comprehensive economic diagnostics. Such information is the basis for making effective management decisions and developing both crisis management strategies (which are the basis of TMA) and crisis management programs as the main tools for ensuring the achievement of long-term goals and objectives of the enterprise, the course of action and the allocation of resources necessary to achieve the goals.

To better understand the different approaches to overcoming difficulties in an enterprise, let's look at specific cases of international companies that have managed to continue their profitable operations

7. Overview of the main types of crises affecting international business

1. General Motors

   Crisis: In the early 20th century, the United States went through the Banking Panic of 1907. The central bank had not yet been established, and excessive lending led to massive bank closures. The panic lasted only a couple of months, and the economy and business recovered for another two years.

   What the company did: GM's founder William Durant was not at a loss and in 1908 switched from producing horse-drawn carriages to manufacturing automobiles. He was almost the first businessman with such an idea.

   Result: When the country's economy stabilized, William Durant was able to buy up other car manufacturers, such as Oldsmobile, Cadillac, and Pontiac, and invest in new developments (BusinessViews, 2020).

2. Netflix

   The crisis: 2009, the peak of the global economic downturn.

   What the company did: Since the company's inception, it has been selling and renting movies on DVD. A year after the company was founded, it focused exclusively on rental. In 2009, the service had 3 million customers, which was the year of the biggest crisis. This success was made possible because the company offered streaming services - subscribers could watch an unlimited number of movies online.

   The result: From 2006 to 2011, the number of subscribers increased by 290% from 6.3 million to 24.6 million, and the Netflix brand is known all over the world (BusinessViews, 2020).

3. Walmart

   One of the largest global retail chains with more than 10,000 stores and over 220 million weekly visitors.

   For example, in 2009, it launched the Walmart Marketplace to offer the widest possible range of products to the audience, and in 2013, it launched a grocery pickup service that did not take off immediately, but during the pandemic, one in five shoppers chose this type of shopping. In order to compete with Amazon, Walmart acquired a number of e-commerce companies and created the Walmart+ service (similar to Amazon Prime) with free next-day delivery (Majevska, 2022).

4. Marvel

   The company, which owns a universe with a multi-million fan base, has been on the verge of extinction more than once. For example, in the 90s, its main business, comic books, ceased to be profitable, primarily due to high competition. The business launched new directions - a chain of restaurants and CDs, which also failed to bring the desired result. The company had to lay off a third of its staff and was on the verge of bankruptcy.

   After the creation of Marvel Studios, the world saw the first films with characters from the universe - Blade, Spider-Man, and X-Men became successful, but a significant share of revenues was eaten up by license fees.

   Then the company took a bold step - it received a $525 million loan for 10 comic book adaptations from Merrill Lynch, but in case the first films failed, the rights to the subsequent ones would have to be given away. Nevertheless, the success was undeniable: the Iron Man movie grossed $600 million, and the studio created the most successful franchise in Hollywood history (Majevska, 2022).

Of course, there are many such examples, but there are also many companies that failed to effectively use the limited amount of time given to respond to difficult situations. Therefore, it is important to remember the main principles of crisis management and apply them correctly in a particular case

Conclusions

Preparedness for emergencies, including sudden crises, is important because preventive actions can always be taken. Companies that have contingency plans in place are more likely to adapt to new conditions and mitigate negative consequences.

Crisis situations, such as the financial crisis of 2008 and the COVID-19 coronavirus pandemic, have brought a number of important lessons for international businesses:

- Diversification of risks is important: companies should not be too deeply involved in one region or sector, and they should also work with different sources of supply or sales.
- Make the business agile and adaptive: business models of organizations should be such that, if necessary, they can quickly adjust to new market trends.
- The place and role of digital technologies: Digital tools and platforms help companies to organize uninterrupted business operations, remote work, and customer service.
- The importance of the human factor: rational crisis management involves the participation of all employees and the creation of an atmosphere of mutual assistance.
- The need for communication: clear and adequate information to all participants in the center process, including the entire system, is an important factor in overcoming the crisis.

Risk management safeguards an organization from the unexpected and boosts its robustness. Similarly, with effective management of crises, the organization has a few unique benefits which assist in ensuring continued profitability:

- Enhancing reputation: Effectively managing crisis situations creates confidence in clients, investors and partners as it shows one is capable of solving problems.
- Employee retention: People are less likely to leave an organization that they perceive as stable.
- Cost containment: Irrespective of the situation likely to occur, management strategies are put in place prior and this assists in preventing large losses from being experienced.
- Decreased downtimes: Restoring functionality takes a shorter duration for an organization which has designed its own mechanisms prior to all other organizations.

Thus, crisis management is not just a necessity, but a strategic advantage for any international company. By investing in the development of crisis management systems, companies can increase their resilience, adaptability, and competitiveness in a dynamic and unpredictable world.

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Applications

Table 1: Classification of crises

Classification criteria of crisis	Types of crisis	Characteristics of crisis types
Time of impact	Short-term	Duration does not exceed one year
	Medium-term	Duration from one to three years
	Long-term	Impact lasts more than three years
Cause of occurrence	Objective	Arises due to the influence of objective factors
	Natural	Arises due to the influence of natural factors
	Accidental	Arises due to the influence of accidental factors
	Subjective	Arises due to the influence of subjective factors
	Artificial	Arises due to the influence of artificial factors
	Law-based	Caused by certain laws and regularities
	Cyclical	Caused by the cyclical development of the organization
Consequences	Destructive	Leads to the destruction of the socio-economic system (bankruptcy, liquidation)
	Recovery	Leads to the improvement of the system's functioning
	Aggravation	Deterioration of indicators towards the maximum possible deterioration
	Sharp Decline	Rapid change in key performance indicators towards deterioration
	New Crisis	Leads to the emergence of a new crisis
	Weakening	Slight deterioration of key performance indicators, weakening of business positions
	Soft Exit	A crisis that does not cause significant damage and allows effective anti-crisis management
Special Management Functions	Strategic Management	Arises due to ineffective strategic management
	Personnel	Arises due to ineffective personnel management

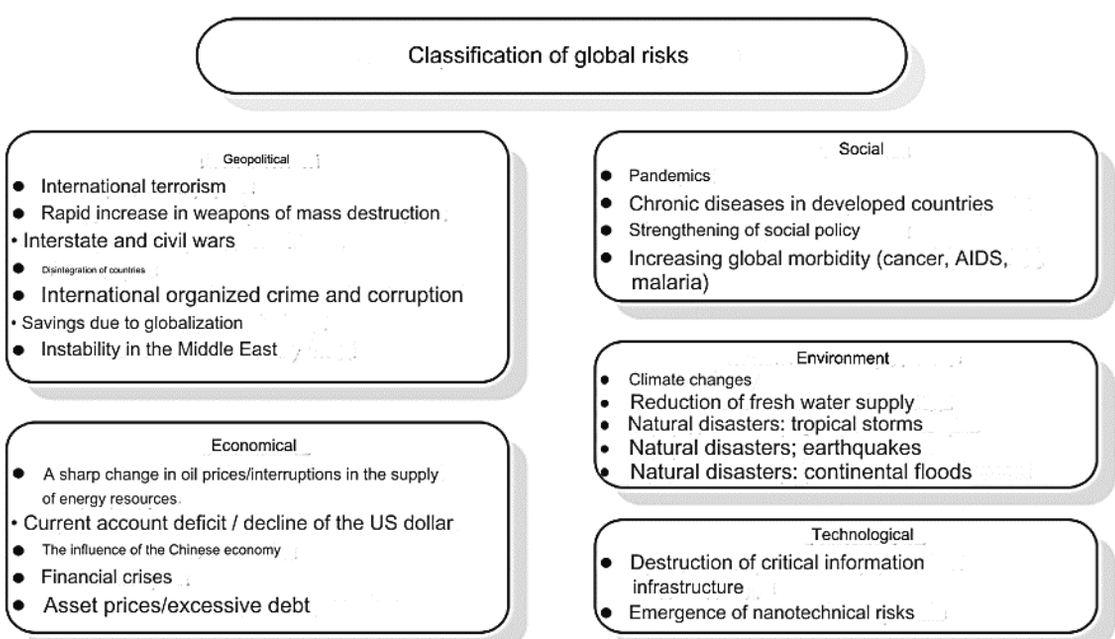

Fig. 1: Classification of global risks.

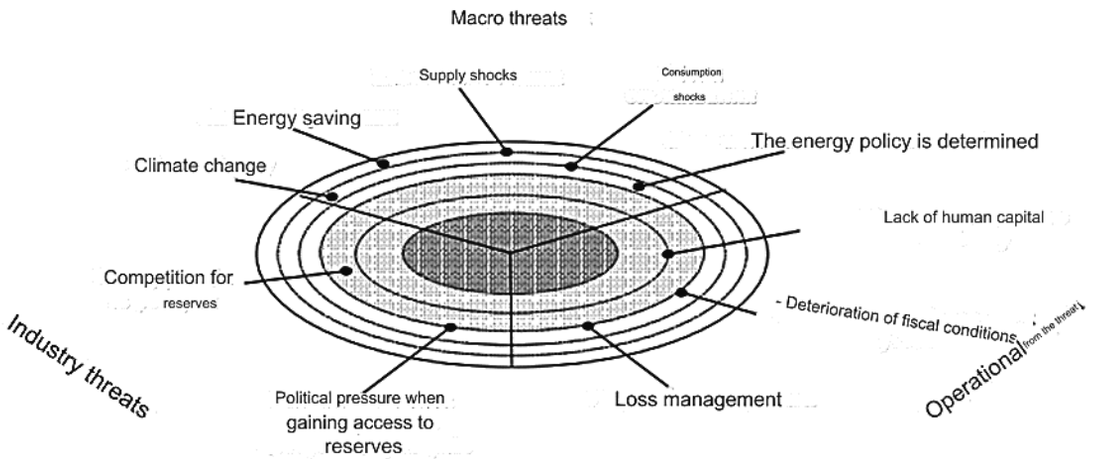

Fig. 2: Strategic risks of international business.

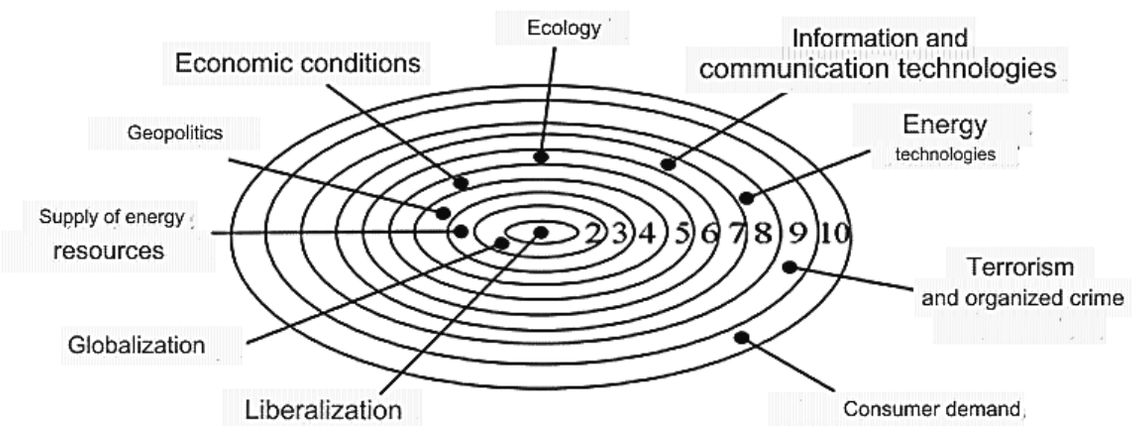

Fig. 3: The main potentially dangerous factors for the development of corporations.

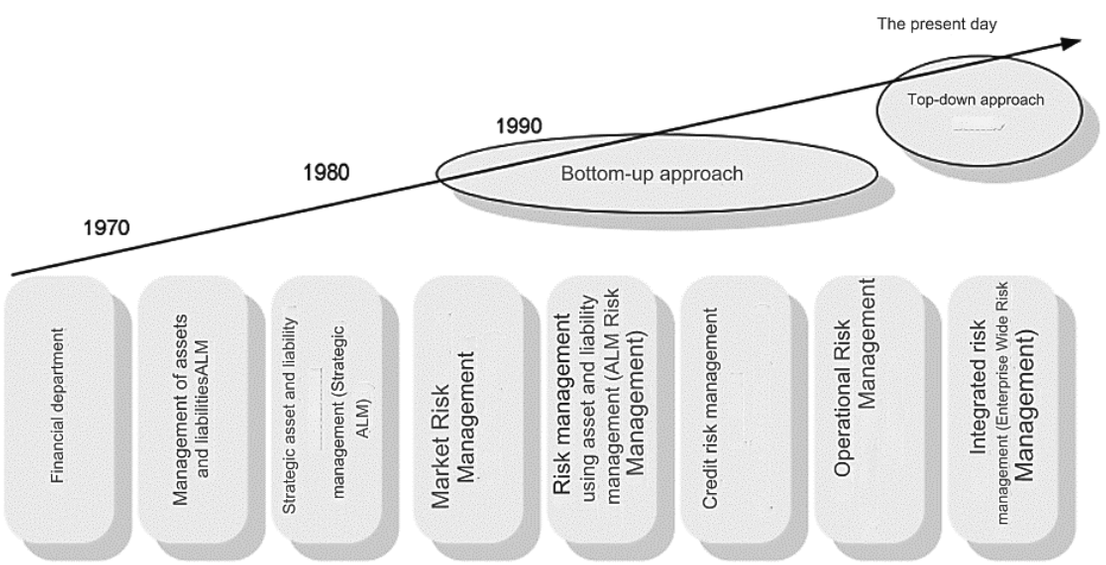

Fig. 4: Evolution of risk management systems.

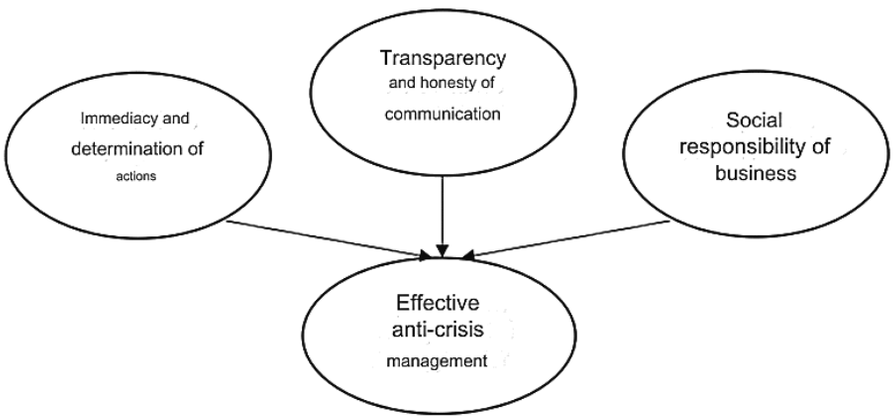

Fig. 5: The most important aspects of crisis management.

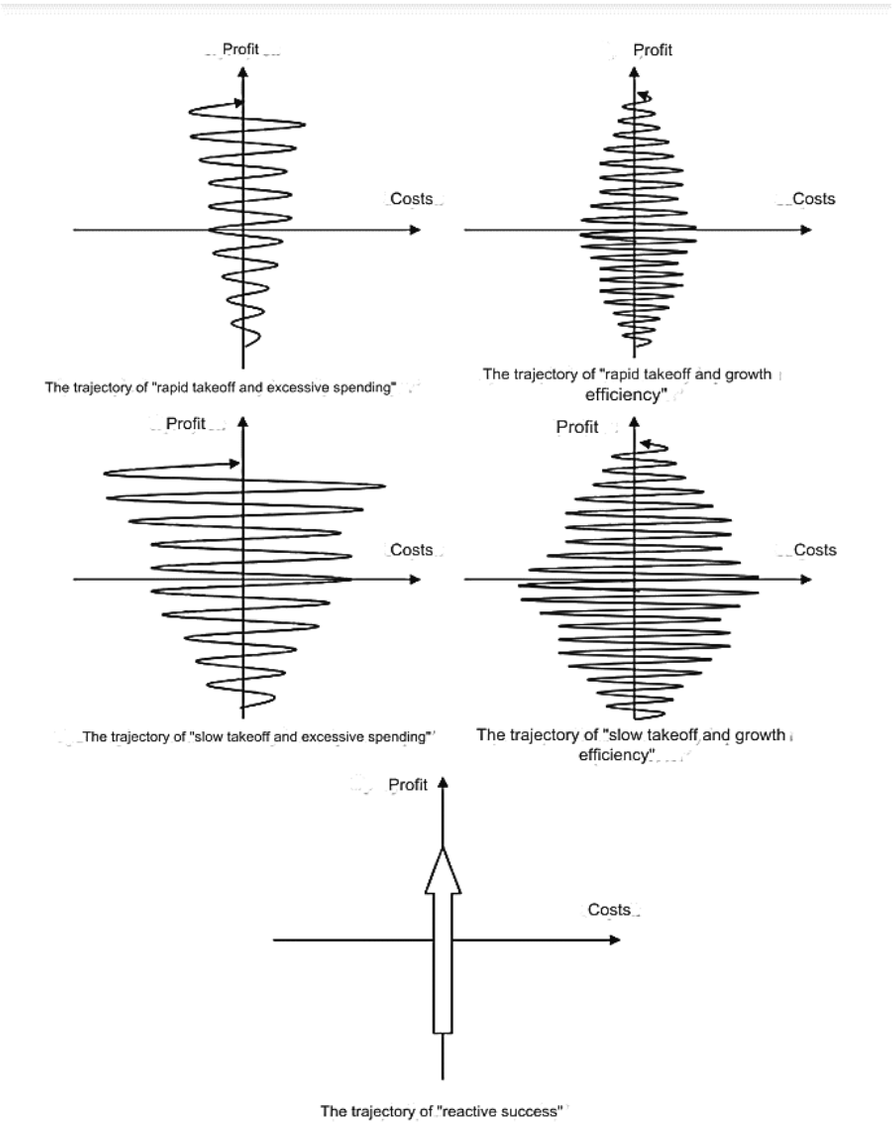

Fig. 6: Types of trajectories of enterprise crisis management.

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STRATEGIC MANAGEMENT OF ENTERPRISES AS A KEY COMPONENT OF MANAGEMENT SYSTEMS

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Abstract

The practical aspects of strategic management and its systemic support, which are key to the effective functioning of enterprises in complex, uncertain, and dynamic socio-economic conditions, were studied. The concept, mission, and development directions of the enterprise were formulated, strategic goals were defined, and a strategic plan was developed to achieve competitive advantages. The global market, which provides instant access to information, contributes to increased competition, requiring enterprises to respond quickly to changes.

A strategic management system was developed to meet the information needs of management and is focused on the prospective development of the business. An integrated system of accounting, planning, analysis, and control was proposed, which includes digital strategic management tools, facilitating effective decision-making and ensuring stable enterprise development in a competitive market. Thus, strategic management defines specific parameters for achieving strategic tasks, contributes to increased profitability, revenue growth, and product quality improvement, ensuring the long-term competitiveness of the enterprise. Further research in this area is of practical importance for the development of the national economy and for increasing the competitiveness of Ukrainian enterprises in the global market.

Keywords

Enterprise, Strategic management, Strategic goals, Strategic analysis, Management principles, Market potential.

Problem statement

In today's dynamic business environment, strategic management has become an essential component of successful enterprise operations. Changing market conditions, globalization, rapid technological advancement, and increased competition require companies to manage not only their operational activities but also their long-term strategic goals effectively. The modern economy is characterized by instability, necessitating flexible and adaptive management strategies. Companies with effective strategic plans are better equipped to navigate economic crises and maintain sustainable development. Moreover, technological advancements present both opportunities and threats for businesses. Strategic management helps in determining how to implement innovations, leveraging technological advancements to increase efficiency and explore new markets. It also involves the development and implementation of sustainable development policies, contributing not only to economic growth but also to social

progress. Additionally, companies must continually adapt their strategies to changes in legislation and regulatory requirements that impact their operations. Strategic management enables businesses to be prepared for such changes and respond effectively, especially in highly competitive market conditions.

Relevance of the chosen topic

The study of strategic management is extremely important in the context of modern challenges and opportunities. It allows for a deeper understanding of how to effectively manage enterprises in conditions of uncertainty and rapid change, ensuring their sustainable development and competitiveness. The current research is focused on analyzing and summarizing the key concepts, methods, and models of strategic management, which will contribute to enhancing the effectiveness of managerial decisions and the long-term success of enterprises.

Analysis of recent research and publications

Ukrainian and foreign scholars and researchers have made significant contributions to the development of the theory and practice of strategic management for enterprises. Their works reflect the specific characteristics of the Ukrainian economy, its transformations, and the challenges faced by enterprises in conditions of instability and globalization. This review examines the main works of Ukrainian scholars related to strategic management and its role in the management system. One of the researchers who highlighted the critical role of strategic management in the global economy is (Osterwalder & Pigneur, 2010). In their work, they emphasized the importance of adapting Western strategic management models to the conditions of Ukraine's transitional economy. Their studies focus on the development and implementation of strategies at the enterprise level across various economic sectors.

The work of (Kormakova, Kruhlyanko, Peniuk, Ursakii, & Verstiak, 2023) is dedicated to analyzing the competitive advantages of Ukrainian enterprises. They proposed a model that takes into account the specifics of the national market and adapts classical theories of strategic management to Ukrainian realities. (Bogers, Chesbrough, Heaton, & Teece, 2019) investigated the role of innovation in strategic enterprise management, underlining the importance of implementing new technologies and processes to enhance the competitiveness of enterprises in both domestic and international markets. (Bestuzheva, 2023) research is focused on the financial aspects of strategic management, exploring issues of financial stability, cost optimization, and improving the efficiency of financial resources

Contemporary Ukrainian studies in the field of strategic management often focus on adapting international approaches to the Ukrainian context. For example, (Bondar & Pashchenko, 2024) studied the implementation of the Balanced Scorecard system in Ukrainian enterprises, highlighting how this methodology allows companies to more effectively monitor and manage their activities. (Rudnytska & Komarovsky, 2023) explore the possibilities of applying Agile management approaches in Ukrainian realities, proposing adapted methods to improve management processes in conditions of high uncertainty.

Practical aspects of strategic management have been studied by many Ukrainian researchers. (Shpak & Gursky, 2023) analyze case studies of successful strategy implementation in Ukrainian enterprises, emphasizing the role of leadership and organizational culture in achieving strategic goals. Additionally, (Shulha, Tereshchenko, & Sharlai, 2020) focus on the challenges enterprises face during the implementation of strategic management. Overall, the diversity and breadth of research on strategic management underscore the importance of further studies to enhance the practical foundations of strategic management science.

Purpose of the article

The objective of this article is to explore the role of strategic management in ensuring the effective functioning and sustainable development of enterprises in a dynamic and uncertain business environment.

Research tasks are as follows:

- to examine the main theoretical and methodological approaches to strategic management, including both classical and modern models;
- to study the methods and models used for analyzing the external and internal environments of an enterprise.
- to formulate recommendations for improving the effectiveness of strategic management in the context of the modern business environment.

Presentation of the main research material and results obtained

In today's business environment, characterized by high levels of dynamism and uncertainty, the implementation and development of strategic management have become key elements for the successful functioning of enterprises. Strategic management is crucial for modern enterprises, enabling them to respond effectively to challenges, leverage emerging opportunities, and ensure sustainable development. It is essential that strategic management be integrated at all levels of the enterprise and supported by appropriate resources and technologies. Only then can an enterprise achieve its long-term goals and maintain competitiveness in the market.

After defining the mission and vision, the enterprise must formulate strategic goals that should be specific, measurable, achievable, relevant, and time-bound (SMART). Based on these goals, specific strategies are developed, which may include innovative projects, market expansion, product or service improvement, and other initiatives. Implementing the strategy requires careful planning and organization. A crucial aspect is building an effective organizational structure that supports strategy implementation. This should include the creation of specialized teams, adequate resource allocation, and the implementation of an employee motivation system. To ensure the success of strategic management, it is necessary to regularly monitor and evaluate the execution of the strategy. This allows for timely identification of deviations from the plan and corrective actions. It is important to use both quantitative and qualitative indicators to assess effectiveness. A balanced scorecard (BSC) can be a useful tool for monitoring progress across various areas of enterprise activity (Rousul & Hidayati, 2022).

In the current innovation-driven economy, Ukrainian enterprises face the need to quickly adapt to market instability and develop long-term competitive policies and development strategies. As a result, the practical aspects of strategic management and its systematic support are of particular importance. Enterprises across different sectors operate in complex, uncertain, and dynamic socio-economic conditions. The global market, which provides instant access to information about any products and suppliers worldwide, has led to significant increases in competition. A rigid, inert management structure does not allow for a rapid response to changing market demands. However, the intensification of competition is not the only problem; competition is also taking on new forms. The key to success in this competitive struggle is the ability to anticipate long-term changes and consistently implement innovations in products, services, technologies, and management, adapting to the rapidly changing market requirements in the context of the modern innovative economy.

Strategic management is a system that satisfies the informational needs of management, focusing on the prospective development of the business. Modern strategic management accounting provides informational support for the adoption, implementation, and evaluation of operational and strategic decisions based on systematized information that takes into account both the internal state of financial and economic activities and external factors influencing the organization. Strategic management should define strategic tasks and action plans through specific parameters, and the careful selection of performance indicators aligned with the overall business strategy is the main goal of the modern strategic management system.

The system includes various categories such as (Sinnaiah, Adam, & Mahadi, 2023):

1. Concept: the vision for the future of the enterprise, including the main characteristics of its activities, production program, product characteristics, partners, and key values.
2. Mission: the enterprise's purpose and desired outcomes in the long term.
3. Development Directions: the paths and methods from the present to the desired future, as defined by the enterprise's mission and concept. These are determined by tactical goals and plans that lead to the strategy's implementation.
4. Strategic Goals: quantitative and qualitative parameters for enterprise development, developed based on the concept, mission, industry analysis results, competitive assessment, available resources, and competitive capabilities. Goals should be clear, measurable, specific, and time-oriented.
5. Strategic Plan: a document outlining the overall direction of the enterprise and specific actions, formulated based on general data.

Fig. 1 presents actions and approaches that reflect the enterprise's overall strategy. There is also a certain part of the strategy that remains hidden from the surroundings—these are the steps that managers are only considering. Managers often prefer not to disclose certain elements of their strategy until the right moment. Strategy is necessary both for the corporation as a whole and for its individual divisions.

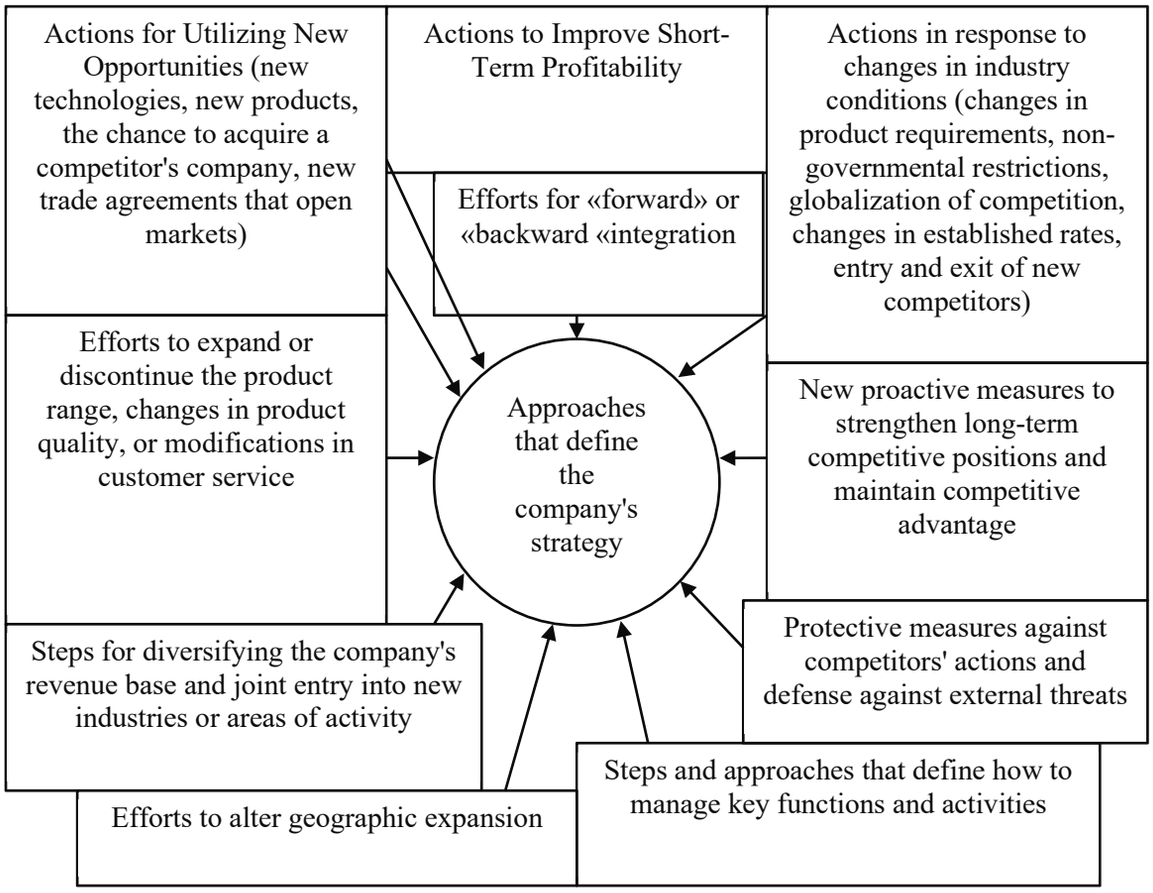

Fig. 1: Main Elements of a Modern Enterprise Strategy.
Source: Constructed based on data from (Feyer, Khaustova, & Gusti, 2023)

For narrowly specialized (single-industry) companies engaged in one type of business, corporate and business strategies align, as the strategy is developed for a single type of activity. Strategic management involves applying both general and specialized scientific approaches to problem-solving. According to (Voytovych & Tereshchuk, 2021), general scientific approaches include:

- systemic approach: this involves considering the enterprise and the functioning of strategic management accounting as elements of the strategic management system.
- comprehensive approach: this includes viewing strategic management accounting as part of financial and production activities that utilize all types of information.
- informational approach: Based on the use of modern computer technologies for strategic accounting.

Strategic management should be viewed as an integrated system of accounting, planning, analysis, and control that meets the informational needs of management when making strategic decisions, considering the interests of all process participants. The system is based on the interactions between management subjects (owners, top managers, specialists) and objects (internal business processes, performance indicators, external processes, and factors).

The strategic management system includes interconnected elements aimed at achieving competitive advantages, high market positions, increased profit, enhanced efficiency, and sustainable development of the enterprise. The enterprise must first establish stable financial indicators to ensure sustainable development and then move on to developing market stability. The use of strategic management methodology involves starting with setting the mission and forming the goals of the enterprise. During the implementation phase of the model, strategic analysis is performed, including the assessment of macroeconomic, natural, technological, social, political, legal, legislative, competitive, and internal factors (Table 1).

Table 1: The integrative role of strategic management for enterprise development.

Strategic goals	Components of enterprise development	Resource base of the enterprise	Expected results

Improving competitiveness	Innovation and technological development	Financial and human resources	Increase in market share
Improving product quality	Implementation of quality standards	Material and technical resources	Increased customer satisfaction
Increasing Profitability	Cost Optimization	Financial resources	Improved Profitability
Expanding Sales Markets	Marketing Strategies	Information Resources	Increased Sales Volume

Source: Developed by the author

Thus, the strategic management system is a set of interdependent components created to implement specific programs aimed at achieving competitive advantages, improving market positions, increasing profits, enhancing efficiency, and ensuring the stable development of the enterprise.

The main components of the strategic management system as defined by us are:.

1. Theoretical and Methodological Component: this includes the enterprise's mission, goals, vision, reports, internal and external documentation, as well as a set of theoretical concepts, approaches, principles, methods, authorities, norms, and procedures that regulate the process of managerial actions and decision-making regarding the management object, as well as corporate culture and philosophy.
2. Organizational and Managerial Component: this encompasses organizational structures that carry out the management process and control the implementation of the chosen strategy, the enterprise's hierarchy, the system of subordination, leadership, and staff motivation.
3. Process-Based Foundation: this includes strategic management processes such as strategic analysis, selection of strategic direction, strategy implementation, and the formation of the enterprise's goals, mission, and vision.
4. Information and Digital System: this includes digital tools for strategic management of the company and its divisions, a system for evaluating economic indicators over a specific reporting period, digital systems for analysis and control, internal electronic communication systems within the enterprise, and a database containing information about clients, suppliers, staff, and management.

These elements provide a comprehensive approach to management, facilitating effective decision-making and ensuring the stable development of the enterprise in a competitive market. They also form universal principles for managing the sustainable development of the enterprise, as presented below (Table 2).

Table 2: Universal Principles of Managing Sustainable Development of the Enterprise.

Principle	Characteristic
Scientific	Application of the most modern management methods and tools.
Rationality	Ensuring high profitability of the enterprise's operations.
Continuity	Ongoing management of the enterprise's operational processes.
Development	The process of management development is associated with qualitative changes, including the introduction of new elements, properties, and characteristics that ensure the enterprise's sustainable development.
Complexity and Systemicity	The process of management development that ensures sustainable development by qualitatively changing management as a whole and introducing new elements, properties, and characteristics.
Flexibility	Adaptability to changing conditions.
Goal Orientation	Realism and attainability of set goals and tasks.
Participation	Coordinated interaction of all enterprise participants in the management process.
Compliance	Management functions should align with the capabilities of the executor.
Hierarchical Levels	Hierarchical management structure where each lower level is controlled by a higher-level body.

Source: Systematized based on (Bondar & Pashchenko, 2024; Hamel, Ims, & Yoccoz, 2022).

Initially, the company should establish stable financial indicators to ensure sustainable development in the market. Once this goal is achieved, the focus can shift to improving market position. The strategic management model

proposed by us combines the advantages of various approaches, creating the conditions for implementing strategic decisions, providing informational support, and facilitating prompt responses to changes. Strategic management requires continuous improvement and the implementation of innovative concepts, principles, methods, and tools. Automating operations related to forecasting, planning, accounting, and analysis is a crucial factor for the successful development of strategic management in modern conditions. Implementing strategic management involves using both general and specialized scientific approaches to achieve set goals and objectives. Such a system is based on the interactions and interdependencies between its subjects, including owners, governing bodies, top managers, and specialists, as well as objects, which include internal business processes, performance indicators, and external processes and factors. Strategic management is a complex of interrelated elements aimed at achieving competitive advantages, high market positions, increased profit, enhanced efficiency, and stable development (Claxton & Kent, 2020). Thus, strategic management provides a holistic view of the enterprise's development, considering various aspects of its operations and ensuring effective management of resources and processes.

It is also necessary to consider the processes that define the gap between the set goals of the enterprise and its actual capabilities based on the analysis of the environment. This approach allows the enterprise to clearly define its strategic positions and ensure effective management to achieve long-term goals. To determine the outcome of implementing the enterprise's potential, it is proposed to introduce a block for analyzing and assessing the enterprise's capabilities and enhancing the competitiveness of significant business areas into the strategic management model (**Fehler! Verweisquelle konnte nicht gefunden werden.**).

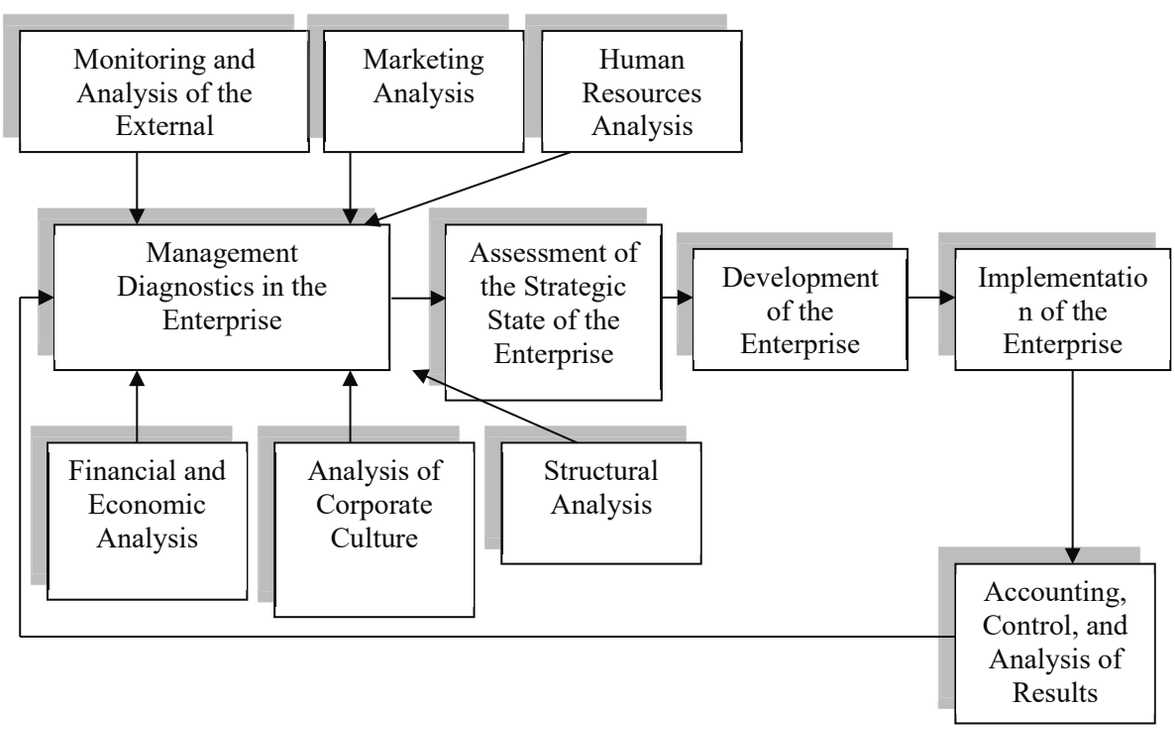

Fig. 2: Strategic Management Model of the Enterprise.
Source: Constructed based on data from (Rudnytska & Komarovsky, 2023; Shpak & Gursky, 2023)

The enterprise strategy is developed in the following sequence:

- a separate strategy is developed for each business line;
- a specific strategy is also developed for each activity that supports the business line;
- the systematic integration of the business strategy and strategies for supporting activities allows for the definition of a set of enterprise strategies.

The strategy implementation process involves continuous monitoring of results and making adjustments through adequate and timely strategic changes. These changes can include restructuring the enterprise, introducing new products and technologies, organizational changes, compensation adjustments, and entering new markets. Strategic control aims to determine the extent to which strategy implementation will achieve the enterprise's goals. Thus, a more advanced model of strategic management is proposed. Its main distinction from previous models lies in the organic integration of the advantages of various strategic management models.

A comprehensive review of the strategic management model has allowed for the formulation of some of its features, including (Shpak & Gursky, 2023):

- creating conditions for implementing strategic decisions;
- using it for both strategic planning and for analysis, control, and operational management;
- providing decision-makers with information promptly, in a clear and convenient form;
- selecting financial indicators for monitoring the execution of the business strategy, considering competitive strategies during business development;
- choosing indicators for economic and managerial activities based on their intended use: to assess the economic efficiency of the enterprise or the financial results of decisions made;
- providing only relevant information regarding the enterprise's strategies in relation to the effectiveness indicators of their implementation;
- flexibility and adaptability to changes for timely detection of potential consequences and rapid response to them.

To formulate a development strategy for the enterprise over a certain period, it is necessary to conduct a management diagnosis in advance. Management diagnosis encompasses a range of analytical tasks, including structural, marketing, and financial-economic analysis, as well as analysis of human resources, corporate culture, and the external environment. Marketing analysis is aimed at studying strategic business areas, resulting in a clear understanding of what the corporation is currently producing, what it could potentially produce, its production capacity, what can be sold on the market, and at what price. During the analysis, the corporation's market position is established, the state of the industry is examined, and the enterprise's competitive strength is evaluated. The mechanism of strategic management can be represented in the following model (Fig. 3).

From the presented diagram, the opportunities for achieving strategic goals are related to:

a) Growth prospects through identifying future trends, threats, and opportunities;
b) Positions in specific competition – the results of the enterprise's work through strengthening its competitive position;
c) Enterprise prospects under different activity strategies and setting priorities for resource allocation among various activities;
d) Changes in diversification paths – eliminating deficiencies in the current range of enterprise activities and identifying new types (Shulha et al., 2020).

Thus, the improvement of strategic analysis of enterprises should proceed in the following sequence:

- establishing the results of the enterprise's activities using trend extrapolation methods;
- Determining the outcome of potential realization through:
- resource allocation among different activities;
- strengthening competitive positions of existing business lines;
- conducting diversification.

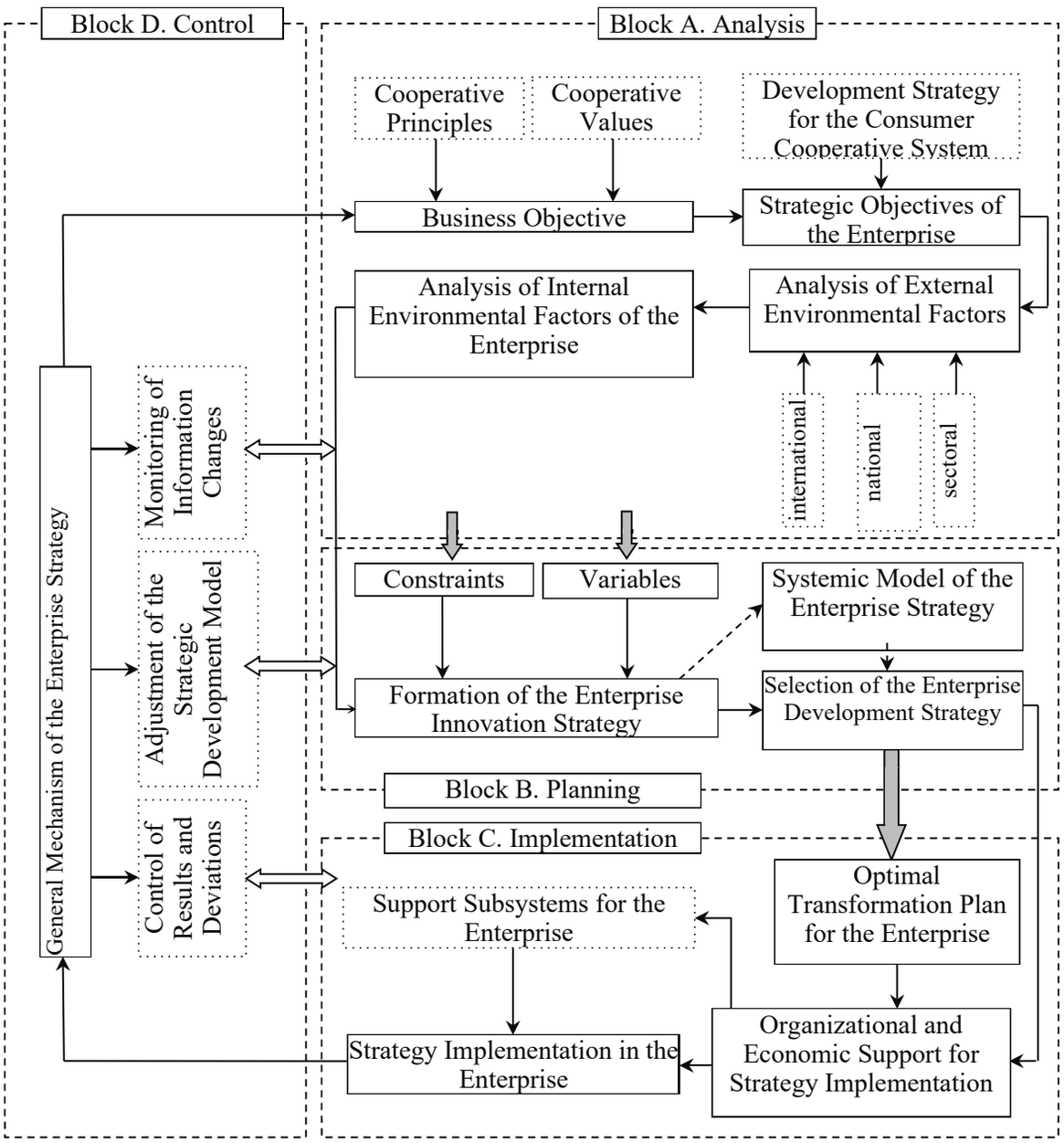

Fig. 3: Mechanism of Strategic Management for Sustainable Development of the Enterprise.
Source: Developed by the author.

Establishing the results of a company's activities using extrapolation is carried out based on the data of the company's past performance and the determining factors from previous periods. To improve the strategic management model, it is suggested to apply the methodology for determining strategic positions. According to this methodology, the strategic management process begins with defining the mission and setting the company's goals, which require justification and periodic adjustments. At the implementation stage of strategic management, strategic analysis is conducted. The primary goal of the analysis is to identify opportunities and threats in the external environment, as well as to assess the strengths and weaknesses of the company in the context of achieving strategic goals.

Strategic analysis includes:

1. Macro-environment Analysis**:** evaluation of economic factors (employment level, inflation, taxation, economic growth), natural factors (raw material shortages, rising energy costs, environmental pollution, government intervention in the use of natural resources), technological factors (development of new technologies), social factors (demographics, culture, social classes), as well as political, legal, and legislative factors, etc.
2. Analysis of the Immediate Environment**:** Evaluation of customers, suppliers, competitors, intermediaries,

and contact audiences.

3. Internal environment analysis: Assessment of the company's human resources potential, employee interests, management organization, production processes (organizational, operational, and technical-technological characteristics), financial status, marketing activities, and organizational culture (Pisarevska, 2023)

Considering the listed specific features, strategic management should be viewed as a dynamic and adaptive management system designed to promptly address the growing informational needs of company managers and to ensure the achievement of the enterprise's strategic and tactical goals.

Therefore, strategic management, as the foundation of internal business management and a crucial component of its overall management, requires continuous improvement through the development of its theoretical and methodological bases, as well as the active implementation of innovative Western concepts, principles, mechanisms, methods, and tools in the practice of Ukrainian businesses. A key factor in the successful development of strategic management in modern conditions is the automation of forecasting, planning, accounting, and analysis operations, integrated with data from other information systems within the enterprise, with the goal of reducing costs related to data collection and processing.

Conclusions

It has been determined that to achieve long-term goals and maintain competitiveness, strategic management must be integrated at all levels of the enterprise. This includes defining the mission, vision, and strategic goals, which should be specific, measurable, achievable, relevant, and time-bound. Proper resource provision and the implementation of a motivation system for employees are also necessary. Research has shown that the stages of implementing strategic management involve conducting a comprehensive strategic analysis, which includes studying the external environment, identifying key trends, analyzing the competitive landscape, and assessing internal resources and capabilities. Strategic analysis helps to identify the enterprise's strengths and weaknesses, as well as opportunities and threats in the external environment, forming the basis for developing an effective strategy.

Strategic management allows enterprises not only to survive but also to thrive by adapting to changing conditions and maximizing available opportunities. The first stage of implementing strategic management in an enterprise involves conducting a comprehensive strategic analysis, which includes studying the external environment, identifying key trends, understanding the competitive landscape, and analyzing the internal resources and capabilities of the enterprise. The next step is defining the mission and vision of the enterprise. The mission articulates the primary purpose of the enterprise's existence, while the vision describes the future state the enterprise aspires to achieve. It is important that these elements are clear and inspiring to all employees, as they set the overall direction for development.

It has been argued that implementing a strategy requires careful planning and organization. An important aspect is building an effective organizational structure that supports strategy implementation, which should include the creation of specialized teams and the implementation of a motivation system for employees. Regular monitoring and evaluation of strategy execution allow for timely detection of deviations from the plan and adjustment of actions, which is crucial for the success of strategic management. In the context of a modern, innovation-driven economy, Ukrainian enterprises face the need for rapid adaptation to market instability and the development of long-term competitive policies and strategies. Strategic management should define strategic tasks and action plans through specific parameters. The careful selection of performance indicators at all levels, aligned with the overall business strategy, is a primary goal of the modern strategic management system.

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THEORETICAL APPROACHES TO THE APPLICATION OF BEHAVIORAL FINANCE IN INVESTMENT PORTFOLIO MANAGEMENT

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Abstract

The article discusses theoretical approaches to the application of behavioral finance in investment portfolio management. The purpose of the work is to analyze the concepts and methods proposed within the framework of behavioral finance to improve investment portfolio management. The main cognitive biases of investors and their impact on portfolio formation are analyzed. Theoretical strategies for overcoming behavioral errors in asset selection and capital allocation are considered. The conceptual foundations of the role of financial consultants in the application of the principles of behavioral finance in portfolio management have been studied. The importance of taking behavioral factors into account in theoretical models for the development of investment products and services focused on the optimization of portfolio investments is substantiated.

Keywords

Behavioral finance, Investment portfolio management, Cognitive biases, Portfolio optimization.

Problem statement

Traditional approaches to investment portfolio management, based on the assumption of rationality of investors, often do not correspond to the real behavior of market participants. Behavioral finance offers an alternative view of the investment decision-making process, taking into account psychological factors and cognitive biases. However, the integration of behavioral aspects into the practice of portfolio management remains a difficult task that requires deep theoretical understanding. The problem is that classic models of portfolio optimization, such as Markowitz's theory, are based on assumptions about the complete rationality of investors and the efficiency of markets. However, numerous studies in the field of behavioral finance demonstrate that real investors are prone to systematic errors and irrational behavior. This leads to suboptimal decisions regarding the formation and management of the portfolio, which negatively affects their investment results.

There is a need to develop new theoretical models and practical approaches that would take into account behavioral aspects of investment portfolio management. Such models should not only describe the real behavior of investors, but also offer mechanisms to minimize the negative impact of cognitive biases on investment

decisions. In addition, it is important to develop methods that will allow financial advisors and institutional investors to effectively apply the principles of behavioral finance in their practical activities.

Relevance of the chosen topic

In the conditions of increasing volatility of financial markets and the complexity of investment products, consideration of behavioral factors is becoming increasingly important for achieving optimal results of investment portfolio management. Theoretical approaches that take into account the irrationality of investors and their cognitive biases can offer new methods of portfolio optimization and risk management strategies that better correspond to real market conditions.

The relevance of the study of theoretical approaches to the application of behavioral finance in investment portfolio management is determined by several factors:

1. The global financial crisis of 2008 and subsequent market shocks demonstrated the limitations of traditional models of risk management and portfolio optimization, which emphasized the need to integrate behavioral aspects into financial theory and practice.
2. The development of technologies and the emergence of new financial instruments create additional challenges for investors, increasing the complexity of making investment decisions. In such conditions, understanding the psychological factors influencing the behavior of investors becomes critically important for the development of effective portfolio management strategies.
3. The growing role of individual investors in financial markets, especially in the context of retirement savings and robotic advisors, increases the need for theoretical models that take into account the peculiarities of decision-making by non-professional market participants. Applying the principles of behavioral finance can help develop more effective investment products and services aimed at the mass investor.

Analysis of recent research and publications

The theoretical foundations of the application of behavioral finance in the management of an investment portfolio were studied by such scientists as D. Kahneman, A. Tversky, R. Thaler, M. Statman, H. Shefrin, N. Barberis, W. De Bondt. Their work laid the foundation for understanding the impact of psychological factors on portfolio formation and management. Recent studies, including the works of C. Egan, D. Hirshleifer, B. Barber, and T. Odean, focus on the development of theoretical models that integrate behavioral aspects into the portfolio optimization process. It is important to note that modern research in the field of behavioral finance is increasingly focused on the development of practical tools and strategies that allow taking into account behavioral aspects in the process of managing an investment portfolio. This includes developing new risk assessment methods, diversification strategies and approaches to communicating with investors.

Purpose of the article

The purpose of the article is to analyze the concepts and methods proposed within the framework of behavioral finance to improve investment portfolio management.

To achieve the goal, the following tasks must be solved:

- to determine the main cognitive biases affecting the formation and management of the investment portfolio;
- analyze theoretical models of portfolio optimization that take into account behavioral factors;
- to investigate the conceptual principles of applying the principles of behavioral finance in the work of financial consultants;
- consider theoretical approaches to taking into account behavioral factors in the development of investment products and services for portfolio management.

Presentation of the main research material and results obtained

The theory of behavioral finance revealed a number of cognitive biases that significantly affect the process of forming and managing an investment portfolio (Table 1). Such biases represent systematic deviations in thinking and decision-making that can lead to suboptimal investment results. Understanding these biases is key to developing effective portfolio management strategies. Cognitive biases that influence investment decisions are the result of evolutionary processes in the human brain. Such mental "shortcuts" often helped our ancestors respond quickly to threats and opportunities in the environment. However, in the complex world of modern

finance, these same mechanisms can lead to systematic errors. For example, the tendency to place more importance on recent events (the recency effect) may be useful for survival in natural environments, but may lead to suboptimal decisions in financial markets, where past performance is not always an indicator of future performance (Buss, 2019).

Analysis of the Table 1, allows us to draw a conclusion about the significant impact of cognitive biases on the investment portfolio management process. Overconfidence, for example, can cause investors to rely too much on their own judgment, ignoring important market information, which can result in an under-diversified portfolio that carries increased risk (Hirshleifer, 2015) (Barberis & Thaler, 2003).

The anchor effect demonstrates how investors can become attached to certain price levels or historical indicators, which can prevent them from adequately evaluating new opportunities in the market. Such a bias can result in lost potential gains due to reluctance to sell assets that have fallen significantly in price, or to overinvesting in assets that appear "cheap" simply because they were priced higher in the past.

Particular attention should be paid to the disposition effect, which was empirically investigated by Shefrin and Statman (Shefrin & Statman, 1985). This bias leads to asymmetry in the behavior of investors regarding profitable and unprofitable positions. Investors tend to lock in profits too soon for fear of losing them, and hold unprofitable positions too long in the hope of recovery. Such behavior can significantly reduce the overall efficiency of the portfolio.

Herd instinct is another important factor that can lead to ineffective investment decisions. Following the "crowd" can create market bubbles and lead to excessive concentration of capital in certain sectors or assets, which increases the systemic risk of the portfolio.

Table 1: Cognitive biases and their impact on investment portfolio management.

No. z/p	Cognitive bias	Features	Impact on portfolio management
1	Excessive self-confidence	Investors tend to overestimate the accuracy of their forecasts and ability to select the best assets for a portfolio	May lead to insufficient diversification and excessive risk taking
2	The anchor effect	When valuing assets, investors are often "tied" to certain numerical values (for example, historical prices)	May lead to suboptimal allocation of assets in the portfolio and ignoring new important information
3	Disposition effect	Tendency to hold unprofitable assets too long and sell profitable ones too soon	It negatively affects the overall performance of the portfolio, disrupting the optimal balance of risk and profitability
4	Herd instinct	A tendency to follow the actions of other investors when forming a portfolio, even if it contradicts one's own analysis	It can lead to the formation of inefficient portfolios and an increase in systemic risk in the market
5	Mental accounting	A tendency to consider each asset in the portfolio separately rather than as part of the whole	May lead to inefficient capital allocation and portfolio structure decisions

Source: Summarized and adapted from (Kahneman & Tversky, 1979), (Shefrin & Statman, 1985), (Barber & Odean, 2000), (Thaler, 1999), materials of Hochschule Mittweida.

Finally, mental accounting, a concept developed by (Thaler, 1999), shows how investors can misjudge the risks and returns of their investments by considering each asset separately rather than as part of a complete portfolio, which can lead to suboptimal portfolio structure and insufficient diversification.

It is important to note that the influence of cognitive biases on investment decisions may vary depending on the cultural context and individual characteristics of the investor. Research in the field of cross-cultural psychology shows that some prejudices may be more pronounced in certain cultures. For example, the dispositional effect may be stronger in cultures where "loss of face" is considered a particularly negative

phenomenon. This highlights the need to consider cultural factors when developing portfolio management strategies and educating investors.

In addition, it is important to understand that cognitive biases are not static – they can change over time and under the influence of external factors. For example, periods of market turbulence can increase the tendency to avoid losses, while prolonged periods of market growth can lead to overconfidence, indicating the need for constant monitoring and adaptation of portfolio management strategies according to changes in the behavioral patterns of investors. Understanding these cognitive biases is critical to developing effective portfolio management strategies. Financial advisors and institutional investors should consider these factors when developing investment recommendations and creating financial products. Additionally, educating investors about these biases can help them make more rational and informed investment decisions.

The classical portfolio theory developed by (Markowitz, 1952) is based on the assumption of rationality of investors. However, behavioral finance offers alternative theories and models that take into account the irrationality and cognitive biases of investors (De Bondt & Thaler, 1985). Such models seek to more accurately reflect the real behavior of market participants and offer more effective approaches to portfolio management (Table 2). The development of behavioral models of portfolio optimization is a response to the limitations of classical portfolio theory, which often does not take into account the real behavior of investors. These new models try to integrate psychological factors into the investment decision-making process, creating a more realistic picture of portfolio formation and management. It is important to note that these models do not negate the classical theory, but rather complement it, offering a more nuanced view of the investment process.

The analysis of the given theoretical models demonstrates significant progress in the development of approaches to portfolio optimization that take into account behavioral factors. The behavioral portfolio theory proposed by (Shefrin & Statman, 2000) introduces the concept of a multi-layered portfolio, where each layer corresponds to different investor goals, which allows for a more accurate reflection of the real preferences of investors who often have multiple, sometimes conflicting, investment goals. The SP/A theory developed by (Lopes, 1987) takes an important step in understanding the emotional factors that influence investment decisions. This model is particularly useful for explaining investor behavior under conditions of high uncertainty and risk. The model of cumulative prospect theory proposed by (Tversky & Kahneman, 1992) is revolutionary in that it proposes an alternative utility function that takes into account the asymmetric attitude of investors to gains and losses. This model helps to explain such phenomena as the disposition effect and loss avoidance. The portfolio optimization model developed by (Das, Markowitz, Scheid, & Statman, 2010), is an attempt to integrate classical financial theories with behavioral aspects. Such a model is particularly interesting because it offers a practical approach to creating optimal portfolios taking into account the individual behavioral characteristics of investors.

Table 2: Comparative analysis of theoretical models of portfolio optimization taking into account behavioral factors.

No. z/p	Theory/model	Features	Advantages and limitations
1	Behavioral theory of the portfolio	The model takes into account the desire of investors to avoid losses and their inclination to mental accounting. Suggests forming a portfolio as a pyramid of several layers, each of which corresponds to a specific purpose	Allows you to create more personalized portfolios that meet the real goals and preferences of investors. Difficulty of implementation in practice
2	SP/A theory (Security, Potential/Aspiration)	Considers emotional factors such as fear and hope when building a portfolio. Suggests a balance between security (S), potential (P) and aspirations (A) of the investor	Allows you to better understand the motivations of investors and create portfolios that meet their emotional needs. Can lead to excessive focus on emotional factors at the expense of financial indicators
3	Model of the cumulative theory of perspectives	Offers an alternative utility function that takes into account the asymmetric	More accurately reflects the process of decision-making by investors in conditions of uncertainty.

		attitude of investors to gains and losses, as well as the subjective perception of probabilities	Difficulty calibrating the model for individual investors
4	Portfolio optimization model taking into account behavioral factors	Integrates elements of behavioral portfolio theory and classical Markowitz theory. It allows taking into account the individual behavioral characteristics of investors when forming an optimal portfolio	Offers a more balanced approach that takes into account both financial and behavioral factors. It requires complex mathematical calculations and a large volume of data for effective application

Source: Generalized and adapted from (Shefrin & Statman, 2000), (Lopes, 1987), (Tversky & Kahneman, 1992), (Das et al., 2010), Proceedings of Hochschule Mittweida.

Practical application of these models can significantly improve the investment portfolio management process. For example, using BPT can help financial advisors create portfolios that are more understandable and psychologically comfortable for clients. SP/A theory can be useful in designing investment products that balance safety and growth potential, meeting the different emotional needs of investors. However, it is important to note that applying these models in practice can be a difficult task. They require a more detailed analysis of individual characteristics of investors and may be less universal than classical approaches. In addition, these models often require more complex mathematical calculations, which can complicate their widespread adoption in the asset management industry.

It is important to note that the implementation of behavioral models of portfolio optimization in the practice of investment management faces a number of challenges. One of them is the difficulty of calibrating models for specific investors. Determining individual parameters, such as the level of loss avoidance or subjective perception of probabilities, requires the development of complex evaluation and data collection methodologies. In addition, the dynamic nature of behavioral factors means that these parameters can change over time, requiring constant monitoring and adjustment of models. Another important aspect is the need for a balance between taking into account behavioral factors and ensuring long-term portfolio performance. Excessive focus on the short-term behavioral responses of investors can lead to suboptimal decisions in terms of long-term financial goals. Therefore, the development of models that effectively combine behavioral insights with the principles of long-term investing remains an important area of research in the field of behavioral finance.

The theory of behavioral finance not only changed our understanding of the process of making investment decisions, but also offered new approaches to the role of financial consultants in the process of managing an investment portfolio (Table 3). Such approaches are aimed at helping clients overcome their cognitive biases and make more rational investment decisions. The integration of the principles of behavioral finance into the practice of financial consulting represents a paradigm shift in the approach to working with clients. Traditionally, financial consultants focused mainly on the technical aspects of portfolio management - market analysis, asset selection, optimization of the ratio of risk and profitability. However, behavioral finance emphasizes the importance of understanding the psychological factors that influence clients' investment decisions, which requires advisors to develop new competencies that go beyond traditional financial expertise.

Analysis of approaches presented in Table 3, demonstrates the significant potential of applying the principles of behavioral finance in the work of financial consultants. The educational role of advisors, as stated by (Pompian, 2006), is critical to improving clients' financial literacy and their ability to make more informed investment decisions. However, this requires consultants to have a deep understanding of not only financial markets, but also the psychology of decision-making.

Table 3: Behavioral approaches to consulting in investment portfolio management.

No. z/p	Approach	Features	Potential benefits and challenges
1	Educational role	Helping clients understand their own cognitive biases and their impact on investment decisions	Increasing the financial literacy of clients, improving the quality of their investment decisions.

			Requires a high level of expertise of consultants in the field of behavioral finance
2	Emotional coaching	Helping clients control their emotions, especially during periods of market volatility	Reducing the likelihood of making impulsive decisions, improving long-term investment results. Requires advanced skills of emotional intelligence and psychological training of consultants
3	Adaptive portfolio management	Development of individual portfolio management strategies taking into account the client's behavioral characteristics	Creating more sustainable portfolios that meet clients' real goals and preferences. It requires sophisticated analytical tools and constant monitoring of the client's behavioral profile
4	Application of behavioral tools	Using framing techniques and choice architecture to improve the investment decision-making process	Helps clients make more rational decisions, avoiding typical behavioral traps. Requires careful ethical scrutiny to avoid manipulation

Source: Summarized and adapted from (Pompian, 2006), (Statman, 2019), (Hens & Bachmann, 2009), (Thaler & Sunstein, 2008).

Emotional coaching, a concept developed by (Statman, 2019), is an innovative approach that recognizes the importance of the emotional factor in the investment process. By helping clients manage their emotions, especially during periods of market turbulence, advisors can significantly improve long-term investment results. However, this approach requires consultants to have advanced emotional intelligence skills and psychological training.

Adaptive portfolio management, proposed by (Hens & Bachmann, 2009), is a promising direction that allows creating individualized investment strategies that take into account the unique behavioral characteristics of each client, which can lead to the formation of more sustainable portfolios that better meet the real goals and preferences of investors. However, the implementation of this approach requires sophisticated analytical tools and constant monitoring of the client's behavioral profile.

The application of behavioral tools such as framing and choice architecture developed by (Thaler & Sunstein, 2008) opens up new possibilities for improving the investment decision-making process. These tools can help clients avoid typical behavioral traps and make more rational decisions. However, the use of the mentioned techniques requires careful ethical control to avoid manipulation and to ensure that the client's interests always come first.

The theoretical model proposed by (Grinblatt, Keloharju, & Linnainmaa, 2011), demonstrates how financial advisors can use knowledge of cognitive biases to improve portfolio management outcomes for their clients. This model emphasizes the importance of an individual approach to each client and the need for constant learning and adaptation of portfolio management strategies.

The implementation of behavioral approaches in the practice of financial counseling also raises important ethical questions. On the one hand, understanding clients' cognitive biases allows counselors to provide more personalized and effective recommendations. On the other hand, it creates the potential for manipulation, especially if the consultant's economic incentives are not fully aligned with the client's interests. Therefore, the development of ethical standards and practices for behaviorally oriented financial counseling is becoming an increasingly relevant topic in the professional community. In addition, it is important to note that the effectiveness of behavioral approaches in financial counseling can vary depending on the type of client and market conditions. For example, institutional investors may be less prone to certain cognitive biases compared to individual investors, requiring adaptation of advisory approaches. Also, in periods of high market volatility, the role of emotional coaching can become especially important to prevent impulsive decisions by clients.

Understanding the behavioral characteristics of investors has a significant impact on theoretical models for the development of new financial products and services for portfolio management. Such models seek to create tools that not only meet the financial goals of investors, but also take into account their psychological characteristics and cognitive biases. (Table 4).

The integration of behavioral factors into the process of developing financial products and services reflects the growing understanding that the effectiveness of investment decisions depends not only on financial parameters, but also on the psychological characteristics of investors. This approach makes it possible to create products that better meet the real needs and preferences of customers, potentially increasing their satisfaction and

long-term investment performance. It is important to note that the development of behaviorally oriented financial products requires an interdisciplinary approach that combines expertise in finance, psychology, behavioral economics and technology, which creates new challenges for financial institutions that must develop new competencies and adapt their product development processes.

Table 4: Theoretical models of development of new financial products and services for portfolio management.

No. z/p	Model	Features	Potential benefits and challenges of implementation
1	Structured products with a propensity to avoid losses	Theoretical models that take into account the propensity of investors to avoid losses in the development of products with capital protection	Increasing the attractiveness of products for risk-averse investors. Complexity of pricing and hedging, potential decrease in expected profitability
2	Behaviorally oriented robotic consultants	Development of algorithms that take into account behavioral factors when providing recommendations on portfolio formation	Personalization of investment recommendations, reducing the impact of emotional factors on decision-making. The complexity of developing algorithms that accurately take into account individual behavioral characteristics
3	Dynamic portfolio management strategies taking into account changes in the behavioral profile	Theoretical models that adapt the structure of the portfolio in accordance with changes in the behavioral characteristics of the investor and market conditions	Improving long-term investment results, increasing customer satisfaction. Technical complexity of implementation, need for constant monitoring and data analysis
4	Behaviorally optimized interfaces of investment platforms	Theoretical Approaches to the Design of User Interfaces that Minimize the Impact of Behavioral Biases on Portfolio Management Decision Making	Improving the quality of investment decisions, increasing the financial literacy of users. The need for a balance between ease of use and informativeness, ethical issues regarding the influence on user behavior

Source: summarized and adapted from (Hens & Rieger, 2014), (D'Acunto, Prabhala, & Rossi, 2019), (Berkelaar, Kouwenberg, & Post, 2004), (Benartzi & Lehrer, 2015).

Analysis of innovative approaches presented in the Table 4, demonstrates the significant potential of integrating behavioral factors into the process of developing investment products and services. Structured loss aversion products, as described by (Hens & Rieger, 2014), are an attempt to create investment instruments that meet the psychological needs of investors. These products may be particularly attractive to clients who tend to be overly risk-averse, offering them the opportunity to participate in potential market growth with limited risk of loss. However, the development of such products involves complex issues of pricing and hedging.

The behaviorally oriented robotic advisors studied by (D'Acunto et al., 2019), represent an attempt to automate the process of providing personalized investment recommendations taking into account the individual behavioral characteristics of clients, which can significantly increase the availability of quality financial advice for a wide range of investors. However, developing algorithms that accurately account for complex behavioral patterns remains a major technical challenge.

Dynamic portfolio management strategies theoretically grounded by (Berkelaar et al., 2004), propose an innovative approach to adapt portfolio structure to changes in investor behavioral characteristics and market conditions, which can lead to improved long-term investment results and increased client satisfaction. However, the implementation of such strategies requires complex technical solutions and constant monitoring of large volumes of data.

Behaviorally optimized interfaces of investment platforms, the concept of which was developed by (Benartzi & Lehrer, 2015), are an attempt to use the principles of behavioral economics to improve the investment decision-making process at the level of user interface design. This approach can help investors avoid typical behavioral traps and make more rational decisions. However, the development of such interfaces requires a careful

balance between ease of use and informativeness, and raises important ethical questions regarding the impact on user behavior.

The theoretical model developed by (Hens & Bachmann, 2009) offers a comprehensive approach to the creation of investment products that take into account the individual behavioral profile of the investor. This model emphasizes the importance of integrating behavioral factors at all stages of development and management of investment products. The development of this model may include the integration of dynamic elements that allow the product to be adapted to changes in the investor's behavioral profile over time. For example, the system can automatically adjust the level of risk of the portfolio or the style of communication with the investor based on the analysis of his reactions to market events and investment results.

The introduction of behavioral financial products and services also raises important regulatory issues. Financial market regulators must adapt their approaches to the assessment and supervision of such products, ensuring a balance between innovation and the protection of investors' interests. This may include developing new disclosure standards that take behavioral aspects into account and assessing the potential risks associated with exploiting the cognitive biases of investors. In general, the integration of behavioral factors into the process of developing investment products and services opens up new opportunities for creating more efficient and client-oriented financial solutions. However, it also creates new challenges for the financial industry, requiring an interdisciplinary approach that combines financial theory, behavioral economics and modern technology. In addition, it is important to consider the long-term implications of the widespread adoption of behavioral financial products. On the one hand, such products can help investors better achieve their financial goals by reducing the influence of emotional factors on decision-making. On the other hand, excessive adaptation of products to behavioral characteristics can potentially lead to the formation of new types of market inefficiencies or the strengthening of certain cognitive biases.

One of the promising directions for the development of behaviorally oriented financial products is the integration of elements of gamification and social learning. For example, investment platforms can use game mechanics to encourage long-term investing and portfolio diversification. Social elements, such as the ability to compare your investment strategies with other users or receive advice from more experienced investors, can facilitate learning and knowledge sharing. It is also important to note the role of technology in the development and implementation of behaviorally oriented financial products. The use of big data and machine learning allows creating more accurate models of investor behavior and personalizing financial products at an unprecedented level. However, it also raises the issue of privacy and the ethical use of personal data.

It is important to emphasize the need for continuous learning and adaptation in the field of behavioral finance. Behavioral patterns of investors can change over time, especially under the influence of technological and social changes. Therefore, theoretical models and practical approaches to the development of financial products must be flexible enough to take these changes into account. In general, the integration of behavioral factors into the process of developing investment products and services opens up new opportunities for creating more efficient and client-oriented financial solutions. However, it also creates new challenges for the financial industry, requiring an interdisciplinary approach that combines financial theory, behavioral economics and modern technology.

Conclusions

Approaches to the application of behavioral finance in the management of an investment portfolio offer new perspectives for improving the efficiency of investment decisions and optimizing the structure of the portfolio. The concepts and models considered in the work demonstrate significant potential for the transformation of traditional approaches to investment management. Investigating the cognitive biases of investors, such as overconfidence, the anchor effect, the disposition effect, the herd instinct, and mental accounting, allows us to better understand the factors that influence investment decisions. This understanding is key to developing strategies that can help investors avoid common behavioral traps and improve the quality of their investment decisions. Theoretical models of portfolio optimization that take behavioral factors into account, such as behavioral portfolio theory, SP/A theory, the cumulative prospect theory model, and the behavioral portfolio optimization model, offer alternative approaches to the formation of investment strategies. The models also try to more accurately reflect the real behavior of investors and their preferences, which can lead to the creation of more efficient and sustainable portfolios.

The application of the principles of behavioral finance in the work of financial consultants opens up new opportunities for improving the quality of financial advice and increasing the financial literacy of clients. Approaches such as the educational role of consultants, emotional coaching, adaptive portfolio management and the use of behavioral tools can significantly improve the effectiveness of the interaction between consultants and

clients. The integration of behavioral factors into the process of developing investment products and services is a promising direction for creating more client-oriented financial solutions. Structured loss aversion products, behaviorally driven robo-advisors, dynamic portfolio management strategies, and behaviorally optimized investment platform interfaces represent innovative approaches that could significantly impact the future of the investment management industry.

However, it is important to note that the application of behavioral finance in the management of an investment portfolio also creates new challenges, including the need to develop sophisticated analytical tools, ethical issues regarding the influence on investor behavior, as well as the need for an interdisciplinary approach that combines financial theory, psychology and modern technology. Further research should focus on developing comprehensive theoretical models that integrate classical financial theories with behavioral aspects. An important direction is also the creation of methodological foundations for empirical verification of the effectiveness of behavioral portfolio management strategies in various market conditions. In addition, it is necessary to pay attention to the development of an ethical framework for the application of behavioral techniques in investment management in order to ensure the protection of investors' interests and avoid potential manipulations.

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A COMPARATIVE ANALYSIS OF STANDARDIZATION AND ADAPTATION OF INTERNATIONAL MARKETING MIX

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Abstract

This article presents a comparative analysis of standardization and adaptation in the international marketing mix, focusing on the ongoing debate regarding the two strategies in the context of global market operations. The relevance of this topic arises from the increasing complexity faced by multinational enterprises when managing marketing efforts across diverse cultural, economic, and regulatory environments. This work aims to assess the relative advantages and disadvantages of both approaches and identify the factors that influence the decision to adopt either strategy. The research methodology involves methods of analysis, and comparison alongside case studies of multinational corporations to illustrate the application of standardization and adaptation strategies.

The benefits and drawbacks of standardisation and adaptation are analysed. The results indicate that while standardization provides cost efficiencies and enhances global brand consistency, adaptation enables firms to respond effectively to local market conditions. A hybrid strategy, which blends the strengths of both approaches, emerges as a practical solution for many global firms. The reasons and factors for implementing a particular approach are considered. The practical significance of the study is to provide recommendations for multinational enterprises on how to choose between or integrate these strategies to enhance competitiveness, brand strength, and market responsiveness in international markets.

Keywords

international marketing mix, standardization, adaptation, hybrid strategy.

Problem statement

In the context of globalization, multinational corporations are constantly challenged to develop and implement effective marketing strategies across various markets. A key strategic decision is whether to standardize marketing efforts across all countries or adapt them to meet local preferences, cultural differences, and market conditions. This challenge is compounded by the rapid changes in global markets, including digitalization, cultural shifts, and economic fluctuations. While standardization offers cost savings, brand consistency, and operational efficiency, adaptation can better address the unique cultural, economic, and regulatory aspects of each market, thus improving local responsiveness and consumer engagement. The primary problem is determining which strategy – standardization, adaptation, or a combination of both leads to better performance in international markets.

Furthermore, the balancing these two approaches is critical in achieving long-term success and maintaining competitiveness in global markets. The question remains: which approach yields better performance, and under what conditions should one or the other be applied?

Relevance of the chosen topic

The topic of standardization versus adaptation in international marketing is highly relevant in today's globalized economy, where firms operate in multiple markets that often have significant cultural, economic, and political differences. The ability to successfully navigate these differences is critical for achieving sustainable growth in international markets. Moreover, the rise of digital technologies and the increasing integration of global markets have further intensified the need for firms to carefully consider their international marketing strategies. Firms that can strike an optimal balance between standardization and adaptation are better positioned to leverage global efficiencies while remaining responsive to local market needs, thus gaining a competitive advantage.

Analysis of recent research and publications

The question of whether to standardize or adapt the marketing mix has been extensively studied in recent literature. According to Tetiana Shtal, Iryna Astakhova and Viktoria Kozub (Shtal et al., 2019), standardization allows companies to streamline their operations globally, focusing on uniformity to achieve cost efficiencies and maintain a cohesive brand identity across diverse markets.

Olena Krasovska (Krasovska, 2021) argues that adaptation is essential in emerging markets, where cultural norms and consumer behaviour can vary dramatically from those in developed markets. Her study emphasizes that firms that adapt their marketing strategies to fit local tastes and preferences are more likely to succeed in these markets, especially when dealing with product offerings and promotional strategies that resonate with local consumers.

Sevda Zengin and Cemal Yükselen (Zengin & Yükselen, 2023) suggest that firms that adopt agile marketing practices can integrate both strategies effectively, enhancing innovation and responsiveness to local market changes while still benefiting from the efficiencies of standardization. Recent research by Felix John Eze, Inyang Bassey Inyang and Edim Eka James (Eze et al., 2024) provides a comprehensive review of the standardization-adaptation debate, concluding that the most successful international marketing strategies often integrate elements of both approaches.

Nanik Hariyana and Hendra Syahputra (Hariyana & Syahputra, 2022) contribute to this discussion with case studies that illustrate the practical application of standardization and adaptation in different industries. Their findings support the idea that industries with high levels of technological development, such as consumer electronics, are more conducive to standardization, while those with significant cultural variability, such as food and beverages, may benefit more from adaptation strategies.

Purpose of the article

The purpose of this article is to analyze the advantages and limitations of standardization and adaptation in the context of international marketing and to identify the key factors that influence a firm's decision to adopt one strategy over the other. Specifically, the objectives of this study are to:

— identify key factors that influence the decision to standardize or adapt;
— examine the advantages and disadvantages of standardization and adaptation in international marketing;
— analyze the circumstances under which each strategy is most effective;
— explore the hybrid approach, which combines both standardization and adaptation;
— formulate practical recommendations for businesses on how to implement these strategies effectively.

Presentation of the main research material and results obtained

In order to enter international markets, various tools, methods and approaches are used that form the international marketing mix. It consists of four interconnected company policies, known as the 4Ps: product, price, place, and promotion. The product policy defines key aspects of goods such as nomenclature, assortment, quality, trademarks, design, packaging, guarantees, and after-sales service. The pricing policy focuses on setting prices that are acceptable to both the seller and the consumer, as well as developing strategies for price adjustments. The distribution policy involves selecting distribution channels and sales methods to ensure the product reaches consumers efficiently. The promotion policy is aimed at advancing the product in foreign markets through various marketing communications, including advertising, personal selling, sales promotion, and public relations (Melnyk & Lahotska, 2011).

Thus, international marketing mix is a set of decisions on product, price, sales channels and promotion, the purpose of which is to create competitive advantages for the company in a particular foreign market or target segment (Melnyk & Lahotska, 2011).

To meet market demands, companies must develop competitive strategies for international marketing mix that are carefully aligned with both internal and external factors. These strategies should harmonize the organization's core functions such as marketing, sales, operations, customer service, finance, and human resource management – with various external market influences. These external factors include competition, globalization, technological advancements, cultural shifts, and changes in consumer demographics and behaviour. Depending on these internal capabilities and external conditions, companies can adopt one of two strategic approaches: standardization or adaptation. (Albrecht, 2023, p. 260).

The choice between standardization and adaptation involves strategic decisions across all components of the marketing mix: (Sramkowski, 2021)

— Product. When choosing between standardization and adaptation, it is essential to consider whether the company offers goods or services. In the case of goods, standardization may be feasible, especially for products with global appeal. However, for services, the need for adaptation is often higher, as the nature of the service can vary based on local consumer involvement.

— Price. Pricing strategies are influenced by both internal and external factors. Internally, the location of production and market entry modes (exporting, licensing, or franchising) impact costs. Externally, local government regulations, taxes, tariffs, and the overall macroeconomic environment (inflation, currency fluctuations) must be considered when determining pricing.

— Place. Distribution decisions are affected by the geographic and infrastructural characteristics of the target market. Firms must assess the availability and efficiency of transportation networks and consider the stage of economic development in the target market to ensure optimal product delivery and long-term profitability.

— Promotion. Promotional strategies often require significant adaptation, particularly when entering new markets with different cultural, linguistic, and media landscapes. It is essential to understand the target market's value system, language, and preferred media channels. In some cases, working with local experts can be instrumental in navigating promotional challenges and ensuring effective communication with the target audience.

Let us analyze various strategies for the marketing mix, the reasons for their implementation and their advantages and disadvantages (Table 1).

Standardization refers to the practice of applying a uniform marketing strategy across all international markets. This approach assumes that consumer needs, preferences, and behaviour are generally similar across various regions, allowing companies to use the same product, advertising, pricing, and distribution strategies globally. Standardization is often employed by companies new to exporting or those seeking to maximize cost efficiencies through economies of scale (Eze et al., 2024, p. 1194).

Several factors support the adoption of standardization: (Sramkowski, 2021)

— Globalization of the market. Companies offering products with global demand can effectively market the same product across different countries, addressing the needs of a broad consumer base.

— Economies of scale. By mass-producing standardized products, firms can lower per-unit production costs, benefiting from increased volume and scale.

— Transferable Competitive Advantages. Standardization fosters competitive advantages such as cost reductions, faster market response times, consistent global branding, and enhanced control over marketing strategies.

Let us consider the advantages of standardisation:

— Cost efficiency. One of the major advantages of the standardization approach is the ability to reduce costs through economies of scale. By producing the same product for multiple markets, firms can reduce production, distribution, and marketing costs (Eze et al., 2024, p. 1200). This is especially true in industries where product differentiation is minimal, such as consumer electronics or pharmaceuticals. Global brands like Apple and Samsung implement standardized product offerings, producing the same smartphones globally to maintain consistency in quality and brand image while minimizing manufacturing and operational costs.

— Brand consistency. Consistency in product features, packaging, and marketing messages strengthens brand identity and customer loyalty, which is crucial for companies with a strong global presence. For instance, Coca-Cola applies a highly standardized approach to its core product, ensuring that the brand remains recognizable and consistent worldwide (Albrecht, 2023, p. 260). Its iconic red-and-white packaging, branding, and global campaigns like "Taste the Feeling" convey a unified message, creating a strong global identity.

— Simplicity in marketing operations. Standardization simplifies marketing operations, making it easier to manage campaigns across multiple regions. Companies can focus on executing a singular, cohesive marketing strategy, which reduces the complexity and resources required for developing multiple localized campaigns (Eze et al., 2024, p. 1200). This is particularly advantageous for large global corporations that operate in numerous markets, as it allows for more streamlined coordination between headquarters and regional offices.

Table 1: Comparative analysis of strategies for the international marketing mix

Strategy	**Reasons for implementation**	**Advantages**	**Disadvantages**
Standardization	• Similar consumer preferences across markets • Economies of scale desired • Global brand consistency prioritized	• Cost-efficient due to economies of scale • Strong, consistent global brand identity • Simplicity in marketing operations	• Low cultural sensitivity, may not resonate with local consumers • Risk of regulatory non-compliance • Limited flexibility
Adaptation	• High cultural, economic, and regulatory differences between markets • Local consumer preferences vary greatly	• High cultural relevance and consumer satisfaction • Greater market penetration • Regulatory compliance	• High costs of customization • Complex management of multiple strategies • Risk of brand fragmentation
Hybrid (Standardization + Adaptation)	• Core product and brand consistency are important, but local adjustments are necessary • Varying competition and market conditions across regions	• Combines cost savings with local relevance • Balanced global brand identity with cultural adaptation • Faster responsiveness to market changes	• Moderate complexity in implementation • More costly than pure standardization • Difficult to balance consistency with flexibility

Source: compiled by the author

Despite its advantages, standardization may not always be suitable, particularly in markets with distinct cultural or regulatory environments. The primary challenge is that it often fails to address the specific needs, preferences, and cultural differences of local markets (Hariyana & Syahputra, 2022). For instance, consumer preferences in Asian markets can differ significantly from those in European or North American markets, and ignoring these differences can lead to a disconnect between the brand and its consumers. Additionally, strict adherence to standardization may overlook local regulations, which could result in legal challenges or the need for product modification.

Adaptation involves adjusting a company's efforts, products, or services to meet the specific needs,

preferences, or expectations of various consumer groups. This strategy generally follows two key steps. First, the necessary changes are identified to enhance the appeal of an offering to a target audience. Second, the modifications are implemented based on the organization's resources and capabilities. Both steps are essential for evaluating the strategy's feasibility (Albrecht, 2023, p. 261).

The key factors that favour adaptation include: (Sramkowski, 2021)

— Differences in consumer preferences. Variation in consumer tastes and preferences across regions necessitates a flexible marketing approach.

— Local competitive conditions. Differing market dynamics and levels of competition require customized strategies.

— Legal and regulatory variations. Differences in local laws and regulations, such as advertising restrictions or product specifications, often necessitate adaptation.

— Service intensity. Companies offering highly service-oriented products may need to adapt their offerings to meet the level of service expected in specific markets.

Let’s consider the key benefits of the adaptation strategy:

— High cultural relevance. Companies that adapt their product offerings, pricing strategies, and promotional messages to meet cultural values and local tastes tend to perform better in diverse markets (Yap & Yazdanifard, 2014). A prime example is Nestlé, which adjusts its food and beverage offerings based on local tastes and preferences. In Japan, Nestlé introduced more than 300 different flavours of Kit Kat, including Green Tea (Matcha), Wasabi, and Sake, to align with Japanese tastes and culinary preferences.

— Greater market penetration and customer satisfaction. Adaptation allows companies to tailor their marketing strategies to better align with consumer preferences, increasing market penetration and customer satisfaction (Yap & Yazdanifard, 2014). For instance, Procter & Gamble tailors its product offerings and marketing strategies based on local market conditions. In China, P&G adjusts the scent, packaging, and pricing of its laundry detergent brands like Ariel to cater to local washing habits and preferences. Similarly, in Latin America, the company offers products in smaller package sizes to cater to consumers with lower purchasing power.

— Regulatory compliance. Adaptation is also crucial for ensuring compliance with local laws and regulations. This is particularly important in industries such as pharmaceuticals, food and beverage, and consumer goods, where product standards, labelling, and safety regulations vary from country to country (Zengin & Yükselen, 2023). For example, Unilever adapts the formulation of its personal care products like Dove to meet the specific regulatory requirements for ingredients and safety in different markets.

Nevertheless, while adaptation offers greater flexibility, it comes with increased cost and complexity. Customizing products, marketing campaigns, and distribution channels for each market requires additional resources and coordination (Eze et al., 2024). Moreover, a highly adapted marketing strategy can fragment a company’s brand identity, making it harder to maintain a cohesive global image.

Recent studies propose that the most effective approach may be a hybrid model (glocalization) that blends standardization with adaptation. While certain elements of the product and marketing mix are standardized, other elements are adapted to meet local market needs. Companies often standardize core product features, branding, and messaging while adapting marketing communication, distribution, or pricing strategies to better suit the local environment. (Eze et al., 2024, p. 1206).

The hybrid strategy is considered to provide the following benefits:

— Combination of cost efficiency and local relevance. By standardizing core elements like product design, branding, or certain aspects of the marketing mix, companies can still benefit from economies of scale, reducing production and marketing costs across multiple regions. At the same time, they can adapt elements such as promotional content, packaging, or customer service to local market needs. Companies employing a hybrid strategy can have cost savings in product development and manufacturing while simultaneously enhancing customer satisfaction by making necessary local adaptations (Zengin & Yükselen, 2023).

— Global brand consistency with cultural adaptation. A hybrid approach allows companies to maintain a strong and consistent global brand identity while customizing certain aspects of their marketing for specific regions. This ensures that the company’s global vision and messaging remain intact, which is essential for maintaining brand recognition and loyalty across markets. At the same time, local adaptations ensure the brand resonates culturally and linguistically with local consumers. This dual focus can strengthen the company’s position in both global and local markets by creating a harmonious balance between a unified brand image and locally relevant marketing (Yap & Yazdanifard, 2014).

— Faster responsiveness to market changes. The flexibility inherent in the hybrid strategy allows companies to respond quickly to market changes, whether they be competitive pressures, consumer trends, or regulatory shifts. For example, companies can quickly adjust their local marketing campaigns or product features without overhauling their entire global strategy. Hybrid strategies benefit from agile marketing, which is essential in today's fast-paced and unpredictable global market environment (Zengin & Yükselen, 2023).

On the other hand, the hybrid approach has also its challenges. Companies must navigate the complexity of managing both global and local demands simultaneously. This requires close coordination between central and local teams, which can increase managerial complexity and operational costs. Successful implementation of a hybrid strategy also depends on a company's ability to conduct thorough market research and continuously analyze customer data to ensure effective localization (Eze et al.,2024).

One of the best-known examples of the hybrid strategy in practice is McDonald's. Globally, McDonald's maintains a standardized brand identity with recognizable elements such as the golden arches, its slogan, and core menu items like the Big Mac. However, the company adapts its menu offerings to cater to local tastes and dietary restrictions. Beyond modifying its menu (product), McDonald's also adapts its advertising (promotion) and services to meet local expectations regarding pricing and distribution (price and place), all while maintaining a consistent customer experience worldwide (Albrecht, 2023, p. 261).

Selecting the appropriate international marketing strategy – standardization, adaptation, or hybrid requires a thorough analysis of several critical factors.

1. First, it is essential to evaluate market characteristics, particularly the cultural, social, and economic differences among target markets.
2. Next, businesses should consider the nature of their products. A comprehensive examination of competitors' strategies is also crucial.
3. Regulatory and legal considerations must not be overlooked. Investigating local regulations that may require product modifications ensures compliance with legal requirements when determining the most suitable strategy.
4. An assessment of available financial and organizational resources is necessary, as adaptation strategies can be resource-intensive, whereas standardization may offer cost advantages.
5. Pilot testing in selected markets allows businesses to gather valuable data on consumer responses and market dynamics, providing insights that can inform and refine the chosen strategy.
6. Lastly, aligning the selected strategy with the overall brand identity and long-term vision is imperative.

Businesses can make informed decisions on their international marketing strategy by systematically considering a range of critical factors. This approach enables a balance between global efficiency and local responsiveness, ultimately optimizing success in international markets.

Conclusions

The comparative analysis of standardization and adaptation in international marketing strategy highlights the strengths and weaknesses of each approach. Standardization offers cost efficiencies, brand consistency, and simplified management, making it an attractive option for companies seeking to expand globally. However, it may not be effective in all markets, particularly those with significant cultural or regulatory differences. Adaptation, while more resource-intensive, allows companies to tailor their strategies to meet local market needs, resulting in greater consumer engagement and satisfaction. Both strategies have advantages and challenges, and the decision ultimately hinges on the specific market conditions, consumer preferences, and the firm's overall objectives. Strategic flexibility across the Marketing Mix is critical in navigating the balance between global efficiency and local responsiveness.

The findings suggest that the optimal approach often lies in a hybrid strategy that combines elements of both standardization and adaptation. Companies should consider product type, market maturity, cultural factors, and legal requirements when determining the appropriate balance between these two strategies. Further research is needed to explore the impact of digital technologies, such as data analytics and artificial intelligence, on the standardization vs. adaptation debate, as these tools can enable more efficient and targeted customization of marketing efforts across markets. Prospective studies could also focus on industry-specific analyses to better understand how different sectors benefit from these strategies, as well as longitudinal studies to track how companies evolve their strategies over time in response to changing market conditions.

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ADAPTING INTERNATIONAL MANAGEMENT STRATEGIES TO LOCAL CULTURES: CHALLENGES AND OPPORTUNITIES

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Abstract

The article explores the process of adapting international management strategies to local cultural contexts, with a focus on analyzing two contrasting cultural models – Geert Hofstede's model and Edward Hall's model. Hofstede's model helps to quantitatively assess cultural differences across dimensions such as power distance, individualism, and uncertainty avoidance, while Hall's model examines the qualitative aspects of communication through high-context and low-context cultures. The study emphasizes the challenges faced when implementing global strategies in different cultural environments and the opportunities for successful adaptation by taking cultural differences into account. Comparative analysis methods were used to identify key factors influencing the success of adaptation. The practical significance of this work lies in providing recommendations for international companies seeking to effectively adapt their management strategies to local cultural conditions, thereby improving their competitiveness in global markets.

Keywords

international management, cultural adaptation, Hofstede's model, Hall's model, challenges, global strategies.

Problem statement

At the current stage of globalization, companies are increasingly entering new markets with significantly different cultural traditions and values. This requires the adaptation of international management strategies to local conditions to ensure the effective functioning of the business. There is a problem of interaction between global management approaches and cultural peculiarities of countries, which can become both a barrier and an opportunity for the development of companies. Inadequate adaptation can lead to conflicts, misunderstandings in communication, and market failures.

Relevance of the chosen topic

In today's world, companies seek to expand their operations to international markets, which requires them to be able to adapt their management strategies to local cultural characteristics. A misunderstanding of cultural differences can negatively affect a company's operations, while successful adaptation can improve management

efficiency and increase competitiveness in new markets. The topic is relevant not only for large multinationals, but also for small and medium-sized enterprises seeking internationalization. As local markets become more and more integrated into the global economy, the issue of adapting international strategies is becoming a strategic challenge for companies in any sector.

Analysis of recent research and publications

Many prominent scholars have studied the adaptation of international management strategies to local cultures. According to Gert Hofstede's "Culture's Consequences: International Differences in Work-Related Values (Hofstede, 1980), international businesses face numerous challenges when interacting with different cultures. His model of six cultural dimensions (power distance, individualism/collectivism, uncertainty avoidance, etc.) has become the basis for researching cultural differences and their impact on management strategies. The updated version of the study in 2010 adds a new perspective on cultural changes and their impact on modern international corporations (Hofstede, G. Hofstede, Minkov, 2010).

Erin Meyer in her work "The Culture Map: Breaking Through the Invisible Boundaries of Global Business" (Meyer, 2014) draws attention to the practical aspects of communication in international companies. Her work emphasizes the importance of taking into account cultural peculiarities in decision-making, negotiation, and team management. Meyer's model shows that communication is a key aspect for successful adaptation of strategies to local conditions.

An important contribution to the study was made by David Livermore, who in his work "Cultural Intelligence: Surviving and Thriving in the Global Village" (Livermore, 2011) developed the concept of 'cultural intelligence'. Livermore shows that the success of an international company largely depends on the ability of its managers to develop intercultural communication and management skills that allow them to quickly adapt to different cultural environments.

Purpose of the article

The purpose of this study is to examine the key aspects of adapting international management strategies to local cultural contexts. To achieve this goal, the following tasks need to be solved:

- to study the essence of the cultural models of Gert Hofstede and Edward Hall, and their impact on management strategies in international companies;
- to consider the basic principles of adaptation of global strategies to local conditions;
- analysis of the advantages and disadvantages of different approaches to cultural adaptation;
- development of practical recommendations for the effective adaptation of management strategies to local cultural characteristics.

Presentation of the main research material and results obtained

Entering markets is often accompanied by the need to adapt management strategies to local cultural characteristics. Cultural differences can be a serious barrier to the successful implementation of global strategies, as each country has its own unique approaches to leadership, communication and resource management. This requires companies not only to understand general management principles, but also to have a deep knowledge of the cultural contexts in which they operate. The main challenges faced by international companies when entering a new market are shown in Fig 1.

Failure to take into account local needs leads to underestimation of expectations of local employees and customers. The Gert Hofstede model is one of the most widely used models for studying cultural differences, based on empirical data collected among employees of the large international corporation IBM in the 1960s and 1970s. The model uses six main dimensions of culture to quantify the differences between national cultures and understand their impact on the management strategies of international companies (Hofstede and Minkow, 2010):

1. Power Distance Index (PDI) - shows the degree of power inequality that is accepted in society. For example, in China with a high power distance, management is more hierarchical, while in Sweden with a low power distance, employees have more freedom to discuss decisions.
2. Individualism vs. Collectivism (IDV) - in individualistic countries, such as the United States, personal achievement is valued, while in collectivistic cultures, such as Japan, group work and interaction are prioritized.
3. Masculinity vs. Femininity (MAS) - defines the dominance of the values of success and competition (masculinity) or social equality and cooperation (femininity). Masculine countries, such as Japan, focus

on competition, while feminine countries, such as Sweden, favor social equality and cooperation.

4. Uncertainty Avoidance Index (UAI) - measures a society's tendency to avoid uncertainty through clear rules and structures.Great examples are Greece, whose society is inclined to stability and clear rules because of crises, while in Singapore, where the level of uncertainty avoidance is low, people are willing to take risks.
5. Long-term vs. Short-term Orientation (LTO) - assesses the future or immediate results orientation of a society, such as Japan, where children are the center of public policy, or the United States, where the population is extremely mobile and ready to take risks for the sake of profit and competition.
6. Indulgence vs. Restraint (IVR) - determines how ready a society is to meet needs and express itself or how inclined it is to self-control. Latin American countries are more indulgent, allowing for the expression of emotions and satisfaction of needs, while restraint and behavioral control dominate in Germany.

The data for analyzing cultural differences using the Hofstede model are published in the public domain on the official Hofstede Insights website. This platform provides information on cultural indicators for more than 100 countries, which allows comparing different national cultures along six dimensions. Users can view data and use analytical tools to assess the impact of cultural differences on business processes.

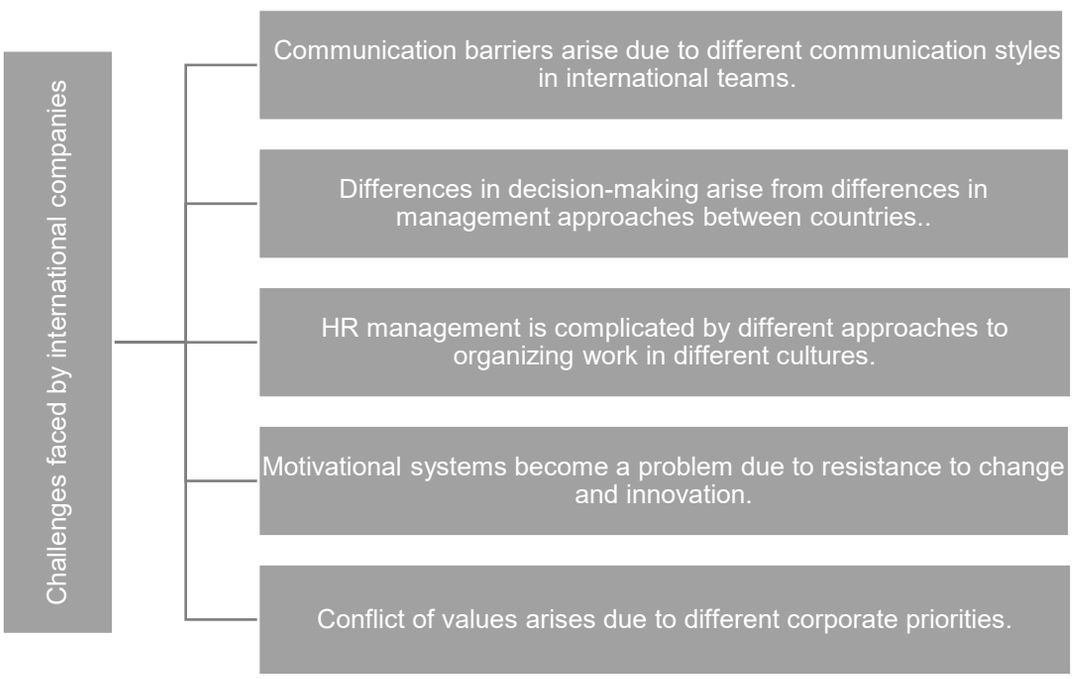

Fig. 1. The main problems associated with the adaptation of international companies in new markets.
Source: "Effective Cross-Cultural Communication for International Business", 2021

Although the Hofstede model is widely used in international management, it has a number of limitations. Since the original data was collected several decades ago, the model may not fully reflect current changes in cultures. Some countries are developing and changing rapidly, which requires constant updating of the data. For example, China has significantly changed its socioeconomic structure in recent decades, which could affect cultural indicators. The model also analyzes national cultures as homogeneous, not taking into account regional and internal cultural differences, which can be significant, especially in large countries. In the United States and Italy, different regions have significant differences in communication and management styles. Not all aspects of culture affect different business sectors in the same way. The model does not take into account industry specifics, where some dimensions of culture may have a greater or lesser impact on management decisions.

Despite its challenges, the Hofstede model remains extremely useful for international companies seeking to understand the cultural characteristics of markets and adapt their strategies. With this model, international corporations can better predict how local employees will react to management decisions, organizational changes, or marketing strategies. Knowledge of cultural dimensions helps to reduce the risk of conflicts and improve interaction in different markets.

IKEA in China has implemented a more hierarchical management structure, taking into account the high power distance, which differs from the egalitarian Swedish model. Airbnb also applies Hofstede's cultural

dimensions to improve the interaction between landlords and tenants in different markets. For example, in countries with a high power distance, Airbnb implements more formal processes and acts as a full-fledged landlord in the region, while in countries with a low power distance, the platform offers a more informal approach to communication and quick resolution of consumer problems ("IKEA in China," n.d.).

On the other hand, Walmart tried to implement its typical US management model, which led to negative reactions from employees and consumers. As a result, Walmart eventually left the German market. This case is an example of how ignoring the cultural dimensions of Hofstede can lead to business failures ("Walmart in Germany," 2016).

Edward Hall's model divides cultures into high-context and low-context cultures depending on how much information is transmitted non-verbally or through the context of the situation (Hall, 1976):

1. High-context cultures (Japan, China) rely on nonverbal cues, traditions, and relationships. Communication is indirect and context is more important than words. High-context communication in Japan (and in Asia in general) leads to indirect negotiations, where it is important to read between the lines and take into account non-verbal cues. This helps to avoid conflicts and maintain harmony, but greatly increases the emotional threshold for a person who grew up in a different cultural region.
2. Low-context cultures (USA, Germany) are characterized by direct, clear communication, where words carry the main load. Low-context communication in the United States emphasizes directness and efficiency. During business negotiations, it is important to speak directly and avoid ambiguity, which speeds up decision-making.

Despite the widespread use of the Hall model, it has its limitations. First of all, the difficulty of quantitative measurement is a significant problem. Since the model is based on qualitative characteristics of communication, it is difficult to define precise boundaries between high-context and low-context cultures. Furthermore, the model has a limited ability to capture the complex social and cultural changes taking place in the modern world, in particular due to globalization and digitalization. It does not take into account the impact of technology, which is changing the way we communicate, or social changes that may affect communication styles within a culture. The model also sometimes simplifies reality by not taking into account the multifaceted nature and complexity of communication processes, which can lead to overgeneralizations.

Nevertheless, there are companies that officially implement this method in their activities. Coca-Cola uses high-context communication in Japan, creating advertising campaigns that reflect local traditions and values, while Google uses a low-context approach in the US and Europe, where the emphasis is on clear and direct communication that meets Western standards of transparency ("Coca-Cola in Japan," n.d.).

Since humanity is diverse, there is never a single approach for entire regions, and even within one country there may be different problems. Therefore, the first task when assessing the market is to combine the two models and ask ourselves what are the main problems for us and what can be solved through internationalization. Therefore, combining these models is a great option to solve the problem of their inferiority, as shown in Fig 2.

To solve the problem of differences in decision-making, it is worth referring to the Hofstede model, which assesses the level of power distance in cultures. In countries with a high power distance, decisions are made at the level of top management, which requires a clear hierarchy and centralized management. In low power distance countries, employees are accustomed to more democratic decision-making, so to effectively manage international teams, management structures should be adapted to allow for greater autonomy in such cultures.

Communication barriers can be overcome by using Edward Hall's model, which defines cultures as either high-context or low-context. In high-context cultures, communication is often indirect, based on non-verbal cues and context. In such cases, managers need to be trained to pay attention to subtext and nonverbal cues. In low-context cultures, communication is direct, so clear, understandable instructions must be provided to avoid misunderstandings.

The Hofstede model, in particular the individualism and collectivism dimensions, is useful for HR management and motivation. In individualistic cultures, personal achievement is a priority, so programs that emphasize individual success are needed to motivate employees. In collectivist cultures, the focus should be on teamwork and social rewards, which increases overall performance.

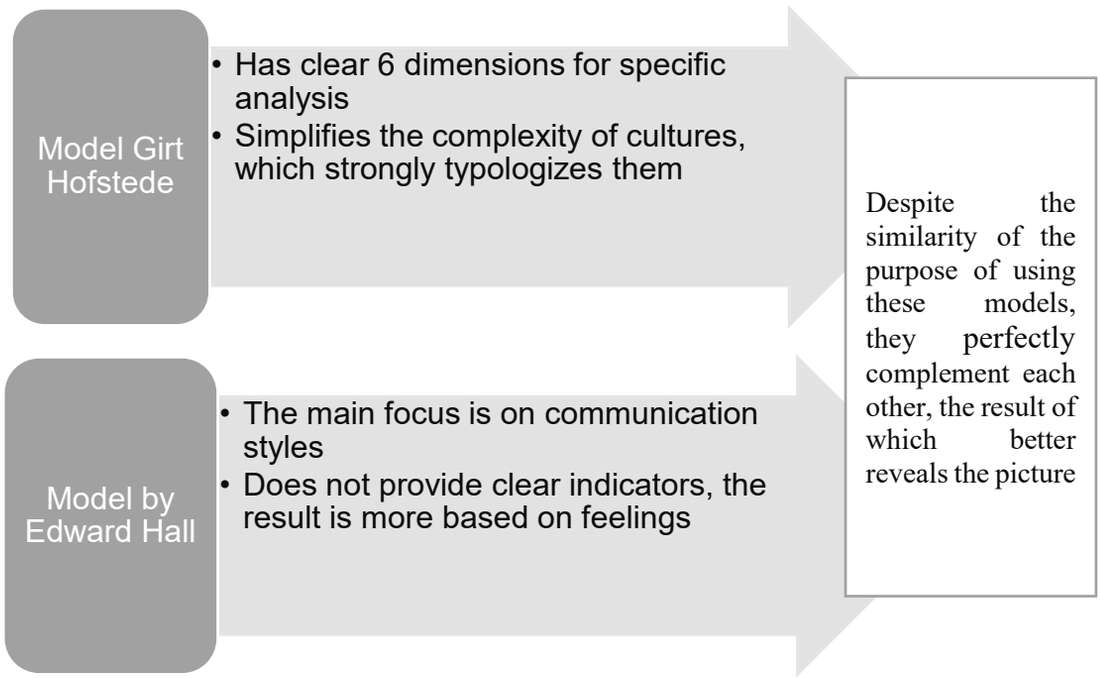

Fig. 2. Combining the Girth and Edward models to complement each other.
Source: compiled by the author

The problem of motivational systems in cultures with high uncertainty avoidance can be solved through gradual implementation of changes. The Hofstede model, which measures uncertainty avoidance, can help determine how stable and predictable work processes should be in a particular culture. In such cultures, it is important to provide clear instructions and create a stable environment to minimize stress due to change.

The conflict of values between masculine and feminine cultures can be assessed through the masculinity dimension of Hofstede's model. In masculine cultures focused on competition and achievement, corporate strategies should be focused on competition and recognition of achievement. In feminine cultures, the emphasis should be on cooperation and social equality to avoid conflicts in the team.

Hofstede's model, particularly the dimensions of individualism and collectivism, is useful for personnel management and motivation. In individualistic cultures, personal achievements are a priority, so motivational programs that emphasize individual success are needed. In collectivist cultures, the focus should be on teamwork and social rewards, which increase overall productivity.

The issue of motivational systems in cultures with a high level of uncertainty avoidance can be addressed through the gradual introduction of changes. Hofstede's model, which measures uncertainty avoidance, can help determine how stable and predictable work processes need to be in a specific culture. In such cultures, it is important to provide clear instructions and create a stable environment to minimize stress from changes.

The conflict of values between masculine and feminine cultures can be assessed through the masculinity dimension of Hofstede's model. In masculine cultures, which are oriented towards competition and achievement, corporate strategies should focus on competition and the recognition of accomplishments. In feminine cultures, the emphasis should be on cooperation and social equality to avoid conflicts within the team.

Furthermore, it is important to develop flexible motivational systems that take into account both individual achievements and team results, depending on the culture of a specific region. Companies need to implement adaptive management approaches, ensuring a balance between global strategies and local needs in order to operate effectively in international markets.

Conclusions

The study analyzed the main challenges faced by international companies when adapting their management strategies to different cultural contexts. It was found that cultural differences in aspects such as decision-making, communication, employee motivation, and corporate values can become both barriers and opportunities for success in international markets. The models of Geert Hofstede and Edward Hall provide effective tools for analyzing and adapting management strategies to cultural characteristics.

Practical recommendations for companies include the development of cultural intelligence, the use of modern communication technologies, and the creation of flexible motivational systems. These approaches allow for consideration of local specifics and ensure harmonious functioning of international teams.

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MANAGING CROSS-CULTURAL CONFLICTS IN INTERNATIONAL CORPORATIONS

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Abstract

This article will explore the challenge of dealing with cross-cultural conflicts in multi-national corporations that is increasingly salient in our era of globalization. Disputes between different cultures may even occur due to different cultural values, ways of communication, approaches to decision-making and management, which always worsen the working atmosphere and efficiency of companies. The main causes and signs of intercultural conflicts are studied, such as language differences; the difference in values and types of leadership among nations; the misunderstanding between cultures on how they perceive time and emotional expression.

The author proposes a conceptual model for managing cross-cultural conflicts, which includes the development of intercultural competence of employees and leaders, adaptive leadership, negotiation and mediation. Particular attention is paid to the role of training, language courses and cross-cultural coaching in overcoming conflicts and increasing the effectiveness of interaction in multicultural teams. The article also contains recommendations for the practical application of conflict management methods in international corporations.

Keywords

cross-cultural conflicts, international corporations, intercultural competence, globalization, communication, cultural differences, conflict management.

Problem statement

In today's globalized world, international corporations face numerous challenges, among which a special place is occupied by cross-cultural conflicts. These conflicts can arise as a result of differences in cultural values, norms, communication styles, work ethics and organizational behavior of employees from different countries. Cross-cultural misunderstandings can not only worsen the working atmosphere, but also negatively affect the efficiency of business processes, labor productivity, and lead to lower employee satisfaction and company losses. In this regard, managing such conflicts is becoming an important aspect of international management in multinational corporations.

The problem lies in the need to understand cultural differences and their impact on employee behavior. Scientific research shows that different cultural values, norms, and ways of communicating can have a significant impact on group dynamics, decision-making, and overall productivity. Despite a significant amount of research in the field of international management, the issue of managing cross-cultural conflicts is still relevant. This is due to both the growing number of international transactions and the increasing diversity of staff in global corporations. Scholars and practitioners are exploring various approaches to solving this problem, including the adaptation of communication strategies, the use of inclusive leadership models, and the development of intercultural competence.

The theoretical significance of this problem lies in the need to develop and improve management models that take into account cultural differences and their impact on corporate interactions. At the same time, the practical relevance is driven by the need of international corporations to increase the efficiency of their operations by minimizing conflict situations and creating a harmonious working environment. This issue is important not only for the successful functioning of individual companies, but also for the development of the global economy as a whole, as proper management of cross-cultural conflicts can help increase innovation, creativity and competitiveness of companies in international markets.

Thus, the management of cross-cultural conflicts in international corporations is an important task for both scholars and practitioners, which requires further research and development of effective tools and strategies.

Relevance of the chosen topic

The management of cross-cultural conflicts in international corporations is becoming increasingly important in the context of globalization and growing international cooperation. The increase in the number of multinational companies and their expansion into new markets is accompanied by an increase in diversity in workforces, which creates unique challenges in human resources management. Cultural differences can manifest themselves in various ways, from communication styles to approaches to problem solving and decision making. This increases the likelihood of cross-cultural conflicts that negatively affect the effectiveness of interaction and corporate culture.

The relevance of the study is due to the need to find effective methods of resolving such conflicts to ensure the sustainable development of international corporations. The globalization of the economy and the rapid growth of international business relationships make cross-cultural issues increasingly urgent. Companies that deal effectively with cultural differences can gain competitive advantages through better interaction, innovation potential, and the ability to adapt quickly in different cultural contexts.

Research in this area will not only allow us to theoretically understand the nature of cross-cultural conflicts, but also to offer practical tools for overcoming them. This is especially important for large international corporations that operate in different cultural environments and require a systematic approach to human resource management that takes into account cultural specifics.

Cross-cultural teams can be a source of innovation and creative solutions if they are managed properly. Research in this area will help identify ways to maximize this potential.

In addition, in today's world, companies are faced with social responsibility and ethical requirements. Understanding cultural contexts helps to ensure ethical business practices and improve the company's image.

Thus, the topic of managing cross-cultural conflicts is relevant not only for the development of management science, but also for business, as it has a direct impact on the productivity, innovation and competitiveness of international companies in the global environment.

Analysis of recent research and publications

In recent years, the scientific literature has paid considerable attention to the issues of cross-cultural management and conflict resolution in international corporations. The study of cultural differences, their impact on business processes and the development of effective management strategies are critical for successful operations in the global business environment.

An analysis of recent research and publications on intercultural conflict management in international business demonstrates the importance of effective management for achieving competitive advantage in a globalized economy. One of the key studies conducted by Kateryna Kryvobok and O. Kanova (2023) emphasizes that intercultural conflict management is critical to the success of international business as it affects the motivation and overall productivity of companies.

The study by Olga Podra and Daria Lysa (2023) emphasizes the need to understand cultural differences in order to prevent and resolve conflicts arising from foreign economic activity. They note that using Richard

Lewis's classification of business culture can help in navigating intercultural differences.

Traditional intercultural communication can no longer limit an organization to increase their efficiency and competitiveness for organizational success in the global market: T. Rachel Shalini (2023) concluded from the study, which supports the significance of cultural awareness within international business. However, every study as part of organisation usually discusses the impact of cultural barriers on decision making processes and this is where a large gap in understanding how management processes in corporations are influenced by cultural differences remains.

Wang Shaojing (2023) in his study examines cross-cultural management with a focus on theoretical and practical aspects of cross-cultural conflict resolution. The author notes that effective management of cultural differences is key to the successful operation of international corporations and emphasizes the importance of cultural integration for achieving global business goals.

Zunwu Feng's (2023) research examines the complexities of cross-cultural management within the realm of international business, highlighting that a company's effectiveness hinges on its ability to navigate cultural variations. The study identifies the specific challenges encountered by Chinese firms in the globalized marketplace and stresses the necessity of incorporating cultural differences into business operations. While it provides a theoretical framework, the study falls short in addressing the practical components of applying cultural integration strategies, marking this as a significant area for future investigation.

The analysis of recent studies shows that the issues of cross-cultural management and conflict resolution in international corporations are widely discussed in the scientific literature, but there are gaps due to insufficient coverage of practical aspects and specific cases. While considerable attention is paid to theoretical approaches to resolving cross-cultural conflicts, research often lacks examples of successful application of these strategies in real-world settings. Studying these unresolved aspects, in particular the impact of cultural differences on decision-making and management processes, is an important area for further research.

Purpose of the article

This research endeavors to formulate a conceptual framework in conjunction with practical suggestions for the efficient administration of cross-cultural disputes within multinational enterprises. It emphasizes innovative strategies for enhancing communication methods, boosting the intercultural competence of both leaders and employees, and fostering an inclusive workplace that minimizes conflicts and bolsters company competitiveness in the global marketplace. The research further seeks to enhance the understanding of cross-cultural conflict mechanisms and propose strategies for their prevention and resolution, considering the evolving dynamics of the global business landscape.

The purpose of the study is based on the analysis of existing scientific publications that do not sufficiently cover aspects of cross-cultural conflicts in the context of management practices, and involves the identification of new scientific facts that can supplement or clarify the already known approaches.

Research objectives:

1. Analyze scientific approaches to the study of cross-cultural conflicts in international corporations, identify their strengths and weaknesses.
2. To explore the main causes of cross-cultural conflicts in global organizations, focusing on differences in cultural values, communication styles and management practices.
3. To determine the role of intercultural competence of managers and employees in minimizing conflicts and developing adaptive strategies for their resolution.
4. Develop a conceptual model of cross-cultural conflict management that would include mechanisms of effective intercultural communication and methods of building an inclusive corporate culture.
5. To offer practical recommendations for international corporations on the implementation of effective methods of cross-cultural conflict management, including conflict prevention strategies through training and development of intercultural competence.
6. Evaluate the effectiveness of the proposed methods based on empirical data or case studies of well-known international companies.

The results of the study will significantly complement the current scientific understanding of cross-cultural conflict management and offer new approaches to creating a harmonious multicultural environment in international corporations.

Presentation of the main research material and results obtained

Cross-cultural conflict is a fundamental aspect of the operations of international corporations that function within a multicultural context. This conflict stems from the collision of diverse cultural norms, values, and communication styles, potentially hampering organizational efficiency and employee interactions (Podra, O., Lysa, D., 2023). To effectively navigate these conflicts, it is crucial to have a thorough understanding of their nature, essence, and characteristics.

This category of discord, which may manifest between individuals or collectives originating from diverse cultural contexts, emerges from discrepancies in perceptions, values, behavioral standards, and methodologies for addressing issues. It may present itself in various ways, ranging from communication misunderstandings to severe confrontations, which can diminish team performance and adversely affect corporate culture.

According to the research of Hofstede and other experts in the field of intercultural communication, cross-cultural conflicts arise when employees from different cultural contexts cannot reconcile their different approaches to communication, decision-making, or understanding of business processes (Khmara, M., & Pilipenko, B., 2020). Such conflicts can be both overt and latent, i.e. manifested in the form of hidden tensions, which leads to a gradual accumulation of dissatisfaction among employees. The emergence of such conflicts is caused by a number of factors that reflect profound differences in approaches to work, management, communication and decision-making. Understanding these factors is critical to preventing and effectively managing conflict in multicultural teams.

There are several main signs of cross-cultural conflict that help identify it in the early stages and develop effective strategies to overcome it (Podra, O., Lysa, D., 2023):

1. Language barriers stem from inadequate proficiency in a shared language or variations in its usage. Even when employees of multinational companies converse in a common language—most frequently English as the global business lingua franca—their levels of proficiency can vary significantly. This disparity may result in misunderstandings or miscommunications. Additionally, language barriers can hinder the articulation of complex concepts, which may ultimately impact performance and foster conflicts.
2. Variations in communicative methodologies. Distinct cultures exhibit their own unique styles of communication. For example, nations such as the United States and Germany favor a forthright approach that clearly articulates information. In contrast, cultures like Japan and China frequently utilize a more nuanced style, wherein meaning is significantly shaped by context, non-verbal signals, and vocal tone. This divergence can result in misconceptions: one individual may perceive directness as impolite, while another may interpret indirectness as an evasion of accountability.
3. Diverse values and priorities. Individuals from various cultures often possess distinct values that shape their priorities in both their professional and personal lives. For instance, some cultures emphasize collectivism and mutual support over individual accomplishments, whereas others prioritize personal success and competition.
4. Differences in approaches to problem solving. Cultures also differ in how they approach conflict or problem solving. In Western cultures, a rational and logical approach is common, where problem solving is based on argumentation and analysis of facts, while Eastern cultures may prefer harmony and avoidance of confrontation.
5. Different perception of time. Cultures may have different perceptions of time, which can also lead to conflicts. In some countries, punctuality and strict adherence to schedules are the basis of working relationships (for example, in Germany or the United States), while in Latin America or the Middle East, time may be more flexible.
6. Different expectations of leadership and management. Cultures may perceive the role of the leader differently. In countries with a high level of power distance (e.g. Russia, India), an authoritarian management style is the norm, and employees expect the leader to make all important decisions. In cultures with a low level of power distance (e.g., Scandinavian countries, the United States), employee participation in decision-making is more common, with the leader acting more as a coordinator or facilitator. Interaction between employees with different expectations of management can lead to conflicts due to dissatisfaction with the management style or different approaches to the distribution of duties and responsibilities.
7. Different approaches to conflict resolution. Different cultures have different conflict resolution strategies, ranging from actively discussing the problem to avoiding conflict situations. Interactions between people who use these different approaches can cause tension and misunderstandings.
8. Differences in motivation systems. In Western cultures, individual achievement and career advancement are often the main motivators, while in Eastern cultures, collective harmony and mutual support are more

important. Conflicts can arise when international corporations use standardized incentive systems that do not take into account cultural differences, leading to employees feeling unfulfilled or seeing no prospects for development.

9. Emotional expressiveness and social norms. Different cultures also differ in their approaches to emotional expression and social norms of interaction. For example, in cultures where emotional expressiveness is common (Italy, Latin America), employees can openly demonstrate their feelings at work. In cultures with low emotional expressiveness (Japan, Germany), restraint and control of emotions are considered important social norms. Conflicts can arise when one employee perceives the emotional expressions of another as inadequate or inappropriate in the work environment.

Consequently, cross-cultural conflict represents a multifaceted phenomenon stemming from the variety of cultural attributes and communicative practices. To adeptly navigate these conflicts, it is imperative to possess a comprehensive understanding of their essence and to timely discern their distinctive characteristics. This understanding paves the way for the formulation of strategies for conflict prevention and resolution grounded in intercultural competence, which serves as an essential instrument for the effective operation of international enterprises.

To avert these repercussions, global corporations ought to proactively cultivate the intercultural competence of their personnel, implement training programs focused on intercultural communication, and devise strategies that adapt corporate culture to a multicultural context. Such measures will aid in reducing conflicts and promoting the seamless integration of employees from diverse cultural backgrounds into a cohesive team.

Modern theories of intercultural communication help to study and analyze these differences, providing tools for effective interaction between representatives of different cultures. The most significant models in this area are those of Gert Hofstede, Edward Hall, and Fons Trompenaars. Each of these models provides insight into how cultural differences affect communication, management, and work organization in a multicultural environment.

Gert Hofstede developed one of the most famous and detailed models for studying intercultural differences. He identified six key cultural dimensions that determine differences in the behavior and approaches of people from different cultures (Khmara, M., & Pilipenko, B., 2020):

1. Power Distance Index (PDI). This dimension describes the extent to which a culture accepts inequality in power and authority between supervisors and subordinates. In cultures with a high power distance (India, Mexico), hierarchy is perceived as normal and natural, and employees expect the manager to make all important decisions. In cultures with a low power distance (Scandinavian countries, Germany), a democratic management style prevails, where employees have more opportunities to participate in decision-making.
2. Individualism vs. Collectivism. This dimension shows how much a society values individual achievement or teamwork. In individualistic cultures (USA, UK), employees are focused on personal success and individual achievement. In collectivist cultures (China, Japan), the interests of the group, harmony in the team, and harmony in relationships are more important.
3. Masculinity vs. Femininity. This dimension describes the dominant values in a culture. Masculine cultures (Japan, Germany) value competitiveness, ambition, and achievement, while feminine cultures (Sweden, Norway) favor cooperation, caring for others, and harmony.
4. Uncertainty Avoidance Index (UAI). This dimension describes the extent to which a society is prepared for uncertainty and risk. In cultures with high uncertainty avoidance (Greece, Portugal), people tend to avoid risky situations and adhere to strict rules and regulations. In cultures with low uncertainty avoidance (Singapore, Denmark), people are more open to change and new ideas.
5. Long-term vs. Short-term Orientation. This dimension indicates whether a culture is focused on long-term planning and strategies or short-term results. Long-term oriented cultures (China, South Korea) value planning for the future, while short-term oriented cultures (USA, UK) place more emphasis on immediate results and achieving goals quickly.
6. Indulgence vs. Restraint. This dimension describes the level of satisfaction of needs and desires in society. In indulgent cultures (Latin America, Western Europe), people are more focused on personal happiness and satisfaction, while in restrained cultures (China, Russia), more emphasis is placed on self-control and restriction.

Edward Hall developed a model that explores intercultural differences through the lens of communication, focusing on the level of context in which information is transmitted. He divided cultures into high-context and low-context cultures, which helps to explain differences in communication styles (Khmara, M., & Pilipenko, B., 2020).

In highly contextualized cultures (Japan, China, Arab countries), most information is conveyed through context: non-verbal signals, intonation, gestures, and not just words. A lot of important information remains "between the lines". People in these cultures rely on shared experiences and understanding of the situation.

In low-context cultures (USA, Germany, Switzerland), communication is more direct, and most information is conveyed through words themselves. In such cultures, meaning does not require additional context or in-depth interpretation, and communication is transparent and clear.

Fons Trompenaars proposed a model that also examines intercultural differences by focusing on key aspects of interpersonal interaction and problem-solving approaches. He identified seven cultural dimensions (Khmara, M., & Pilipenko, B., 2020):

1. Universalism versus particularism. Universalist cultures (USA, Germany) believe that rules and laws are universal and should be applied to everyone equally. Particularistic cultures (China, Russia) are more concerned with circumstances and context, viewing rules as flexible and dependent on the specific situation.
2. Individualism versus collectivism. As in Hofstede's model, this dimension reflects the difference between an orientation toward individual achievement (individualism) and group harmony (collectivism).
3. Neutrality versus emotionality. Neutral cultures (UK, Germany) tend to restrain emotions in formal interactions, while emotional cultures (Italy, Spain) allow open expression of emotions at work.
4. Specificity versus diffusion. In specific cultures (USA, Germany), work and personal relationships are clearly separated. Interactions in the workplace are narrowly focused and limited to specific tasks and goals. In contrast, in diffuse cultures (Spain, China), personal and work relationships are interconnected. For example, successful cooperation requires establishing trusting personal relationships.
5. Achievement versus prescription. In achievement cultures (USA, Australia), a person's value is determined by his or her personal achievements and successes. In cultures of attribution (India, Saudi Arabia), social status and respect depend on one's place in society, as well as on one's family background, age, or gender.
6. Orientation to time. Trompenaars conducted an examination of cultural interpretations of temporality, paralleling the methodologies of Edward Hall. Certain cultures prioritize historical context and tradition, whereas others emphasize future aspirations and innovation. For instance, Western societies tend to be oriented towards future developments and advancements, in contrast to Asian cultures that may place greater significance on historical legacy and traditional practices.
7. Relations with the environment. The final dimension pertains to whether the environment is regarded as a phenomenon that can be manipulated or as a condition to be embraced in its existing state. In cultures that view the environment as amenable to control (such as the United States and the United Kingdom), individuals endeavor to exert influence over their surroundings and facilitate transformation. Conversely, in cultures that advocate for acceptance of the environment (exemplified by China and Japan), individuals tend to exhibit greater adaptability to external conditions and strive for harmony with nature.

Each of these theoretical frameworks presents a distinct methodology for examining intercultural variances. Hofstede's framework emphasizes dimensions that elucidate social and organizational divergences among cultures, thereby offering a comprehensive overview of the impact of cultural elements on management and workplace dynamics within corporations. Hall's framework concentrates on communicative dimensions, particularly how cultural contexts influence the dissemination of information. Trompenaars provides an in-depth exploration of interpersonal dynamics, as well as the implications of cultural disparities on organizational structure and social engagements.

Collectively, these three frameworks furnish valuable instruments for comprehending and addressing cross-cultural disputes in multinational enterprises. Various models may be employed contingent upon the specific context: Hofstede's model aids in grasping cultural influences at the organizational stratum, Hall's at the communicative level, and Trompenaars at the level of interpersonal connections and collaborative interactions.

Intercultural competence is a key success factor for global organizations operating in a multicultural environment. In a globalized business environment, where communication and collaboration between people from different cultures are becoming an integral part of everyday work, the ability to interact effectively with people from different cultural backgrounds is critical. Intercultural competence helps to reduce the risks associated with cultural conflicts and increase the effectiveness of work in international teams.

Intercultural competence is defined as the ability of an individual to interact effectively with representatives of other cultures (Vasylenko, O., 2022). It includes knowledge about other cultures, communication and adaptation skills, and a willingness to accept and respect cultural differences. This competence is not innate, but is developed through learning, experience and practical interaction with other

cultures.

The main components of intercultural competence:

— The cognitive component is knowledge about other cultures, including an understanding of their values, norms of behavior, language and customs. This includes understanding key aspects of cultural models, such as those described by Hofstede, Hall, and Trompenaars.

— The affective component is the ability to emotionally adapt and tolerate uncertainty that arises when interacting with representatives of other cultures. An important aspect is the development of empathy, which allows employees to better understand the emotional and social needs of colleagues from other cultures.

— Behavioral component - includes the skills of effective communication and behavior in an intercultural environment. This involves adapting one's own communication style, the ability to resolve cross-cultural conflicts and find compromises.

For global organizations operating in different countries and regions, intercultural competence is a prerequisite for success in the international market.

In international corporations, communication between people from different cultures can be complicated by differences in languages, non-verbal cues, and cultural expectations. Intercultural competence helps employees to better understand how their words and actions may be perceived by others, which helps to avoid misunderstandings and mistakes.

Intercultural conflicts frequently emerge due to misinterpretations or neglect of cultural variances. The development of intercultural competence equips employees to identify potential conflict sources and to implement timely measures to prevent or mitigate these issues.

Within global organizations, teams are commonly composed of individuals from diverse nations. Intercultural competence fosters synergy within such teams, leading to enhanced understanding and collaboration, thereby contributing to heightened productivity. When employees hailing from varied cultural backgrounds engage effectively and exchange ideas, it paves the way for innovative solutions and novel strategies for addressing challenges. Cultural diversity serves as a wellspring of creativity and facilitates the advancement of new products and services.

For organizations venturing into unfamiliar international markets, comprehending cultural nuances is imperative. The intercultural competence possessed by managers and employees enables them to adjust business strategies more adeptly to local contexts, considering the distinctive behaviors of consumers, partners, and regulatory bodies.

In global corporations, developing a common corporate culture that combines the values of different cultures is an important part of success. Intercultural competence contributes to building an inclusive and tolerant work environment where all employees feel that they are important members of the organization.

To develop intercultural competence, there are many methods that can be applied in educational programs, trainings, and daily activities of international corporations. The most effective methods include (Vasylenko, O., 2022):

1. Training in intercultural communication. Specialized trainings help employees gain knowledge about cultural differences, learn how to adapt their communication to the context, and develop skills in resolving intercultural conflicts. Such trainings can include both theoretical lectures and practical exercises, such as role-playing games or case studies.
2. Language courses. Mastering a foreign language is an important part of intercultural competence. Language courses help not only to master communication skills, but also to immerse yourself in the culture of the country whose language is being studied. Knowledge of a language allows you to better understand the context in which an international organization operates and build trusting relationships with colleagues and partners.
3. Intercultural workshops. Workshops that involve representatives of different cultures facilitate the exchange of experience and understanding of different approaches to work and communication. Workshops can be devoted to various aspects of intercultural interaction: from practical communication issues to a deeper understanding of social norms and values of other cultures.
4. Employee rotation and international exchanges. One of the most effective methods of developing intercultural competence is direct experience in another country. Moving employees between offices in different countries allows them to learn through practice, adapt to a new cultural environment, and acquire valuable intercultural skills.
5. Mentoring and coaching. In an intercultural context, mentoring involves experienced professionals with strong intercultural skills guiding new employees as they adapt to and navigate the complexities of

working effectively in a diverse environment. Furthermore, coaching can be valuable in nurturing personal qualities such as openness to new ideas and adaptability.

The cultivation of intercultural competence represents a multifaceted yet critically essential endeavor for global enterprises. The application of diverse methodologies, strategies, and instruments facilitates the thorough enhancement of this competency among personnel. The amalgamation of cognitive, affective, and behavioral elements not only elevates efficacy within multicultural teams but also fosters the establishment of an innovative and cohesive workplace that recognizes cultural distinctions and values diversity.

The administration of cross-cultural disputes constitutes a principal responsibility for multinational corporations, as such disputes can profoundly influence performance, interpersonal relations among employees, and the overarching corporate ethos. The significance of formulating a conceptual framework for the management of cross-cultural disputes lies in its capacity to systematize conflict resolution strategies, emphasizing crucial factors and mechanisms for their resolution, while ensuring the effective application of conflict management practices in real-world scenarios.

The development of a conceptual model of cross-cultural conflict management includes several important stages (Podra, O., Lysa, D., 2023):

1. The first step is to understand and classify the types of conflicts that arise in intercultural interaction. Conflicts can be associated with differences in communication styles, differences in cultural values, emotional reactions to different situations, and differences in approaches to leadership and management.
2. The model should take into account the cultural differences that often cause conflicts in multinational corporations. These differences may include such aspects as individualism versus collectivism, power distance, attitudes toward time (monochronicity and polychrony), gender roles and hierarchy.
3. Once conflicts have been identified, it is necessary to analyze how cultural differences affect the development and resolution of the conflict. For example, in some cultures, open confrontation may be unacceptable, while in others it is a common way of expressing disagreement.
4. The strategy should include management methods that are most effective in an intercultural environment. These may include negotiation, mediation, adaptive leadership, and specific communication techniques that take into account the cultural characteristics of the parties to the conflict.
5. The framework should be grounded in key theoretical perspectives on intercultural communication, specifically the frameworks established by Hofstede, Hall, and Trompenaars. This will aid in organizing the comprehension of cultural variances and in implementing the most suitable management strategies for diverse cultural environments.
6. An important part of the model is the implementation of a system for monitoring and evaluating the results of cross-cultural conflict management. The effectiveness of the measures can be assessed through the level of employee satisfaction, reduction of conflicts, and increase in the overall productivity of international teams. Preventing conflicts is not always possible, so it is important to have effective strategies for resolving them. Such strategies include (Podra, O., Lysa, D., 2023):
    a. Conflict mediation. Mediation is a process in which a third party (mediator) helps the parties to a conflict find a common solution. The mediator can be an internal employee or an invited expert. In a cross-cultural context, the mediator should have a good awareness of cultural differences and be able to neutrally guide the dialogue.
    b. Negotiations with an emphasis on cultural sensitivity. Negotiation serves as a fundamental instrument for conflict resolution within international enterprises. Nevertheless, in a multicultural context, negotiations necessitate heightened awareness of cultural variances. For instance, in certain cultures, candid and emotionally charged dialogues are deemed acceptable, whereas in others, a more formal and restrained approach to negotiation is favored. The efficacy of negotiations is contingent upon the capacity to adjust to the anticipations of the opposing party and to consider their cultural sensitivities.
    c. Adaptive leadership. Adaptive leaders are able to effectively manage multicultural teams by responding quickly to cultural differences and adapting their management style depending on the situation. This approach minimizes conflicts and creates conditions for productive work, where each employee feels heard and understood.
    d. Consensus decision-making. A viable approach to mitigate conflicts is through collaborative, consensual decision-making processes. This methodology guarantees that all stakeholders are engaged in the proceedings, considers their perspectives, and diminishes the potential for discord. It is imperative that management not only formally incorporates employees in the decision-making process but also fosters dialogue among diverse cultural groups, which will aid in the early

prevention of conflicts.

e. Cross-cultural coaching. Coaching serves as a potent mechanism for enhancing intercultural competence and resolving conflicts. Cross-cultural coaches assist employees in honing their communication skills with individuals from various cultural backgrounds and provide strategies to navigate conflictual scenarios. Coaching may be implemented in either group settings or one-on-one sessions, contingent upon the distinct requirements.

f. Rotation and temporary relocation of employees. Sometimes it is a useful strategy to temporarily relocate employees to other regional offices to gain a deeper understanding of the local culture. This experience allows employees to better understand how other cultures work and reduces misunderstandings that may arise from cultural differences.

Conclusions

Managing cross-cultural conflicts in international corporations is a critical aspect of modern business in the context of globalization. Cross-cultural conflicts arise as a result of differences in values, language barriers, communication styles and management practices of employees from different cultures. They can have a significant impact on business performance, productivity, and overall corporate culture.

A crucial element in successfully navigating conflicts is the enhancement of intercultural competence among both managers and employees. This involves the skill to engage effectively with individuals from diverse cultures, comprehend their values, and tailor communication strategies to suit various cultural contexts. Culturally aware and adaptive leadership is vital in mitigating conflicts and cultivating a harmonious workplace.

To proficiently handle cross-cultural disputes, international corporations ought to invest in their workforce by providing training in intercultural communication, offering language courses, facilitating cross-cultural coaching, and implementing employee rotation programs. Such initiatives will reduce the likelihood of conflicts, boost productivity, and encourage innovative teamwork.

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STRATEGIES FOR MANAGING REMOTE TEAMS IN INTERNATIONAL ENTERPRISES

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Abstract

This article examines the strategies, tools, and influencing factors in managing remote teams within international companies in a changing external environment. The goal is to explore the unique aspects of managing remote teams in the context of cross-geographical interactions within modern organizations.

Key challenges affecting multinational collaboration are discussed, such as communication difficulties, coordination, and cultural differences. The article highlights the importance of effective leadership, adaptive organizational culture, and the use of innovative digital technologies, including artificial intelligence, to enhance remote team productivity. It analyzes current approaches to managing remote teams, including shared leadership concept, flexible hiring practices, and optimizing work processes across different time zones and cultural contexts.

The research emphasizes the critical impact of external factors on the growth of remote team practices. Recommendations are provided for improving management practices to ensure the effectiveness of remote teams in international business.

Keywords

remote work, leadership, international management, organisational culture, team communication, adaptability, human resource management.

Problem statement

Managing remote teams in international companies presents unique challenges related to communication, coordination, and maintaining high levels of productivity. The lack of physical presence, cultural differences, and time zone disparities can complicate task execution and decision-making processes. There is a need to develop and implement effective management strategies that enable companies to ensure productive collaboration in a remote work environment.

Relevance of the chosen topic

Modern international companies are increasingly adopting full or partial remote work models, presenting new management challenges. To stay competitive and efficient in today's globalized environment, innovative strategies for managing remote teams are vital. These approaches unlock the potential of geographically dispersed teams, enhancing collaboration across diverse cultures and time zones. Understanding these strategies is key to developing effective work models that align with the current needs and trends of global business.

Analysis of recent research and publications

Many domestic and international researchers have focused on this topic. Authors such as Goreiko, D., and Ilchuk, P. (2024) highlight the theoretical foundations of remote teams and methods for managing them, describing communication models and the use of digital tools to enhance remote work efficiency. Grinchak, N., and Motuzka, O. (2020) mainly focus on the communication aspects of virtual teams, emphasizing the importance of establishing transparent and effective interaction between team members in a remote environment.

The works of researchers like Gasaab, O. V. (2023) and Valenduc, M. (2023) analyze the specifics of managing multinational and cross-geographical teams, particularly the challenges related to cultural differences and organizational culture within these teams.

Issues of effective management and leadership models are explored in the studiy of Batırlık, Gencer, & Akkucuk (2022). Additionally, Pearce & Conger (2003) provide a detailed analysis of the impact of shared leadership and different types of teams.

The influence of innovative approaches and technologies, including artificial intelligence, is considered in the works of Budhwar et al. (2024) and Treacy, S. (2022).

Purpose of the article

The aim of the article is to study the features of managing remote teams in international companies in the context of a changing external environment. To achieve this goal, the following tasks were identified:

- Investigating how the external environment influences the need for creating remote teams in international companies;
- Examining the key characteristics of remote teams working in multicultural settings;
- Evaluating the role of innovative digital technologies in organizing work;
- Analyzing different forms of leadership in new market conditions.

Presentation of the main research material and results obtained

In today's globalised world, remote work is becoming an integral part of international companies' operations. Such circumstances require new approaches to team management to ensure effective communication and productivity. The study of remote team management strategies is becoming more relevant, as it allows to develop and make decisions that contribute to the successful functioning of organisations in a global environment.

The subject of the study is remote teams, the concept of which in the context of remote work is expanded to include technological aspects of interaction between its members. In general, a remote team can be described as a set of individuals collaborating at a distance, with clearly defined roles and interactions, united by common goals and supported by digital technologies that ensure the continuous exchange of information, ideas and resources (Horeiko & Ilchuk, 2024, p. 10).

The reason for the accelerated development and proliferation of remote teams was the Covid-19 pandemic, which forced international companies to choose new approaches to organising the work process. This forced transition has acted as a catalyst for the rapid introduction and adaptation of technologies that enable remote collaboration, and has also led to a transformation in approaches to labour organisation and team management. Accordingly, these transformations have caused a sharp increase in the number of vacancies with a fully remote work schedule, which amounted to 200% between February and April 2020. Also, the share of remote work adverts was positively correlated with the level of information technology use and technical education among workers (Hansen et al., 2023, pp. 16-19). Global market trends have finally confirmed the importance and necessity of developing new HR strategies for remote work. With the outbreak of the pandemic in 2020, despite the measures taken to support businesses, economic stability and employment rates have worsened. Across Europe, the employment rate decreased by 10% on average. The largest proportions of such changes were observed in Greece and Spain (18%), as well as in Hungary and Romania (14%) (Ahrendt, D. et al., 2020, p. 9). These data show the significant impact that the pandemic has had on employment and labour market structure in

Europe. The changes caused by the pandemic required companies to develop new approaches to maintaining productivity and employee engagement. Remote work has become not only a necessary measure, but also an important part of many organisations' strategy to remain competitive in the long term.

As a result, the pandemic has not only accelerated the adaptation to remote work, but also highlighted the need of technological proficiency, the ability to hire staff efficiently and quickly, and to change requirements in an unstable labour market. In the face of these changes, digitalisation has become a key factor that has affected all aspects of business processes. Today, it is becoming not only an important aspect of internal business organisation, but also a strategic tool for successful global development, which allows companies to remain competitive in a rapidly changing global environment.

Current management strategies and their development in the context of remote work are based on the need to use new technologies, adaptability and readiness for change. As noted before, the Covid-19 pandemic has caused an accelerated change in approaches to the organisation of work processes. In line with this, traditional approaches and practices of teamwork have also been transformed. Table 1 compares the main transformations that have taken place with the classic management components in the context of remote work.

Table 1: Comparison of components of traditional and remote management practices

Component	Traditional Practices	Remote Management Practices
Communication	In-person contact and communication during offline meetings. Informal face-to-face interactions in the office.	Communication via mobile platforms, video conferences, and email.
Data Analytics and Reporting	Regular meetings to discuss data, physical monitoring, and reporting.	Using digital tools for data collection and activity analysis. Automatic reporting via software.
Planning and Task Monitoring	Long-term activity planning, physical meetings for progress monitoring, daily reports, attendance sheets.	Adaptive planning through online tools, real-time progress tracking via project management software (Trello, Asana, Jira, etc.).
Organizational Culture	Building corporate culture through shared events, employee presence in the social space.	Virtual events to engage the team, maintaining social media presence to support and showcase company culture and values.
Leadership and Motivation	Personal communication, direct mentorship, performance evaluation based on personal observations and attitudes.	Virtual mentorship, motivation through regular online meetings with a mentor, using adaptive technologies for skill development.
Professional Training and Development	On-the-job training, in-office workshops, lectures, and seminars.	Remote learning, online courses, webinars, and virtual training sessions.

**Source: compiled by the authors using data from (Hrynchak & Motuzka, 2020, p. 167; Perevozova, I.V. et al., 2023, p. 421)*

According to Table 1, the main conclusions about the nature of differences between traditional and remote HR management practices can be drawn:

1. Managing remote teams requires the use of additional software and mobile platforms that can expand the company's strategy.
2. Remote management complicates the development of an organisational culture and effective employee engagement due to the limited or no face-to-face interaction.
3. New management practices require flexibility and adaptability in decision-making, which creates new requirements for managers and team leaders.
4. Remote interaction of teams can complicate the process of conflict resolution, as the lack of personal contact and direct communication can prevent quick and effective conflict resolution.
5. The introduction of new tools and practices of remote interaction requires an understanding of cultural characteristics, national traditions and geographical factors that may affect the effectiveness of communication and cooperation.

Therefore, the main problems and challenges that arise in managing remote teams have a significant impact on the efficiency and organisation of work in the company, as well as on the formation of its corporate culture. Developing an organisational culture in companies with remote teams requires taking into account the set of factors shown in Fig. 1.

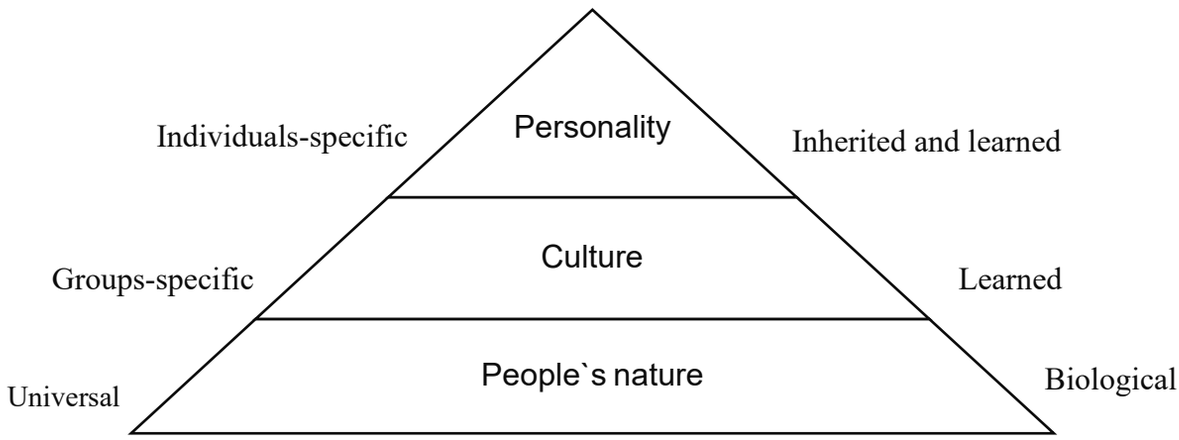

Fig 1. Factors influencing organisational culture
Source: (materials of presentations 'International Management' at the Mittweida University of Applied Sciences, 2024)

The organisational structure should be developed and maintained on the basis of a set of factors that include both primary needs based on universal human characteristics and behavioural patterns, and individual characteristics such as personal values, psychological traits, and the behavioural style of each employee. In international enterprises, national peculiarities and traditions of certain work groups also play a significant role, making the culture aspect even more complex and multilayered. Culture in international companies must take into account the diversity that arises from the interaction between representatives of different geographical environments.

Studies (Raghuram, 2021, p. 151-153) (Treacy, 2022, p. 552-553) show that one of the most pressing challenges today is to increase the level of effective communication in remote teams. In order to reduce the possibility of isolation and disconnection of employees from the team, the task of enterprises is to build open systems for interaction not only between employees of the same level, but also with senior line managers.

The problem of socialisation, knowledge sharing, communication and psychological stability of employees also requires the introduction of innovative interaction tools that can provide regular contacts, mentoring programmes and help in adapting to new working conditions. In addition to the common remote work applications (Zoom, Gmail, Google Meet and Google Docs), international organisations may expand their existing set of tools to increase the functionality of interaction. The latest applications such as CultureMonkey (CultureMonkey | Employee Engagement Platform) and Qualtrics (Qualtrics XM - Experience Management Software) allow to maintain communication with employees at all stages of their career path. They also allow collecting feedback through various channels, including surveys and chats. These tools also include sentiment analysis, which allows companies to understand the emotional state of remote teams and respond quickly to changes if necessary. CultureMonkey's HR tool also integrates with various business platforms, such as Zoho People and Workday, to help companies better adapt their culture to remote work.

In addition to implementing various tools to enhance socialization and communication in remote teams, effective leadership remains a key aspect. It should foster openness and adaptability in the team's work, creating space for innovative solutions even in remote work conditions. Two main behavioral models of a modern leader in multicultural remote teams can be distinguished. The first model is task-oriented, focusing on clearly defining roles and responsibilities for both the leader and other team members. In this model, the leader provides detailed instructions to ensure precise task execution and monitors business processes. Such behavior mostly has a positive impact on the quality of results in remote teams. The second style is relationship-oriented, focusing on communication efficiency and the mental well-being of team members. A leader of this type promotes positive communication interaction between colleagues, meeting their social needs and establishing sincere relationships based on mutual respect. A relationship-oriented leader primarily focuses on employees' emotional state, which helps strengthen their sense of value and trust within the team (Batırlık, Gencer, & Akkucuk, 2022, p. 3). Thus,

organizations now need to maintain a balance, monitoring the influence of each leader to support optimal work results. Since remote teams often face trends of isolation and detachment from the team, a two-stage system of formal leadership is proposed when forming new working groups and teams. At the formation and training stage, the leader should focus on building communication efficiency and creating balanced teams depending on employees' personal data, cultural background, and other factors. After completing this stage, a strategy oriented toward maximizing the effectiveness of task execution can be followed. In this way, maintaining flexibility in remote team management, the two-stage formal leadership system allows for combining initial team-building investment with a focus on achieving results in future work, ensuring the effective operation of remote teams.

However, considering the complexity of team management in a virtual environment, the possibility of shared leadership within the team can also be explored (Batırlık, Gencer, & Akkucuk, 2022, p. 4). The concept of shared leadership is viewed as a set of processes where leadership functions are distributed among team members rather than concentrated in one person. In this model, the focus shifts to joint decision-making, shared responsibility, and more active interaction within the team. Shared leadership is more flexible and adaptive compared to traditional leadership models (Pearce & Conger, 2003, p. 22).

Thus, effective leadership remains one of the key elements for the successful functioning of remote teams, especially in multicultural organizations. A balanced approach, which includes task orientation, communication, or shared decision-making, enables high performance while maintaining a positive psychological climate within the team. Leadership must be based on considering cultural differences and the work styles of the team.

In the context of global interaction, the international aspect becomes even more important. Cross-cultural teams may face numerous challenges, such as physical distance, different time zones, and differences in cultural environments. These factors are illustrated in Fig. 2.

Cross-cultural remote teams face numerous challenges, including:

1. Geographical distance, which, as previously mentioned, complicates coordination and creates a risk of social isolation and psychological detachment of certain employees.
2. Time differences, caused by working across various time zones, which can hinder the synchronization of work schedules within the team.
3. Diverse leadership styles characteristic of different cultures and nations, which may lead to misunderstandings and conflicts within the team as members have different expectations regarding the leader’s role.
4. Cultural differences also play a key role in remote team collaboration, requiring the development of intercultural competence to better understand and respect all values and lifestyles.
5. Moreover, team members from different countries may have different perceptions of organizational culture and its role within the company, potentially causing difficulties in organizing the collaboration process.
6. Finally, language barriers, which may involve entirely different languages or various dialects, can create obstacles to mutual understanding and information exchange.

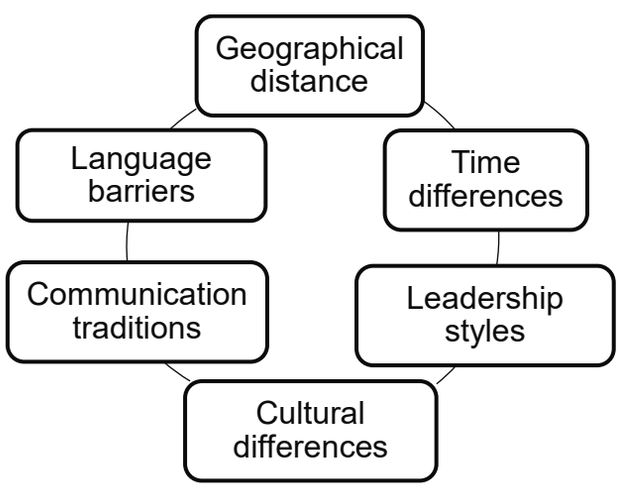

Fig. 2. Challenges in Cross-Cultural Teams
Source: compiled by the authors

The presence of people from different cultural backgrounds in a group or team is called cultural

dispersion. It can negatively impact team productivity, especially when team members have different communication styles or conflict resolution strategies (Valenduc, 2023, p. 10). However, aside from the challenges in functioning, cultural differences can contribute to various positive aspects in the work of international teams. When communication is well-established, multinationality can become a source of innovative solutions and a creative, fresh approach to problem-solving. By synthesizing cross-geographical experiences, methods, and perspectives, unique and inherently innovative ideas can emerge, providing a competitive advantage in the global market. Additionally, cross-geographical teams with representatives from different cultures can offer a deeper understanding of potential foreign markets. These teams can provide valuable context and information about local market characteristics, cultural nuances, and consumer preferences. This can significantly enhance a company's competitiveness at a global level, allowing it to adapt more effectively to the dynamic and changing market conditions (Hasaaeb, 2023, p. 217).

To fully leverage the potential of cultural dispersion in remote cross-geographical teams, the following approaches can be used:

1. Global cultural exchange system. For example, the fully remote work organization of GitLab focuses on the continuous development and improvement of the remote environment (tools, meeting approach, collaboration, communication, overall compensation). The organization also organizes informal activities, such as sharing photos with descriptions of the workday and location tagged "#office-today." Such initiatives help teams get to know the cultural characteristics of each member through casual communication (GitLab, 2024).
2. Flexible hiring strategy. To recruit employees in new foreign markets, companies can use a combined HR policy. For deeper market adaptation and to foster creativity in decision-making within such teams, a fully geocentric HR management policy can be adopted. However, in this case, efforts should focus on strengthening coordination among team members. A polycentric HR policy may also be applied, but when forming new teams, preference should be given to employees who are more adaptable to changes and new working conditions (Mittweida University of Applied Sciences, 2024).
3. Forming a Shared Team Identity. Creating shared values, organizing virtual meetings, cross-cultural training to improve mutual understanding, and regular team-building activities will foster transparent communication and enhance the efficiency of multinational teams.

Thus, in managing and coordinating cross-cultural aspects of work in international remote teams, companies need to expand the classic set of management tools with innovative solutions. These could include feedback collection tools, augmented or virtual reality, comprehensive CRM systems for personnel management, or tools powered by artificial intelligence (AI). AI is gaining popularity as it can facilitate the management of remote teams, including international ones. AI can support decision-making based on analyzing large volumes of data, improving accuracy in HR processes such as performance evaluation, initial candidate screening, or career development planning. Additionally, AI systems can help overcome language barriers and cultural communication nuances through the use of automated translation technologies. However, the use of AI requires compliance with data protection laws. These tools must be designed to ensure the confidentiality of information (Budhwar et al., 2024). Therefore, the measured use of AI can not only optimize HR processes but also increase the engagement and satisfaction of employees in remote international teams. This can also improve the quality of communication and positively impact the effectiveness of collaboration in remote teams.

It can be noted that the rapid development of technologies and approaches to personnel management significantly changes the conditions of the labor market. As previously mentioned, the Covid-19 pandemic led to substantial transformations in traditional hiring and human resource management approaches. Increasingly, employees are preferring hybrid or fully remote work formats. The statistics on preferred work modes as of 2024 are shown in Fig. 3.

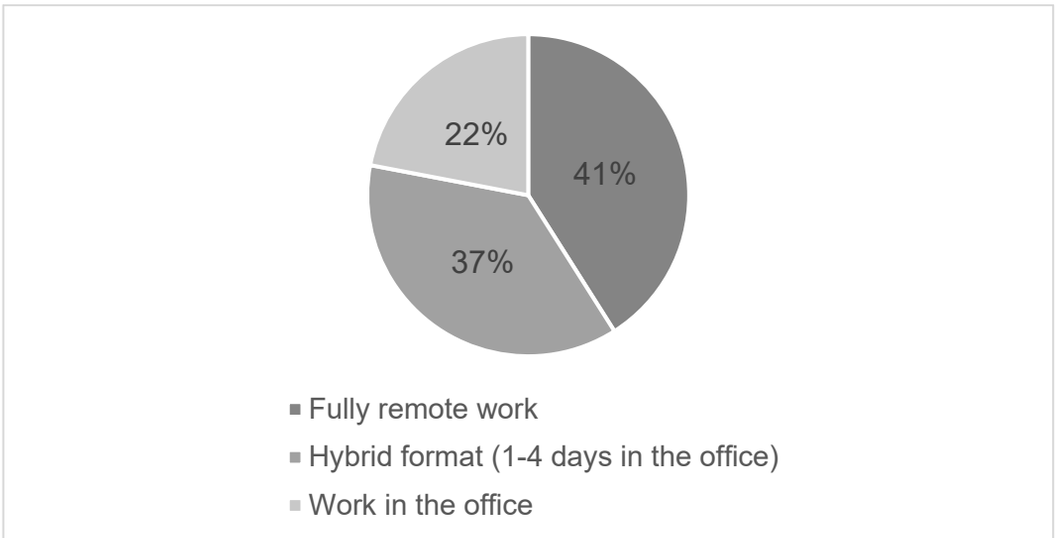

Fig. 3. Most Popular Work Models in 2024
Source: (Zoom, 2024)

Thus, the trends toward remote work remain strong. Therefore, it is essential to continue revising management strategies to effectively control and maintain employee productivity in remote conditions. However, not all industries can support a fully remote work format. Currently, the industry with the largest share of predominantly remote workers is the information technology sector, with 67% of employees working remotely (Statista, 2024). Other sectors, such as financial services, marketing, or project management, also show high rates of transitioning to hybrid or remote formats, though the share of such workers is significantly lower (Forbes, 2024). This indicates that adaptation to remote work varies depending on the specifics of the industry, and companies need to consider these factors when developing management strategies.

Conclusions

Managing remote teams in international companies is a complex task that requires the integration of various approaches to ensure efficiency and productivity. The remote work format, which became widely adopted due to the Covid-19 pandemic, continues to reshape the labor market, particularly in industries where digital technologies play a key role. The transformation of management processes has led to the need for companies to consider multinational characteristics, effective leadership, and actively use innovative tools such as artificial intelligence and CRM systems to implement successful strategies for managing such teams in an international context.

Given the numerous challenges of working with remote teams in international companies, special attention should be paid to global cultural exchange, building a shared team identity, and implementing clear and transparent communication processes. The use of artificial intelligence can improve data management, enhance productivity, and streamline communication, but it is important to comply with data protection regulations. Flexibility and adaptability in the hiring process are also essential for creating effective teams.

Therefore, it is recommended that international companies continually review and adapt their management strategies to remain competitive in the face of the growing demand for remote work formats.

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SMART AI ENERGY ARTIFICIAL INTELLIGENCE FOR THE OPTIMIZATION OF RENEWABLE ENERGIES: EDUCATION, RESEARCH AND FUTURE PROSPECTS

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Abstract

Academic education in the field of AI-driven renewable energy systems is developing rapidly, driven by digitalization, interdisciplinary collaboration, and technological advancements. Online platforms and international research networks facilitate access to specialized content and enable global networking of students and researchers. At the same time, cooperation between universities, industry and research centres leads to practice-oriented training formats that strengthen the transfer of knowledge between theory and practice.

Pioneering technologies such as Edge AI can be integrated into energy research to maximize the efficiency of renewable energy systems of the future. The continuing demand for skilled workers in this field requires continuous adaptation of curricula, especially with regard to practice-oriented projects, regulatory frameworks and ethical issues. This study looks into the challenges and opportunities of academic education in the field of AI and renewable energies and shows how technological innovations can drive the energy transition.

Keywords

SMART Renewable Energy, AI, Optimization, green energetics, research, future

Problem statement

The transition to renewable energy is a central part of the global strategy to combat climate change and reduce dependence on fossil fuels (BDEW, 2020). Solar and wind energy in particular play a key role in this transformation, as they are inexhaustible and emission-free. However, these energy sources are subject to natural fluctuations, which requires efficient forecasting and control mechanisms (Fraunhofer ISI, 2024).

Artificial intelligence (AI) offers promising solutions to optimize energy production, storage, and distribution, thereby improving the efficiency and reliability of sustainable energy systems (German Energy Agency, 2024). Recent studies indicates that AI-driven models can significantly improve the accuracy of energy forecasts, increase grid stability, and optimize storage solutions (Chiorean et al., 2023). The use of AI in the energy

industry not only enables economic benefits, but above all serves to optimize the energy system and maximize the share of renewable energies (Alaerjan et al., 2024).

Huge progress can be attained in the field of energy, specifically in grid stability and energy distribution (Mossavar-Rahmani & Zohuri, 2024). Integration of renewables in present-day grids practically mandates sophisticated forecasting models with AI-algorithm prediction for accurately forecasting energy output and demand (Haupt et al., 2020).

Relevance of the chosen topic

AI-supported models have proven to be particularly beneficial for the integration of electric mobility and renewable energies. A study shows that AI-based energy forecasts for charging stations powered by solar and wind energy have a very high accuracy and help stabilize the grid (Shetty et al., 2024).

However, it should be noted that the use of AI itself is associated with significant energy consumption. Data centers running AI models require large amounts of electricity, especially for training complex models (Ejjami, 2024). This raises the question of how sustainable the use of AI in the energy industry actually is. However, research indicates that optimized algorithms and specialized hardware can significantly reduce this consumption (Yousef et al., 2023).

Another obstacle in deploying AI in a widespread form is a lack of infrastructure and datasets for integration with existing networks in an unobtrusive form. AI requires high volumes of training datasets in an attempt to make sound forecasts, and such datasets aren't necessarily in a high enough quality and high enough volumes (Salma et al., 2024).

Overall, it is clear that AI is a central element for the sustainable transformation of our energy system. The intelligent use of AI can make more efficient use of renewable energies, increase grid stability and thus make a significant contribution to the energy transition (Wen et al., 2024).

Analysis of recent research and publications

Need for interdisciplinary training

The use of artificial intelligence (AI) to optimize renewable energy systems requires expertise from various disciplines, including computer science, engineering, meteorology, and energy economics. This interdisciplinary approach is crucial, as the integration of renewable energies into existing grids entails both technical and economic challenges. The increasing demand for AI-enabled solutions in the energy sector has led to universities increasingly developing curricula in machine learning, data science, and energy informatics to train professionals for these emerging technologies (Ukoba et al., 2024).

A solid renewable energy AI must not only convey theoretical skill in algorithms and forecasting algorithms, but must involve hands-on practice in grid management, weather forecasting, and energy storage. All these considerations are important for smart grid development, for with them, one can precisely predict energy output and maximize grid loading (Dawodu et al., 2024).

In addition to the technical challenges, the successful implementation of AI in the energy sector also requires an in-depth analysis of economic and regulatory frameworks. The energy industry is highly regulated, and the use of AI technologies must be brought into line with existing legal regulations. Research indicates that companies and governments alike need to develop strategies to integrate AI into energy systems efficiently and safely (Salma et al., 2024).

A promising application area of AI in renewable energy systems is predictive maintenance. Machine learning can detect and fix potential errors or inefficiencies early on, before they lead to critical system failures. Studies have shown that AI-powered predictive maintenance models can predict failures with up to 92% accuracy and reduce unforeseen downtime by 35% (Bello et al., 2024). This not only increases the efficiency of renewable energy systems, but also helps to reduce costs and extend the life of infrastructure components.

Another relevant field of investigation is AI integration in energy storing systems. Solar and wind powers, being intermittent, have a variable behavior, and, therefore, regulating such powers' distribution with accuracy is a must. AI can make charging and discharging processes in battery systems efficient with adaptable algorithms and deep learning, and in such a way, can enhance efficiency in storing energy (Chiorean et al., 2023).

In addition, innovative hybrid AI models are under development that combine both physical and data-driven approaches to further improve the prediction accuracy of energy production and consumption (Darwish et al., 2024). These models analyze large amounts of data from historical energy generation data, meteorological forecasts, and real-time sensor data to develop optimal strategies for energy use.

The increasing prominence of AI in renewable networks is reflected in increased international studies and

collaborations, such as in studies of scientific articles, in which universities in China, India and America dominate in terms of activity in such a field, and in Europe, with an increased concern for creating frameworks for legislation and ethics (Eslava-Zapata et al., 2024).

In addition to technological advances, challenges must also be addressed, including data protection, interoperability, and the need for standardized AI frameworks for the energy industry. Experts advocate for the creation of open data platforms that enable the exchange of energy data, thus promoting the further development and scalability of AI applications (Daraojimba et al., 2023).

Overall, it can be seen that the integration of AI into renewable energy systems requires interdisciplinary cooperation to overcome technical, economic and regulatory challenges. Continuous research and education in this area will be crucial to further increase the efficiency of renewable energy and drive the global energy transition.

University Programs and Innovation Centers for AI and Renewable Energy

Many universities and institutes have recognized increased demand for fusing artificial intelligence (AI) with renewable sources of energy. As demand for smart energy continues to rise, new courses in smart energy and informatics in energy have begun in most educational institutes (Eslava-Zapata et al., 2024). All such courses have been designed with an objective of providing students and researchers with multidisciplinary training in subjects including machine learning, data science, economy in terms of energy, and grid management with a view towards developing AI for renewable sources of energy even further.

In parallel, research centers are intensifying their collaboration with industry to develop innovative AI-driven technologies for the energy sector. Especially in the field of predictive maintenance, AI-powered algorithms have proven valuable in accurately predicting the maintenance needs of wind and solar plants, thus minimizing failures and interruptions to operations. These AI models analyze large amounts of sensor data and historical operational information to identify sources of error at an early stage (Dawodu et al., 2024). Research shows that such systems can significantly extend the lifespan of energy equipment while reducing operating costs (Dawodu et al., 2024).

In addition to predictive maintenance, research groups are developing advanced optimization algorithms for smart grids. These grids use AI-powered control systems to monitor and adjust energy flows in real time. This allows grid operators to ensure a stable energy supply, even if highly fluctuating renewable energy sources such as solar or wind energy are integrated (Rusilowati et al., 2024). In addition, AI technologies improve load balancing and energy forecasting through the use of deep learning methods, enabling more efficient use of renewable energy (Daraojimba et al., 2023).

In addition, innovation centres specifically focus on testing AI implementations in actual-life energy networks in a way that proves pragmatic viability for such technology. For example, pilot programs have been started for testing AI-powered technology for storing in a way that can store excess energy produced through sunlight and wind and make it available when one wants (Darwish et al., 2024). All such frameworks stabilize the grid for electricity and allow renewable sources to become even larger parts of present supply networks.

Another field of research is the use of AI for weather and energy forecasts. Since renewable energies are highly dependent on weather conditions, precise forecast models play a crucial role. Modern AI models use sophisticated neural networks such as Long Short-Term Memory (LSTM) to predict wind speeds and solar radiation with high accuracy. These improved forecasts help to optimally match energy demand and feed-in from renewable sources (Mane et al., 2024).

International research initiatives are driving collaboration between universities, companies, and political institutions to accelerate the development of AI technologies for renewable energy. Especially in China, India and the USA, there is close cooperation between research institutions and industry to develop AI-based solutions for a sustainable energy future (Eslava-Zapata et al., 2024).

The close link between research and industrial practice indicates that AI is an indispensable tool for the future of renewable energies. Through continuous innovation and interdisciplinary collaboration, it will be possible to further improve the efficiency and sustainability of energy systems and accelerate the transition to a low-carbon economy.

Challenges and opportunities for students

Despite the tremendous potential for artificial intelligence (AI) in renewable energy maximization, students and researchers face a variety of challenges. It is a multidisciplinary field with a lot of computer science, engineering, physics, mathematics, and data science, and many students have a rough time getting to know the field and becoming an expert (Jose & Jose, 2024).

Another significant barrier is the availability of high-quality datasets, which are crucial for training and validating AI models. Numerous educational institutions lack the requisite computational capacity and financial means to handle extensive data sets and train sophisticated AI models (Satyam & Geetha, 2023). Furthermore, regulatory limitations and data protection laws complicate the exchange of energy data between research institutions and companies. These data gaps represent a considerable challenge because accurate forecasting models require large, high-resolution historical data to produce reliable results (Atias, 2023).

In addition to the technical and infrastructural equipment, the methodological diversity is also a challenge. The application of AI in energy research requires a close integration of machine learning, optimization algorithms and physical models. Many students and researchers have to familiarize themselves with different disciplines in order to develop innovative solutions, which prolongs and complicates the learning process (Dawodu et al., 2024).

But despite these challenges, the field offers numerous opportunities. So called "AI-driven energy management" is increasingly becoming the core of modern smart grids. These networks use AI-powered control systems to efficiently distribute energy and stabilize the power grid. Since renewable energies are volatile, AI models help to analyze production and consumption patterns and calculate optimal load distributions in real time. This not only increases grid stability, but also improves the economic viability of renewable energies (Dawodu et al., 2024).

Skilled workers in this field are in high demand globally as companies and governments invest in the digitization and optimization of their energy systems. The need to develop climate-neutral solutions is leading to a growing demand for experts who have knowledge of both energy technology and artificial intelligence (Zolfaghari et al., 2024). AI plays a key role, especially in large research projects and industrial collaborations, as it can significantly increase the efficiency of energy systems. This can be seen, among other things, in the successful integration of AI in wind turbines, where algorithms help to adapt the optimal orientation of the rotor blades to changing wind conditions, thus maximizing energy yield (Swarnkar et al., 2023).

In addition to its financial and technological benefits, AI integration in the energy sector also promotes scientific innovation. For one, research work has been ongoing in researching how AI can manage energy storing systems in a smart manner in a way that will level off fluctuations in power output and have a constant source of power (Mohamed et al., 2023).

Overall, it can be argued that AI is a key tool for shaping the future of the energy sector. In contrast to information and computational powers, technological advances and multidisciplinary collaboration are unlocking enormous avenues for innovation in the energy sector.

Purpose of the article

The shift to renewable energy is a crucial element of the global strategy to tackle climate change and decrease reliance on fossil fuels. In this transition, solar and wind power are especially significant, as they provide an unlimited and emission-free energy supply. However, their natural variability necessitates effective forecasting and management systems to ensure stability and efficiency. The overall purpose of this article is:

- Need for interdisciplinary training
- University Programs and Innovation Centers for AI and Renewable Energy
- Challenges and opportunities for students
- Future prospects for academic teaching.

Presentation of the main research material and results obtained

The future of academic education in the field of AI-driven renewable energy systems will be significantly shaped by increased digitalization and interdisciplinary collaboration. As digital transformation continues, new learning opportunities are opening up, breaking down geographical barriers and facilitating access to highly specialized knowledge. Online platforms, Massive Open Online Courses (MOOCs), and international research networks enable students and researchers to participate in world-class AI and energy informatics programs, regardless of their location (Rashid et al., 2024).

Besides digital educational formats, there will be a further intensification of interdisciplinary collaboration among universities, research institutions, and companies. To guarantee that students obtain practical experience with AI-driven energy systems, it is essential to foster partnerships between academic institutions and industry. This partnership is promoted via collaborative research initiatives, work placements in industry, and the creation of practical laboratories for assessing novel technologies (Dawodu et al., 2024).

A key trend in academic education is the increasing integration of advanced technologies such as Edge AI into energy research. While traditional AI models process large amounts of data centrally, edge AI enables

decentralized processing of energy and network information directly at the source. This reduces latency and increases the efficiency of smart grid applications and real-time energy forecasts (Yousef et al., 2023; Zolfaghari et al., 2024).

Another central theme in future curriculums is an increased emphasis on hands-on work. There will increasingly become a level of student engagement in real-life problem-solving, for example, through simulation platforms in which students can model AI in an effort to maximize energy flows. There will increasingly become an integration of AI in laboratory work in terms of energy, with new methodologies emerging to monitor and manage renewable sources of energy (Ohalete et al., 2023).

The combination of AI and renewable energies will also have an increased impact on the development of autonomous energy networks. Self-regulating networks that use AI to react flexibly to fluctuations in demand and supply will make a significant contribution to the energy transition. These intelligent systems use advanced neural networks to predict energy production and consumption, thus optimizing the use of energy storage and grid infrastructure (Maurya, 2024).

The increasing importance of AI in the energy industry requires continuous adaptation of curricula to technological innovations. In addition to the classic disciplines such as computer science and engineering, ethics and regulation will also come into focus, as the use of AI in the energy industry brings new challenges in the area of data security and algorithmic fairness (Rusilowati et al., 2024).

In summary, AI-powered renewable energy training in schools is increasingly characterized by application orientation, inter-disciplinarity, and digital technology. Edge AI and smart grid technology will make a significant contribution towards future energy system efficiency and sustainability and towards a global transition in terms of energy.

Conclusions

The integration of artificial intelligence in renewable technology is a key pillar in a transition towards a new era for energy and requires continuous adaption of academic training to technological development. Digitalization creates access to worldwide availability of information, and practice training programs allow for translation of output of research into practice. Emerging future technology such as Edge AI holds further efficiency improvements and optimized energy management in store. Despite current impediments – including access to big sets of information, availability of computation and inter-disciplinarity – enormous potential for investigation, for industry and for society in general is in store in the field. In the long run, strong integration between practice and science will become a necessity in order to secure a future with a reliable, secure and AI-facilitated energy supply.

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TRANSFORMATION OF THE STEEL INDUSTRY: STRATEGIES FOR CLIMATE-NEUTRAL PRODUCTION

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Abstract

Primary steel production is currently the dominant process in global steel production, but is characterized by high energy consumption and significant CO_2 emissions. In Germany, around 70% of crude steel was produced using primary steel production in 2015, while 30% came from secondary steel production. The traditional blast furnace route, which is based on the reduction of iron ore using coal, is responsible for around 28% of total industrial emissions in Germany. Given the need for a sustainable transformation of the steel industry, alternative processes are being researched to drastically reduce CO_2 emissions.

One promising approach is hydrogen-based direct reduction, in which iron ore is reduced using green hydrogen instead of coal. This enables almost CO_2-free steel production, but requires sufficient availability of renewable energy and an extensive hydrogen infrastructure. Other alternatives include increasing the recycling of steel scrap in electric arc furnaces and innovative production processes such as the electrolytic reduction of iron ore. Secondary steel production already represents a lower-CO_2 alternative, as electric arc furnaces are increasingly being operated with electricity from renewable energy sources.

The transformation of the steel industry requires technological innovation, extensive investment and regulatory and economic support. The combination of hydrogen-based direct reduction, increased steel scrap recycling and the development of new emission-free processes represents a promising strategy for achieving climate neutrality. In the long term, political measures, research funding and infrastructure investments are essential to ensure the competitiveness and sustainability of steel production.

Keywords

Green steel, decarbonization, steel production, climate-neutral production, transformation

Problem

The transformation of the steel industry towards climate-neutral production by 2045 poses a considerable challenge due to CO_2 emissions and the high process temperatures required. Traditional processes such as the blast furnace process are highly carbon-intensive and cause significant CO_2 emissions. Innovative approaches such as direct reduction with hydrogen offer potential for reducing emissions, but require considerable investment and the development of a corresponding hydrogen infrastructure. In addition, large amounts of renewable electricity are required for the largely greenhouse gas-free production of hydrogen (Prognos 2023). Companies such as ThyssenKrupp have set themselves the goal of producing climate-neutral steel by 2045 at the latest. An interim goal is to produce three million tons of CO_2-neutral steel per year by 2030. This transformation is to be achieved by means of direct reduction, in which the process-related greenhouse gas emissions are largely eliminated by using hydrogen instead of coal. This technology incurs considerable additional costs compared to conventional processes (ThyssenKrupp 2023).

Furthermore, a long-term political framework is necessary to give the steel industry security for the necessary investments (GermanWatch 2023). Overall, the decarbonization of the steel industry is a complex undertaking that requires close cooperation between industry, politics and science in order to achieve the climate targets that have been set. This collaboration requires innovative solutions and the development of suitable infrastructures. This article examines the particular challenges facing the steel industry in the transformation to climate-neutral production and discusses potential solutions. The aim is to contribute to the scientific and practical debate on how to shape the transformation towards a climate-neutral industry.

Relevance of the chosen topic

The transformation of the energy-intensive steel industry towards climate-neutral production is one of the key challenges to achieving the climate targets. The steel industry was responsible for 23% of greenhouse gas emissions in 2023 (Wirtschaftsvereinigung Stahl 2024). This figure underlines the importance of the steel industry in reducing industrial emissions. The need for innovative technologies and political framework conditions for climate-neutral production is therefore essential. The steel industry plays a key role in the decarbonization of industrial production (Umweltbundesamt 2023).

Analysis of recent research and publications

Primary steel production is particularly energy-intensive and dominates steel production. According to the Federal Ministry for Economic Affairs and Climate Action, around 70% of the crude steel produced in Germany alone was produced via primary steel production in 2015, while 30% was obtained from steel scrap via secondary steel production. This distribution underlines the importance of primary steel production for the German steel industry and the associated challenges in reducing CO_2 emissions (Bundesministerium 2023). Steel is mainly produced using two processes (Energiebilanzen 2023):

- **Primary steel production (blast furnace process**): In this traditional process, iron ore is fed into the blast furnace together with coke and aggregates. The coke serves as a reducing agent to remove the oxygen from the iron ore, resulting in liquid pig iron. This pig iron is then processed into steel in the converter, where unwanted by-elements are removed and the desired alloying elements are added.
- **Secondary steel production (electric arc furnace):** This process is based on the processing of steel scrap. The scrap is melted down in an electric arc furnace and processed into new steel. This process is less energy-intensive and therefore produces lower CO_2 emissions than the blast furnace process. Current developments are aimed at reducing CO_2 emissions in steel production.

One innovative approach is the direct reduction of iron ore using hydrogen instead of coke. This produces water instead of CO_2 as a by-product. However, this process is still under development and requires considerable investment in the infrastructure for green hydrogen.

Primary steel production is currently the leading process in steel production. Iron ore is processed into pig iron using coal as a reducing agent and energy source. This process is associated with considerable CO_2 emissions. According to the Competence Centre for Climate Protection in Energy-Intensive Industries, steel production generates over 50 million tons of CO_2 every year, which corresponds to around 28% of total industrial emissions. A large proportion of these emissions are process-related and result from the combustion of coal (Klimaschutzindustrie 2025). In view of the high CO_2 emissions from the blast furnace route, alternative methods for reducing emissions are being researched. CO_2 emissions can be significantly reduced by using green hydrogen. However, this process is still under development and requires considerable investment in infrastructure and technology (Fraunhofer IKTS 2025). The transformation of the steel industry towards climate-neutral production processes is technically possible, but is subject to various conditions, including the availability of green hydrogen, economic framework conditions and political support.

In contrast, in secondary steel production, crude steel is produced in an electric arc furnace by casting iron scrap. As around 50% of the electricity for the electric arc furnace in the electricity mix in 2023 was already generated from renewable energies (Energiebilanzen 2023) and must be climate-neutral by 2045 at the latest, the secondary steel route is easy to decarbonize. CO_2 emissions can already be significantly reduced through the use of electric steel furnaces. A study by the Federal Environment Agency emphasizes that increasing the use of scrap and decarbonizing electric steel production are key measures on the way to a climate-neutral steel industry (Umweltbundesamt 2024).

Hydrogen-based direct reduction of iron ore to sponge iron in a shaft furnace is currently emerging as the most promising alternative route to primary steel production. In this process, iron ore pellets are directly reduced to meltable sponge iron. (Wirtschaftsvereinigung Stahl 2025). This process enables almost CO_2-free steel

production, provided that the hydrogen used is produced in a climate-neutral way. Hydrogen-based direct reduction is therefore a key building block in the transformation of the steel industry towards climate-neutral production processes.

Hydrogen is used as a reducing agent instead of coal, which can be produced in an almost climate-neutral way. The sponge iron produced is then refined into crude steel using a classic converter with the help of green electricity. This reduces the carbon footprint by around 97% from 1.7 tons of CO2 to around 0.05 tons of CO2 per ton of crude steel compared to the blast furnace route. Reducing the carbon footprint in steel production through the use of green hydrogen in direct reduction is a key topic of current research. A 2021 study by the Fraunhofer Institute for Ceramic Technologies and Systems analyses the potential of hydrogen-based direct reduction and highlights its importance for the decarbonization of the steel industry. This study provides a comprehensive overview of the technological approaches and the associated CO_2 savings potential in steel production (Fraunhofer IKTS 2021).

Other alternatives to primary steel production include the electricity-based electrolysis of iron ore dissolved in caustic soda with subsequent further processing into crude steel. Although this process is theoretically more energy efficient than direct reduction, it is still under development and it is unclear when the first commercial plants can be built. Another innovative alternative to the blast furnace route is the electricity-based electrolysis of iron ore dissolved in caustic soda. This process has the potential to extract iron directly from oxidic compounds while avoiding CO_2 emissions. Although it theoretically has a higher energy efficiency than direct reduction, it is currently still in the development phase. It is unclear when the first commercial plants can be built (Neues Deutschland 2024). These developments demonstrate the steel industry's efforts to reduce CO_2 emissions and establish more sustainable production methods.

CO_2 utilization and storage are considered potential methods for decarbonizing the steel industry. However, these processes are considered outdated technologies and are inferior to the direct reduction process in terms of energy efficiency and on sight. The production process in combination with green hydrogen enables a direct reduction of the iron ore and avoids the generation of CO_2 emissions during the production process. It is considered a more efficient and environmentally friendly alternative (Holtz et al. 2023). The energy required for this could be partially covered by natural gas before switching to 100% climate-neutral energy sources such as electricity, hydrogen and biomass from 2040 onwards (Deutscher Wasserstoffverbund 2025).

Purpose of the article

The aim of the study is to identify the most important aspects and characteristics of the transformation to climate-neutral steel production. In order to achieve the formulated goal, the following tasks need to be solved:

- Examination of the nature of steel production and its underlying methods, namely primary and secondary steel production;
- Consideration of the basic principles of the concepts mentioned;
- Analysis of the advantages and disadvantages of the methodologies;
- Discussion and development of strategies for implementation in the companies.

Presentation of the main research material and results

In view of the high CO_2 emissions associated with the traditional blast furnace route, alternative production processes must be developed and implemented. The following three strategies represent key approaches to the sustainable transformation of the steel industry:

Strategy I: Hydrogen-based direct reduction as a key technology The decarbonization of the steel industry requires innovative production processes. One of the most promising alternatives to conventional primary steel production is the direct reduction of iron ore using green hydrogen. This process replaces coal as a reducing agent with hydrogen, producing only water vapor as a by-product instead of CO_2. Studies show that hydrogen-based direct reduction can reduce emissions in primary steel production by up to 97%. The prerequisite is that the hydrogen used comes from renewable energy sources. The widespread implementation of this technology requires the development of a broad hydrogen infrastructure such as pipelines and suitable storage systems. In addition, economic competitiveness must be ensured. This requires targeted funding programs and appropriate CO_2 pricing to make green steel production financially attractive.

Strategy II: Promoting recycling and strengthening secondary steel production: Another key approach to CO_2 reduction in the steel industry is the increased use of recycled steel scrap. Electric arc furnace technology enables a significant reduction in CO_2 emissions as it is based on recycled steel scrap as a raw material. This process requires less energy than primary steel production and can be operated with almost zero emissions thanks

to the use of renewable electricity. In order to increase the share of the secondary steel route, targeted recycling and circular economy strategies should be promoted. This includes the expansion of renewable energy to power electric arc furnaces and the development of efficient sorting and processing methods to provide high-quality steel scrap.

Strategy III: Development of innovative CO_2-free production processes: In addition to hydrogen direct reduction and scrap enhancement, other pioneering CO_2-free production processes are being researched. One promising alternative is the electricity-based electrolysis of iron ore in alkaline solutions. This process is theoretically more energy-efficient than conventional processes and could enable emission-free steel production in the long term. In addition, there are approaches for CO_2 capture and use as well as CO_2 storage in order to minimize unavoidable emissions. Scaling up these technologies requires extensive research and development work as well as long-term investment in electrolysis-based processes.

The transformation of the steel industry towards climate-neutral production requires a combination of technological innovations and political measures. Hydrogen-based direct reduction, the strengthening of the circular economy and the development of new emission-free processes are key building blocks for decarbonization. The successful implementation of these technologies depends largely on the availability of renewable energy, infrastructure development and political support through funding programs and regulatory frameworks. Only by consistently implementing these strategies can the steel industry make its contribution to achieving the climate targets.

The decarbonization of the steel industry is of central importance for achieving the climate targets that have been set. While primary steel production is still the dominant process for steel production, alternative technologies such as direct reduction with hydrogen or secondary steel production using electric arc furnaces are the focus of current research and development. Despite the great potential of climate-neutral production processes, there are numerous challenges, particularly with regard to economic viability, infrastructural requirements and political framework conditions. The conversion of steel production to climate-neutral processes requires considerable investment. Companies such as ThyssenKrupp are already planning concrete measures to reduce emissions, but the introduction of new technologies causes significant additional costs compared to conventional blast furnace processes. The insufficient availability of green hydrogen in large quantities is particularly problematic, as the necessary capacities for its production do not yet exist. In addition, unclear political framework conditions and uncertainties regarding the promotion of climate-neutral technologies are a deterrent for many companies.

The production costs of green hydrogen are still high, which limits the economic competitiveness of this technology compared to conventional steel production. Long-term political measures are essential to give the industry planning security. Subsidies, tax breaks or CO_2 pricing systems could accelerate the introduction of climate-friendly production processes. The EU Green Deal and national support programs have already taken initial measures, but there is still a great need for action, especially with regard to reducing the production costs for green hydrogen and expanding renewable energy.

While direct reduction with hydrogen is currently the favoured alternative, there are other approaches to decarbonizing the steel industry. These include CO_2 storage and CO_2 utilization. However, these technologies are controversial from an environmental and economic perspective, as they incur high energy costs and do not contribute directly to avoiding emissions. Another innovative approach is the electrolytic reduction of iron oxide, which theoretically offers greater energy efficiency but is still at an experimental stage. The transformation of the steel industry towards climate-neutral production processes is a complex task that involves technological as well as economic and political challenges. While direct reduction with hydrogen offers enormous potential for reducing emissions, its widespread introduction requires considerable investment and infrastructural adjustments. Political support in the form of subsidies, clear regulations and support measures is essential to accelerate the transformation of the steel industry. In the long term, the success of climate-neutral steel production will depend on the development of cost-efficient technologies, the availability of renewable energy and the creation of suitable market conditions.

The use of hydrogen instead of coal is a key measure for reducing CO_2 emissions in the steel industry. This transformation not only offers considerable ecological benefits, but also opens up economic potential. The implementation of sustainable technologies makes a significant contribution to environmental protection, as the elimination of fossil fuels leads to a significant reduction in air pollution. In addition, advanced recycling methods and optimized production processes enable a more efficient use of resources, which helps to reduce manufacturing costs in the long term. Furthermore, adapting to future environmental regulations and CO_2 pricing is crucial to ensuring the competitiveness of the steel industry. Government subsidies offer companies financial support and encourage investment in innovative processes. These developments open up new market opportunities,

particularly in sustainability-oriented sectors such as the automotive and construction industries, which are increasingly aligned with international climate targets. The continuous development and implementation of new technologies also strengthens the industry's innovative power and reduces dependence on fossil fuels in the long term. The transformation of the steel industry is therefore not only a necessary step towards decarbonization, but also a strategic measure to secure the future of the industry (Welt 2024).

The switch to climate-neutral steel production not only brings ecological benefits but also significant technical, economic and regulatory challenges. The implementation of hydrogen-based processes not only requires fundamental technological adjustments, but is also associated with considerable investment costs. The modernization of existing plants and the further development of the necessary technologies require billions in capital expenditure. The production of green hydrogen in particular poses a central challenge, as it requires large amounts of renewable energy, which is currently not available in sufficient quantities in many regions. In addition, the long-term storage and efficient transportation of hydrogen are not yet fully developed, which makes the economic scalability of this technology even more difficult. Another problem area concerns competitiveness on the global market. Countries with less stringent environmental regulations can continue to produce steel more cost-effectively using conventional, CO_2-intensive processes. This could lead to a shift in emissions to countries with lower environmental standards, which would jeopardize global climate targets. In addition, without harmonized carbon pricing, climate-neutral steel remains more expensive than conventional steel, which poses a challenge for export-oriented manufacturers in particular. The successful transformation of the steel industry is also heavily dependent on political framework conditions. Government support programmes, incentives for decarbonization and uniform CO_2 pricing play a decisive role in the economic profitability of climate-friendly production processes. A lack of or inadequate regulatory measures could slow down the conversion process or have a lasting negative impact on the competitiveness of the industry. A viable long-term strategy for climate-neutral steel production therefore requires not only technological innovations, but also stable economic and political framework conditions that actively support the transformation (Financial Times 2025).

Conclusions

The transformation of the steel industry towards climate-neutral production is technically feasible, but is subject to various key prerequisites (Klimaschutzindustrie 2023). The rapid expansion of renewable energies plays a central role here in order to be able to provide sufficient green energy sources such as hydrogen or green electricity in the future. In addition, the construction of the necessary infrastructure, including the adaptation of existing grids and supply routes, is essential. There is also a need for economically viable framework conditions that enable companies to shape the transformation process sustainably while remaining competitive. Added to this is the importance of social acceptance. The construction of the necessary facilities and infrastructure requires the early involvement and participation of all relevant stakeholders in order to ensure acceptance and support among the population.

In addition to these prerequisites, the realization of a climate-neutral steel industry within the next 20 to 25 years will become much more likely and sustainable if resource conservation measures are integrated. These include an increase in recycling rates, an increase in material efficiency and the promotion of sufficient lifestyles. These approaches could reduce the consumption of primary raw materials and thus additionally support the switch to climate-friendly production processes . An important factor in this context is the role of secondary steel production, which proves to be comparatively easy to decarbonize. With consistent expansion and optimized use, the steel industry can make a significant contribution to achieving climate neutrality by 2045 (Technische Universität Graz 2024). The findings show that a successful transformation of the steel industry requires not only technological, but also systemic and social changes in order to achieve sustainable results in the long term.

The decarbonization of the steel industry is an essential but highly complex transformation process that encompasses technological as well as economic and political dimensions. While the long-term ecological and economic benefits predominate, there are considerable short-term challenges to overcome. In particular, the high investment costs for the implementation of climate-neutral technologies, existing technical uncertainties and the dependence on regulatory framework conditions and state funding mechanisms represent key hurdles. The success of this transformation is largely dependent on continuous technological innovation, clear and stable long-term political control and an adequate supply of renewable energy. Effective cooperation between industry, politics and science is crucial to ensure sustainable and economically viable steel production. Only by integrating technological advances, adequate support measures and a reliable infrastructure for green energy can the transformation of the steel industry be successfully shaped in the long term.

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THE IMPORTANCE OF SMART CITIES: CHALLENGES, OPPORTUNITIES AND IMPLEMENTATION STRATEGIES

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Abstract

This article deals with the increasing importance of smart cities in the context of global urbanization trends and their impact on municipal structures. In view of growing challenges such as overloaded infrastructures, resource scarcity, environmental problems and demographic change, it is becoming clear that digital, networked and sustainable urban development concepts are essential. Smart cities offer promising approaches to this: They aim to use modern information and communication technologies to increase the efficiency of administrative processes, optimize mobility, conserve resources and improve citizens' quality of life.

Key principles and characteristics of smart cities are elaborated and challenges and potentials are highlighted from a scientific perspective. These include issues such as acceptance by the population, data protection and human resources as well as the willingness to change in public administration. A key result shows that the implementation of smart city processes requires a holistic and participatory approach in which politics, administration, business, science and citizens actively work together. In rural areas in particular, digitalization opens up new opportunities to compensate for structural deficits and create equal living conditions.

The four-stage implementation plan "Smart Cities and Regions" of the Federal Ministry of Housing, Urban Development and Building is presented, which offers municipalities a practical framework for implementing digital solutions. Overall, it is clear that smart cities have enormous potential for sustainable urban development, but their successful implementation depends largely on strategic planning, adequate funding, inter-municipal cooperation and the active involvement of all relevant stakeholders.

Keywords

Smart city, urban development, urbanization, megatrends.

Problem

Urbanization has been a global megatrend for several years, the effects of which are expected to manifest themselves by 2050 to the extent that over two thirds of the world's population will live in urban areas (UN-Habitat 2024). This trend will be particularly pronounced in emerging and developing countries. In Germany, on the other hand, this process is largely complete, as around 75% of the population already lives in urban areas (Statista 2023). Future population growth will increasingly be concentrated in large cities and metropolitan areas (Etezadzadeh 2020).

This urbanization trend confronts cities around the world with considerable challenges. In particular, increasing traffic congestion, the lack of housing, the scarcity of natural resources and increasing environmental pollution require innovative solutions (Zhou et al. 2024). Integrated and technology-supported concepts, so-called smart city approaches, are becoming increasingly important in the context of sustainable urban development. These include intelligent mobility solutions, the networking of economic players, digitalized administrative processes and the development of smart energy infrastructures. The successful implementation of such concepts requires holistic strategies in which both political control and the active participation of citizens are key success factors (Etezadzadeh 2020).

Against the backdrop of a stable infrastructure and a pronounced administrative culture, there is often a tendency in Germany to maintain the status quo instead of making far-reaching structural changes. The central goal of smart cities is to increase efficiency, with a particular focus on aspects of ecological, economic and social sustainability (BNP Paribas Real Estate 2024). The focus here is on increasing the efficiency of municipal processes and the targeted use of digital technologies in order to achieve comprehensive networking of people, systems and information (PricewaterhouseCoopers 2024).

Relevance of the chosen topic

Smart City describes the concept of a city in which the use of technology is intended to solve very different urban development problems. In contrast to a *normal* city, a smart city should be more efficient, sustainable and progressive thanks to digitalization (LPB 2024).

In times of energy transition and digitalization, more and more public and private buildings are being converted to solar energy. Photovoltaic systems will also be increasingly installed in 2025 and buildings will also be brought up to the latest technical standards. Mobility is changing, with more and more vehicles being converted to electric or alternative drive systems. Combustion engines are increasingly taking a back seat. In this context, more and more smart cities (Marr 2025) are also emerging, i.e. entire city districts that technically meet the criteria for achieving the climate targets set and are set up accordingly. The trend towards urbanity is here to stay. All over the world, people are moving to urban areas. As early as 2010, half of the world's population lived in cities. The United Nations predicts that by 2050, more than two thirds of the world's population could be concentrated in urban regions. In Germany, three out of four people already live in a city (ENBW 2024).

Analysis of recent research and publications

The Fraunhofer-Gesellschaft's "Morgenstadt" research project offers a differentiated and practical approach to urban development in the context of future challenges. The aim of this concept is to counteract the threat of traffic congestion in urban areas by combining efficient public transport with autonomous, electrically powered vehicles that are used collectively as part of a sharing system. In this vision of future cities, private transport using private vehicles will become largely obsolete. Instead, urban planning envisages greater integration of green spaces that not only serve recreational purposes, but also perform climate-regulating functions, for example by improving air quality and reducing heat islands (ENBW 2024).

A key success factor for the implementation of smart urban development strategies is the active involvement of relevant stakeholder groups. These include citizens, representatives from business, administration, science and political decision-makers. These groups have heterogeneous interests, needs and expectations of urban infrastructure and development. A key challenge is to identify these different requirements at an early stage, to analyze them systematically and to translate them into solution-oriented strategies. The smart city process is to be understood as a dynamic and continuous transformation process in which new needs constantly arise and must be addressed adaptively (Smart City Dialog 2024).

Citizen participation in particular is a challenging task in this context. A lack of acceptance or skepticism towards digital transformations often makes it difficult to integrate technology-based measures. In addition, there are infrastructural and social inequalities due to varying degrees of technical equipment and digital skills. Around 20% of the population have no or insufficient digital end user devices, which significantly limits access to smart city services (Dahm & Werth 2023). This makes it necessary to always supplement digital strategies with analog communication formats. Information platforms and events play a key role here in creating transparency, promoting understanding and ensuring long-term acceptance.

Another central area of tension lies in the handling of personal data in the context of digital urban development processes. Consistent compliance with the General Data Protection Regulation (GDPR) is a

fundamental prerequisite for this. Against this backdrop, it is recommended that data protection-compliant open data strategies be developed that not only meet legal requirements but also strengthen citizens' trust. Innovative models such as data trusts, certification procedures or the implementation of codes of conduct in accordance with Art. 40 and 42 GDPR could serve as best practice examples for safeguarding informational self-determination (BBSR 2021).

Financing also represents a considerable hurdle in the implementation of smart city projects. Although both the European Union and the German government provide funding, the main burden of financing lies with the municipalities themselves. The consequences of the coronavirus pandemic have placed a heavy burden on municipal budgets, meaning that investment projects often have to be postponed or prioritized. This makes it considerably more difficult to implement innovative solutions in a timely manner. The structural debt level of municipalities in Germany illustrates this financial bottleneck: between 2020 and 2022, municipal debt rose from 133.36 to 140.77 billion euros (Statista 2024).

Municipal administration plays a key role in the smart city process. Many cities lack specialized teams that deal exclusively with digitalization strategies. Instead, corresponding tasks are performed in addition to regular administrative processes, which can lead to an overload of personnel capacities (Smart Cities Dive 2025a). In order to meet these challenges, a transformation towards agile administrative structures is necessary. This requires a change in management and organizational culture: managers must actively engage with digital innovations, employees must be given targeted further training and be motivated in the long term. In addition, time, personnel and technological resources must be sustainably expanded in order to create the conditions for a successful digital transformation at municipal level (Dahm 2023).

Purpose of the article

The aim of this study is to systematically identify and analyze key challenges and potential opportunities in the context of municipal transformation towards smart cities. The focus is on the question of the extent to which smart city concepts can be integrated into existing urban structures without impairing their functionality, but rather expanding them in a future-oriented manner (ThoughtLab Group 2025). In addition, the main characteristics, functional principles and impact dimensions of smart cities are to be identified, with a particular focus on their contribution to increasing efficiency, sustainability and quality of life in urban areas. To achieve this objective, the following subtasks will be addressed as part of the study (Deloitte 2024):

- Analysis of the key challenges and potentials;
- Strategies for implementing smart city approaches;
- Evaluation of the methodological advantages and disadvantages of corresponding approaches;
- Derivation of practice-oriented recommendations for the successful realization of smart cities in current urban contexts.

Presentation of the main research material and results

Increasing the quality of life through intelligent technologies

In the course of increasing urbanization and the growing need for sustainable urban structures, digitalization plays a central role in improving the quality of life without increasing the consumption of resources. Intelligent technologies play a key role in increasing the efficiency of urban systems while promoting ecological sustainability goals (Stadt Frankfurt 2023). In this context, smart cities, i.e. technologically networked and data-based cities, are seen as a forward-looking model for urban development in Germany. Through the use of information and communication technologies, particularly in the context of the Internet of Things, key areas such as mobility, energy supply, logistics, healthcare, environmental management and transport can be digitally transformed (Bundesamt für Sicherheit 2021). As an example, the medical sector shows great potential for innovation; digital consultation hours enable the elimination of regional supply bottlenecks, reduce infection risks and save travel distances (Ahrens 2022).

One practical example is the city of Dormagen, which has equipped over 100 streetlights with sensors. These record environmental parameters such as temperature, humidity, CO_2 levels, particulate matter concentrations, noise levels and traffic volumes in real time. The recorded data serves as an evidence-based decision-making basis for urban planning and traffic measures. At the same time, transparency towards citizens promotes social participation in the transformation process (Lemke 2024).

Digitization potential in rural areas

While metropolitan regions are becoming less attractive due to the high cost of living and overburdened infrastructure, there has been an opposing trend towards the re-urbanization of rural areas in recent years (Ahrens

2022). Although the existing digital infrastructure of urban centers facilitates the implementation of digital administrative services, peripheral regions in particular often have structural deficits in this regard. The digital transformation has also arrived there, but financial, technical and personnel bottlenecks make it difficult to implement it across the board. As a result, many municipalities in rural areas have so far limited themselves to providing general information via municipal websites (Ahrens 2022).

Nevertheless, digitalization offers considerable potential for promoting equal living conditions, especially in rural areas. In particular, social services of general interest, for example in the areas of education, health and administration, can be strengthened by digital services. The Bertelsmann Stiftung identifies four key advantages of digital infrastructures for rural areas: overcoming spatial distances, increasing efficiency, promoting networking and the flexible availability of services (Bertelsmann Stiftung 2024). Cities are increasingly using social media to disseminate local information. The high reach of local Facebook pages, such as in the town of Zwiesel, points to the growing potential of digital channels for participatory administrative processes. In the future, the development of municipal apps also offers a promising way of making official processes citizen-oriented and efficient (Ahrens 2022).

Intelligent mobility as a component of municipal transformation

Mobility is a central aspect of municipal services of general interest, especially in rural regions where private cars are still the dominant means of transportation (Ahrens 2022). The smart city approach opens up new possibilities for optimizing traffic flows and reducing emissions. Simple sensor technologies can reduce parking search traffic and the associated CO_2 emissions, for example. In addition, intelligent traffic management systems enable demand-oriented control of traffic volumes (Smart Cities Dive 2025b).

Digital tools can also make regional and local passenger transport much more flexible. Smart city applications make it possible to dynamically adapt timetables, routes and stops to actual demand, which can significantly improve accessibility, especially in rural areas (Ahrens 2022).

Step-by-step plan for implementing smart cities and regions

The Federal Ministry of Housing, Urban Development and Building has developed a four-stage "Smart Cities and Regions" plan to support municipalities with digitalization, regardless of regional conditions. This was developed with the participation of relevant social and institutional stakeholders and includes the following four stages (Bundesministerium 2023):

- Stage 1 - Knowledge building and networking: The focus is on establishing a smart city competence center that supports small and medium-sized municipalities in particular with the digital transformation. It acts as an information, advice and coordination center, offers a knowledge database and networks relevant stakeholders.

- Stage 2 - Development of a marketplace: This phase aims to create a platform for the exchange of innovative digital solutions. Municipalities can benefit from existing experiences, reduce costs and compare open source and license models.

- Level 3 - Inter-municipal cooperation: Digital infrastructures are to be developed jointly through cooperation between several municipalities. The aim is to exploit economies of scale, exchange knowledge and relieve the burden on municipal resources, especially in the event of staff shortages.

- Stage 4 - Implementation and consolidation: The final phase involves the concrete implementation of the developed solutions in municipal practice. The digitalization of municipal services is intended to make processes more flexible, use resources more efficiently and sustainably improve the quality of life of the population.

Possible recommendations for action

The Federal Office for Information Security (BSI) initiated and carried out the "Secure Municipal IoT Infrastructures" project. Based on the project results, the publication *Smart Cities/Smart Regions - Information Security for IoT Infrastructures* was developed, which contains concrete recommendations for action to improve the information security of municipal IoT infrastructures. These recommendations are aimed in particular at municipal decision-makers and operationally responsible actors in order to provide them with well-founded orientation in the employee survey topic area of information security for IoT infrastructures (Umweltbundesamt 2022).

The recommendations for action include four central aspects that should already be taken into account in the planning phase of IoT infrastructures in order to create a secure and sustainable basis for their development (BSI 2024):

1. Digitalization processes in municipalities should be systematically transferred to a comprehensive digitalization strategy or built on an existing strategy in order to ensure sustainable and controllable digitalization.
2. The relevant roles, responsibilities and potential stakeholders must be clearly defined and identified in order to enable a structured and coordinated approach to the implementation of IoT projects.
3. Planned use cases must be analysed and documented, taking into account their benefits as well as their organizational, technical, financial, personnel, regulatory and, in particular, security-related requirements. The aim is to develop resilient objectives with recognizable added value and to ensure forward-looking resource planning.
4. Based on the documented requirements, the need for protection and the resulting protection goals for the processed data and information must be determined in order to identify and effectively implement adequate security measures.

The road to a scalable smart city solution is a long one. It must be well thought out and designed. (Bundesministerium für Bau, Stadt, und Raumforschung 2024).

Conclusions

Advancing urbanization is presenting municipalities around the world with multi-layered and increasingly complex challenges. These manifest themselves in particular in overloaded transport infrastructures, a growing need for housing and increasing environmental pollution. While in Germany, where around 75% of the population already lives in urban areas, the process of urbanization is considered to be largely complete, demographic growth continues to be concentrated in urban centers and metropolitan regions. Against this backdrop, the development and implementation of intelligent urban development concepts - so-called smart city approaches - is gaining strategic importance in order to sustainably integrate existing public service structures into modern, digital administrative processes.

The aim of smart cities is to improve the functionality, efficiency and resilience of urban spaces through the targeted use of digital technologies. The focus here is on promoting the comprehensive networking of individuals, systems and information, which supports an integrative and data-based approach to urban development. The central fields of action include intelligent mobility solutions, networked economic units, digitalized administrative services and intelligent energy infrastructures. The consistent implementation of such smart city concepts is essential for the long-term viable and sustainable development of municipal areas. The involvement of citizens and political support at all levels is a key success factor. The organizational culture of public administration also plays a key role: an internal administrative attitude that is primarily focused on maintaining existing structures can hinder innovation processes and delay transformation projects. In many cases, there is a lack of specialized project teams and the human, technical and financial resources to drive digitalization projects forward efficiently.

In order to adequately meet these challenges, an agile administrative structure is required that is characterized by a willingness to innovate, digital competence and a modern leadership culture. The continuous training and motivation of employees is just as essential as the provision of appropriate resources. In addition, the tight budget situation of many municipalities represents a considerable hurdle for the implementation of digital transformation processes. Despite existing funding programs from the European Union and the German government, a large part of the financial burden remains with the municipalities themselves. This requires the development and testing of alternative financing models, for example in the form of public-private partnerships, joint ventures or license-based usage concepts. Although such models offer the advantage of clearly defined competencies and responsibilities, they are also associated with increased risks and a higher coordination effort. They also require flexible partnerships and specific legal and institutional frameworks.

In conclusion, it can be said that smart cities offer considerable potential for increasing the efficiency of public administration structures and improving the quality of life of urban populations. However, realizing this potential requires a holistic, integrative and strategically sound approach that takes technological innovations, social participation, ecological sustainability and economic viability into account in equal measure. Only under these conditions can the challenges of urbanization be effectively addressed and viable municipal structures established.

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THE AI'S ETHICAL USE' FEATURES IN THE CONDITIONS OF INTERNATIONAL BUSINESS MANAGEMENT' IMPLEMENTATION

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Abstract

The purpose of the article is to analyze the ethical challenges associated with the use of artificial intelligence (AI) in international business and to evaluate different regulatory approaches to AI in the world. The rapid development of AI creates significant opportunities for the transformation of business processes, but at the same time raises serious ethical questions about transparency, algorithmic bias, data protection and responsibility for decisions made by AI. The article examines EU, US and Chinese approaches to AI regulation, including the European AI Act, the US AI Bill of Rights and China's strategy to achieve global AI leadership. The ecological aspects of AI development, in particular the problem of high energy consumption and the potential of AI in solving environmental problems, were studied. The impact of AI on the labor market is analyzed, including structural changes and the need for retraining of employees. The concept of prompt engineering as a key skill for effective interaction with generative AI is considered. The conclusions emphasize the importance of ethical norms in the global regulation of AI and the need for cooperation between business, governments and public organizations to ensure the responsible development and implementation of AI technologies, emphasizing the importance of a balance between innovation and ethical considerations for the sustainable development of AI in international business.

Keywords

Artificial Intelligence (AI), AI Ethics, International Business Management, Transparency, Automation, AI Regulation, Ethical Standards.

Problem statement

Artificial intelligence has become an integral part of the daily life of many people and an important element of the activities of many companies. Its use is so widespread that we, as users, often do not even realize exactly

where it is used. For example, the search engine algorithms that we use every day are also built on the basis of AI technologies, which makes our queries more accurate and relevant.
However, the growing use of AI in business raises new ethical issues that are becoming particularly acute in the international context. These issues are becoming especially urgent right now because of the rapid development of technology and its potential impact on data privacy, human rights, transparency of decision-making and inequality of access to technology between different countries and social groups.

Relevance of the chosen topic

In today's globalized world, where artificial intelligence (AI) technologies are rapidly developing and introducing into various areas of business, organizations have to find a balance between innovation, efficiency and ethics. International business management faces unique challenges related to the use of AI in various cultural, legal and economic contexts. The ethical application of AI is becoming a key factor for ensuring sustainable development, increasing consumer confidence and preserving the reputation of companies in the global market.

Analysis of recent research and publications

Modern research in the field of public administration, aimed at innovative development, is rich in the names of leading scientists. Among them it is worth highlighting the works of L. Arsenovich, V. Gavrilyak, S. Kvitka, I. Maly, A. Osmak, N. Savchenko, O. Skibun, S. Shaikhet and P. Shpigi. They comprehensively explore various aspects of this complex process. In parallel, foreign scientists such as A. Agrawal, N. Bostrom, E. Vance, T. Mitchell, L. Perry, K. Paul, H. Price, S. Russell, M. Tegmark, T. Filer and P. Highham made a significant contribution to understanding the potential of artificial intelligence. However, despite significant achievements, the question of how artificial intelligence can become a fundamental technology for managing the socio-economic development of Ukraine remains open to scientific debate.

Purpose of the article

The main objective of the article is to analyze the key ethical challenges in the use of artificial intelligence in international business, covering the comparison of approaches to regulation in different countries, the development of recommendations for companies on the implementation of ethical standards in AI management, and the assessment of risks and benefits of ethical standards in global competitors.

Presentation of the main research material and results obtained

Ethical aspects of the use of artificial intelligence in management are important, in particular the privacy of data, which focuses on the responsible collection and use of personal information of users. The risks of data abuse are emphasized, which can lead to manipulation of consumer behavior using algorithms. Also, the importance of transparency of algorithms, analyzing how they make decisions, and emphasizes the question of responsibility - who should be responsible for the consequences of AI actions. (Kudryan, 2024)

The concept of AI management is based on voluntary principles that are designed to guide practitioners in their study, development and maintenance of AI systems, as well as formal rules such as binding rules and legislation. It is essentially a framework for rules that AI practitioners can use to help develop strategy and daily activities. The idea behind responsible AI management is to ensure that automated systems and technologies help individuals and organizations achieve their long-term goals, and to protect the best interests of all stakeholders.

Business leaders must comply with all applicable laws, regulations and regulations for AI management practices. In addition, they must adhere to moral principles, values and standards. To overcome obstacles, minimize uncertainties, risks and any adverse outcomes, such as reduced human control over decision-making, among others, professionals must be reliable, conscientious and responsible in how they dispose of their intellectual capital and other resources, including their information technology, finance and employees. It is extremely important to have procedural management mechanisms in place to ensure responsible use of AI technologies. Some of the main components required for responsible AI control are shown in Fig 1.

User concerns about the privacy of their data are growing mainly because employees in business settings have the right to decide who can access their data. According to reports by Wu et al. (2021) and Zhu et al. (2020), people's privacy will be violated if third parties collect or use their data without their permission or voluntary consent. Large amounts of customer data are collected and stored by AI-enabled products that include chatbots and virtual assistants, digital assistants, technology, and dialog systems. Numerous obstacles may outweigh the benefits these interactive technologies bring. According to Rodriguez-Barroso et al. (2020), the tech companies

that created these products are responsible for protecting the personal information of their users. In this regard, users often do not realize that they disclose personal information in the form of text, images, sounds, words and other meanings.

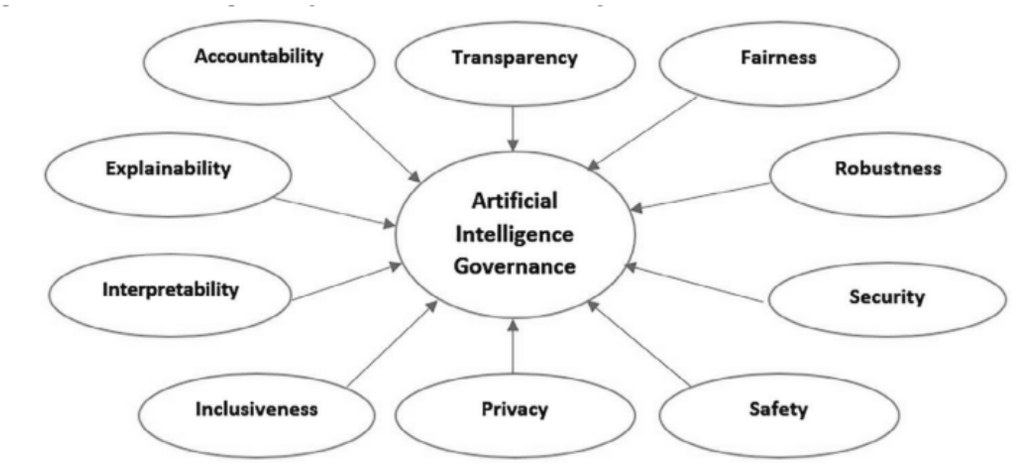

Fig. 1: Components for AI control
Source: (Oladele, Orelaja, & Akinwande, 2024)

For example, facial recognition technologies are used in business situations. People can use them to securely access websites and social media, and authorize payments through banking and financial apps. Such systems can be used by employers to track and record attendance of their employees. In addition, the study showed that these technologies allow marketing organizations to target digital advertising to specific customers. They can be used by security services for criminal investigations and surveillance. The use of these technologies has often raised concerns about security and privacy concerns. Organizations are required by several data privacy laws enacted in different jurisdictions to notify users of the collection and storage of biometric data. Therefore, businesses using these technologies are not allowed to use customer data without permission.

In addition, companies should inform their target audience about their data privacy policy. They must assure customers that the information they receive with their consent is protected and that their information can be used to improve.

They provide personalized services. Therefore, AI developers should implement preventive policies and procedures for monitoring and controlling data. To guard against cyberattacks, they should invest in security technologies such as firewalls, access control systems, and authentication and/or encryption software. Regular testing can reduce the likelihood of incidents, increase security standards, and protect data. (Oladele, Orelaja, & Akinwande, 2024)

Key challenges of AI implementation include structural changes in the labor market, where automation of routine tasks can lead to the reduction of certain positions, potentially causing economic and social problems. There is also a gap in competencies, as new roles created by AI often require skills other than replaceable ones, creating the need for large-scale retraining of workers. Ethical dilemmas are becoming more urgent, as the growing role of AI in decision-making raises questions about the fairness, transparency and responsibility of algorithms. In addition, there is a transformation of work processes, where AI can change the nature of existing positions, requiring employees to adapt and develop new competencies. At the same time, the potential benefits of using AI are significant. This includes the generation of new professions, since the development of AI creates a demand for specialists in the areas of development, implementation and maintenance of intelligent systems. AI also helps optimize efficiency, allowing you to automate routine operations, increasing productivity and giving employees the opportunity to focus on creative tasks. An important aspect is the synergy of man and machine, where instead of completely replacing human labor, AI can complement human abilities by creating effective collaborative systems. In addition, AI stimulates innovation in various industries, contributing to the development of new business models and technological solutions, opening up new career and entrepreneurial opportunities. Studies by Daron Acemoglu and Pascual Restrepo offer a theoretical model for analyzing the impact of AI on the labor market, highlighting three main effects: displacement, productivity improvement and recovery. Their findings point to the ambiguous impact of AI on employment: on the one hand, automation of production processes occurs, and on the other, new tasks are created in the service sector, where human labor retains its

advantages. Thus, the impact of AI on the labor market and business processes is complex and multifaceted, requiring careful analysis and adaptive strategies to maximize benefits and minimize risks. (Єсіна & Михайлов, 2024)

AI Act, developed in the European Union, is a key regulatory document aimed at regulating the use of artificial intelligence (AI) in order to protect human rights and ensure the security of society. This regulation provides for a risk-oriented approach to the use of AI, which will allow finding a balance between stimulating innovation and preventing potential threats.

One of the main aspects of AI Act is the requirement to manage AI risks throughout the life cycle of systems. This means that developers must support systems at all stages of their use, and not only during development, ensuring their safety and compliance with ethical standards. Especially important is the mandatory certification of AI systems that work with high-risk processes, for example, processing confidential data or use in critical infrastructure. These systems must meet strict standards to minimize risks to society.

AI Act also stipulates that the datasets used to train AI must be up-to-date, complete and error-free to avoid discriminatory decisions. This will help improve the accuracy and transparency of AI. The document also provides for restrictions on technologies that may threaten human rights or state interests. This applies to systems that promote misinformation, manipulation of public opinion or discrimination. Particular emphasis is placed on the transparency of the work of AI: users should be informed that they interact with the machine, and not with the person.

For developers and AI users, AI Act provides for the development of special codes of conduct that will regulate their activities depending on the type of technology with which they work. Transparency in the development and use of AI is one of the main principles of this document. It also introduces the concept of regulatory sandboxes - controlled environments where companies can test their innovative solutions without the risk of violating laws, which will allow them to adapt products to the requirements of regulators.

AI Act classifies AI systems by risk level into four main categories. Systems with minimal risk include technologies that perform routine tasks, such as automating office processes, and do not significantly affect the rights and freedoms of citizens. Systems with limited risk may have some impact on the rights of individuals, but this impact is controllable. It is important that users of such systems should be aware that they are interacting with AI, and be able to stop interacting if necessary. High-risk systems can seriously affect people's rights and freedoms, particularly in cases involving automated decisions with legal consequences, such as in employment or justice. Such systems must undergo a thorough compliance check before entering the market. Finally, prohibited AI systems include those that can pose a serious threat to society, for example, technologies for manipulating public opinion or political persecution.

If adopted, the AI Act is expected to take effect no earlier than 2026. This will provide time for AI developers and users to adapt so that they can align their products and processes with the new norms. In addition, this regulation will have a significant impact on the international technological community, including Ukraine, which will also have to adapt national legislation and regulation of AI to new European standards. This is an important step to ensure that Ukrainian projects comply with international norms and standards. (Shadska et al., 2024)

In the US, the approach to regulating artificial intelligence has evolved from a general strategy to specific principles. Although the country does not have strict laws in this area, the authorities recognize the importance of managing the development of AI. The 2021 National Strategy outlined major areas including support for education, research and international cooperation. However, the rapid progress of technology has necessitated more detailed recommendations.

In response, the White House in 2022 proposed a "Bill of Rights in the field of artificial intelligence." This document defines five key principles for the responsible use of AI. They cover the security and effectiveness of systems, prevention of discrimination, protection of privacy, transparency of use and availability of human alternatives.

These principles are aimed at creating a balanced approach to the development of AI. They emphasize the need to thoroughly test systems, use representative data for training, give users control over their data, and inform the application of AI. Particular attention is paid to the possibility of choosing between automated and human services.

Thus, the United States seeks to form an ethical and responsible ecosystem of AI, balancing between innovation and the protection of citizens' rights. This approach reflects an understanding of the potential of AI and related challenges, aiming to maximize the benefits of technology while minimizing risks.

China demonstrates an ambitious and comprehensive strategy for the development of artificial intelligence, aimed at achieving world leadership in this area. This strategy is based on the long-term planning outlined in the "Next

Generation Artificial Intelligence Development Plan" of 2017. The document outlines a phased path to 2030, when China plans to become a global leader in AI technology and create an industry worth 1 trillion yuan. This goal is reinforced by intermediate goals and concrete steps to achieve them. (Spesivtseva, 2023)

A key advantage of China in the development of AI is its huge resource base. The country has 1.2 billion internet users and 1.63 billion mobile users, providing massive amounts of data to train AI algorithms. In addition, less stringent personal data protection standards compared to Western countries give Chinese developers greater access to data.

Despite this, China pays attention to the ethical aspects of the development of AI. The country develops ethical principles and creates commissions on technical ethics. The White Paper on Reliable Artificial Intelligence and Ethical Norms for Next Generation Artificial Intelligence form the regulatory framework that aims to.

Education and staffing are key elements of China's AI strategy. The country introduces AI disciplines at all levels of education, from elementary school to universities. The "AI Innovation Action Plan for Higher Education Institutions" from 2018 aims to create a multi-level AI education system to overcome the shortage of qualified personnel.

China is actively promoting its AI technologies in the international arena through the Digital Silk Road initiative. The country collaborates with developing states in Africa, Latin America and Asia to offer affordable digital products and services. This allows China to expand its influence and gain access to new markets and resources.

China's economic influence in the field of AI and related technologies is significant. The country is a leader in the export of goods of information and communication technologies, providing 32% of world exports. Chinese companies are actively promoting their technologies in the field of surveillance, 5G and e-commerce in the global market.

However, China faces certain challenges in the development of AI. The main one is the lack of highly qualified personnel, especially in the field of innovation and the introduction of advanced developments. In addition, potential social problems associated with automation and changes in the labor market can be a serious test for a country where about 12% of the global workforce lives.

In general, China's approach to the development of AI can be described as infrastructure-expansionist. The country combines a powerful internal development of technology with active international expansion. This may lead to the formation of a kind of "digital empire" with global influence, where China will play a central role in the development and implementation of AI technologies on a global scale. (Vinnikova, 2022)

Artificial intelligence is rapidly evolving and has significant potential to transform many industries, but its environmental impact is worrying. The main problem is the high power consumption required to process huge amounts of data in data centers (data centers). This results in significant CO2 emissions, especially when traditional energy sources are used. Studies show that training complex AI models can generate emissions greater than a car's emissions over its entire life cycle.

In addition, AI consumes large amounts of water to cool data centers and contributes to an increase in electronic waste that contains hazardous substances. These factors together create a significant ecological footprint of the technology.

However, despite these challenges, AI has the potential to address environmental challenges. It can contribute to the development of renewable energy by optimizing the operation of wind turbines and solar panels. In agriculture, AI helps implement sustainable practices by analyzing soil and yield data. In addition, AI can be useful in combating climate change by analyzing data on greenhouse gas emissions and developing strategies to reduce them.

To minimize the negative impact of AI on the environment, it is proposed to place data centers in regions with access to renewable energy sources and a favorable climate for natural cooling. It is also important to develop technologies for the processing of electronic waste (see Fig.2).

In general, artificial intelligence has the potential to bring more benefits than harm to the environment, but this is possible only if a responsible approach to its development and use. The key is to ensure the operation of AI exclusively from renewable energy sources and optimize its placement to minimize environmental impact. Only under such conditions can AI effectively contribute to solving global environmental problems without creating new ones. (Ecoaction, 2023).

Generative artificial intelligence (AI) transforms the rules of the game in many areas, and the ability to work effectively with it becomes a key skill. Prompt engineering is the art of creating clear instructions for AI to get accurate and relevant results.

This skill does not require deep technical knowledge and can be mastered by anyone. It allows you to automate routine tasks, increase productivity and achieve better results in various areas, from marketing to data

analysis.

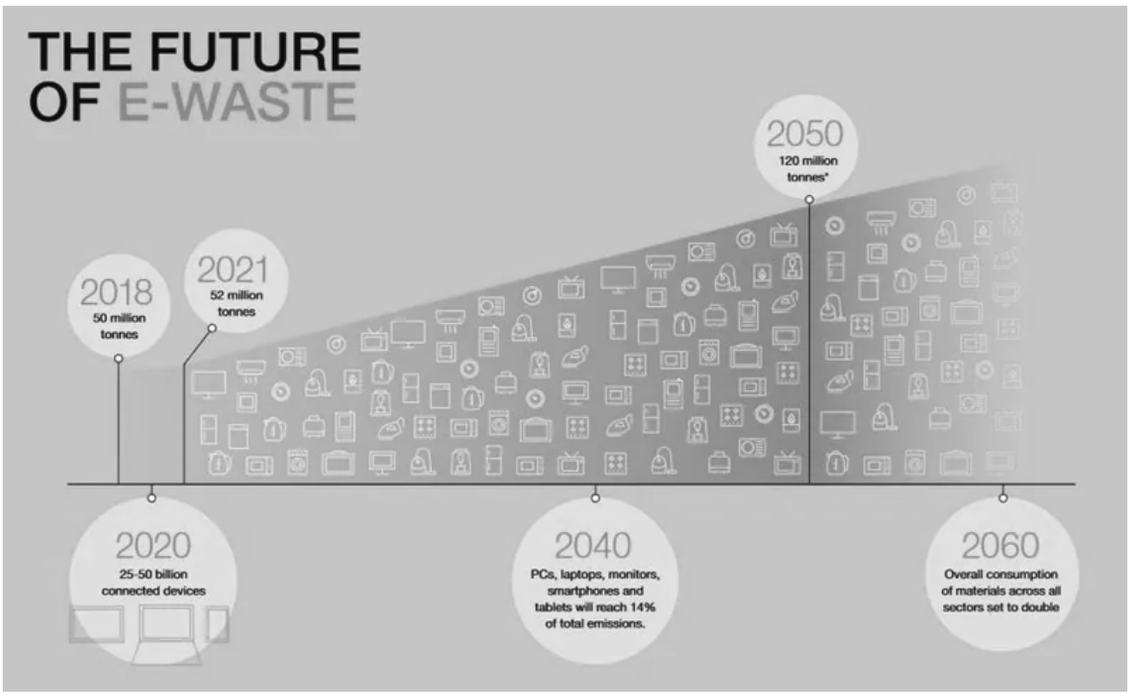

Fig 2. The future of e-waste
Source: (Ecoaction, 2023)

To work effectively with AI, you need to understand how it functions and how to formulate requests. It is important to provide clear and specific instructions, specify the desired format of the result and take into account the context of the task.

Prompt engineering is not just a tool for optimizing the current work, but the basis for creating a new type of organization. With this skill, companies will be able to achieve greater efficiency and competitiveness (Ecoaction, 2023).

Conclusions

Ethical challenges in the use of artificial intelligence in international business cover issues of transparency, bias, data protection and responsibility for decisions made by AI. The use of opaque algorithms can lead to discriminatory decisions, and insufficient protection of personal data - to privacy violations. In addition, issues of responsibility for mistakes made by AI are key to avoid legal risks and loss of trust. To effectively implement ethical standards, companies need to create clear internal codes, regularly check the transparency of algorithms, invest in employee training and comply with international data protection standards.

In the future, ethical norms will become even more relevant in the context of global regulation and elevated expectations of business from society. The development of artificial intelligence will lead to the need for closer cooperation between business, governments and public organizations, which will contribute to the introduction of responsible innovations. Such cooperation will help ensure not only compliance with ethical standards, but also the development of socially oriented technologies that support equality, transparency and inclusion at the global level.

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PROBLEMS OF INTERNATIONAL MANAGEMENT OF UKRAINE'S FOREIGN TRADE POLICY IN TRADE IN GOODS IN THE CONTEXT OF INTEGRATION WITH THE EU

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Abstract

The purpose of this article is to study the formation and management of Ukraine's foreign trade policy and to analyse the state of foreign trade in goods between Ukraine and the EU. The objectives of the study are to summarize the historical milestones in the formation of relations between Ukraine and the EU, to analyse the main aspects of the free trade agreement in the context of reducing customs restrictions in mutual trade, to analyse the indicators of Ukraine's foreign trade in goods with the EU until 2022, and to determine the impact of the war on Ukraine's foreign trade operations with the EU after a full-scale invasion, to identify problems and prospects for deepening trade integration. In order to achieve these objectives, the methods of statistical data analysis, comparative analysis of markets of different countries, literature review, analysis and synthesis of information were used. The conclusions of the study provide a general assessment of the impact of recent events on Ukraine's economy, in particular on foreign trade with the EU, and also indicate the need to deepen economic cooperation.

Keywords

foreign trade management, exports, imports, goods, import duties, free trade zone, tariff liberalisation, European integration, consequences of the war.

Problem statement

The sovereign Ukraine directs its foreign policy towards strengthening peace and stability in the world by protecting national interests and its own security, which is especially important in the context of the full-scale invasion of Russian troops and simultaneous strengthening of economic and political integration with the European Union as a candidate country. Foreign trade is a factor in the economic development of countries and an important component of commodity turnover and foreign economic activity. The development of foreign trade ensures the growth of the country's GDP, contributes to the profitability of domestic producers and improves the quality of manufactured products, which increases the competitiveness of goods and services, it is a source of foreign exchange earnings, and ensures the growth of national income. The management and implementation of foreign trade in goods is an important condition for ensuring the national sustainability of the economy. An important element of the EU-Ukraine Association Agreement is the provision on the establishment of a Deep and

Comprehensive Free Trade Area (DCFTA). It provides for substantial trade liberalisation (elimination of tariffs or quotas) between the parties, harmonisation of legislation and the regulatory framework.

Relevance of the chosen topic

The current processes of integration and globalisation, the crises of the past years, the war with the Russian Federation, and significant transformations require a more detailed study of the benefits and challenges of European integration and an assessment of the economic consequences of the Deep and Comprehensive Free Trade Area with the EU as a component of the Association Agreement for Ukraine's trade, which shapes its place in the international community. Insufficient study of this issue, especially in times of war, has led to the relevance of this study.

Analysis of recent research and publications

Today, there is a significant number of scientific studies that examine the issue of creating free trade zones, in particular, the features of bilateral EU free trade agreements (Campling et al., 2016); attention is paid to the priority vectors of the Free Trade Agreement (deepening sectoral integration, increasing duty-free exports and abolishing non-tariff measures) between Ukraine and the EU (Osipova, 2018); the results of the study of the dynamics, state and structure of Ukraine's foreign trade with the EU countries are presented, and it is found that deindustrialisation of export and consolidation of its agricultural specialisation has been a characteristic feature of recent years (Redko and Tkachenko, 2021); the peculiarities of implementation of the Free Trade Area with the EU and its impact on the trade sectors of the Ukrainian economy are determined, the peculiarities of reforms and changes in accordance with the standards and requirements of the European community are considered (Zubko, 2022).

Purpose of the article

The purpose of the study is to investigate the formation and management of Ukraine's foreign trade policy and analyse the state of foreign trade in goods between Ukraine and the EU. The objectives of the study are to summarise the historical milestones in the formation of relations between Ukraine and the EU, analyse the main aspects of the Free Trade Agreement in the context of reducing customs restrictions in mutual trade, analyse the indicators of Ukraine's foreign trade in goods with the EU until 2022, determine the impact of the war on Ukraine's foreign trade operations with the EU after a full-scale invasion, and identify the problems and prospects for deepening trade integration.

Presentation of the main research material and results obtained

Modern Ukrainians are one of the branches of historical Slavs. For the first time, the Slavs-Venetians were mentioned in the works of Roman authors. In the second century AD. Pliny the Elder, Tacitus, Ptolemy, and from the sixth century onwards, the Byzantine historians Jordan, Procopius of Caesarea, John of Ephesus, and others speak about them more widely. At the turn of the century AD, the Slavs formed as an independent ethnic community that coexisted in Europe with the Germans, Thracians, Sarmatians, Gauls, and Ugrophins. Along with the Antes, the name Slavs was used simultaneously (Chekalenko and Fedunyak, 2010). Modern Ukrainians are one of the branches of historical Slavs. For the first time, the Slavs-Venetians were mentioned in the works of Roman authors. In the second century AD. Pliny the Elder, Tacitus, Ptolemy, and from the sixth century onwards, the Byzantine historians Jordan, Procopius of Caesarea, John of Ephesus, and others speak about them more widely. At the turn of the century AD, the Slavs formed as an independent ethnic community that coexisted in Europe with the Germans, Thracians, Sarmatians, Gauls, and Ugrophins. Along with the Antes, the name Slavs was used simultaneously (Popovych, 1998). Therefore, historically, Ukraine's attraction to Europe is quite understandable. In general, the idea of European integration gained momentum as a result of a deeper understanding of the tragic consequences of the Second World War, which Europe ended with heavy losses. European integration was intended to rebuild the economies of the affected Western European states and establish close economic cooperation between them (Boyko, 2023).

2022 is the year when the whole world, unfortunately, realised that the rattling of weapons is not just an empty sound and some theatrical performances, but a serious argument that pushes diplomacy into the background. At such a time, the issues of political and economic alliances, especially the EU, have become particularly relevant, as it is impossible for states to wage war alone, due to the rapidly growing role of

globalisation in the world, in the most diverse areas that can now exist on earth (Kravtsova, 2022). Given its geopolitical position, historical experience, cultural traditions, rich natural resources, strong economic, scientific, technical and intellectual potential, Ukraine can and should become an influential global power capable of playing a significant role in ensuring political and economic stability in Europe (Verkhovna Rada of Ukraine, 1993).

An indispensable condition for the successful realisation of Ukraine's potential is its active and full integration into the global community. In overcoming the crisis in its society and paving its way to the world, Ukraine relies on its fundamental national interests, which determine the principles, directions, priorities and functions of its foreign policy (Verkhovna Rada of Ukraine, 1993). According to the Law of Ukraine "On the Principles of Internal and External Policy", one of the basic principles of Ukraine's foreign policy is to ensure Ukraine's integration into the European political, economic and legal space with a view to EU membership. The Resolution of the Verkhovna Rada of Ukraine of 2 July 1993 "On the Main Directions of Ukraine's Foreign Policy" defined for the first time Ukraine's intention to develop relations with the European Union. Ukraine's strategic orientation towards European integration was confirmed and developed in the Strategy of Ukraine's Integration into the EU (11 June 1998) and the Programme of Ukraine's Integration into the EU (14 September 2000). It proclaimed a long-term strategic goal - the European integration of Ukraine. On 9 September 2008, at the Paris Summit, Ukraine and the EU reached a political agreement to conclude a future agreement in the form of an Association Agreement based on the principles of political association and economic integration. The political part of the Association Agreement was signed on 21 March 2014 and the economic part on 27 June 2014. The EU-Ukraine Association Agreement entered into full force on 1 September 2017. It is an international legal document that enshrines at contractual level the transition of relations between Ukraine and the EU from partnership and cooperation to political association and economic integration.

An important component of the EU's integration mechanism is the common economic policy. The economic instruments of foreign policy involve the use of a state's economic potential to influence the economy and politics of other states (Mittweida University, 2023). It is the economic potential that determines the state's position in international relations, including the development of industry, raw materials and the state of the labour force. We focus on foreign trade, which helps to increase the economic potential of the state and allows it to influence the policies of other states through world prices, the establishment of the most favoured nation regime or the introduction of an embargo (Palinchak et al., 2022).

It is important to note that the EU became Ukraine's largest trading partner even before the outbreak of the full-scale war. The changes began 10 years ago when, after numerous trade 'wars', Russia's annexation of Crimea and the outbreak of the war in Donbass, Ukrainian producers began to look for alternatives to Russia and the CIS countries. The EU started to liberalise tariffs on goods from Ukraine on 23 April 2014 (under the EU's Autonomous Trade Preferences (ATP) for Ukraine), while Ukraine started to eliminate tariffs on European goods on 1 January 2016. The liberalisation process foresees the immediate elimination of part of the import duties from the start of the DCFTA, as well as the gradual liberalisation of import duties during the transition periods, which will be completed by 2023 for the EU and 2026 for Ukraine. According to the World Trade Organisation (WTO), in 2014 the EU applied zero import duties to goods from Ukraine for about 89% of tariff lines. In addition, around 25% of MFN duties were already at zero and 64% were lifted as ATP by the EU on 23 April 2014. In total, around 95.8% of EU tariff lines for products from Ukraine will be at zero by 2023. At the same time, the EU has excluded 400 tariff lines from tariff liberalisation. These tariff lines belong to the following product groups: products of animal and plant origin, prepared food and chemical products. The highest tariffs remained for tobacco products (HS24), processed vegetables, fruits, nuts and plants (HS20), sugar and sugar confectionery (HS17), meat and edible offal (HS2) (Taran et al., 2022).

Tariff liberalisation under the DCFTA has significantly reduced tariff barriers to the EU market for Ukrainian goods (Fig. 1). As a result, Ukrainian goods have gained advantages in accessing the EU market compared to other countries that do not have preferential trade agreements with the EU and are subject to MFN tariffs (Taran et al., 2022).

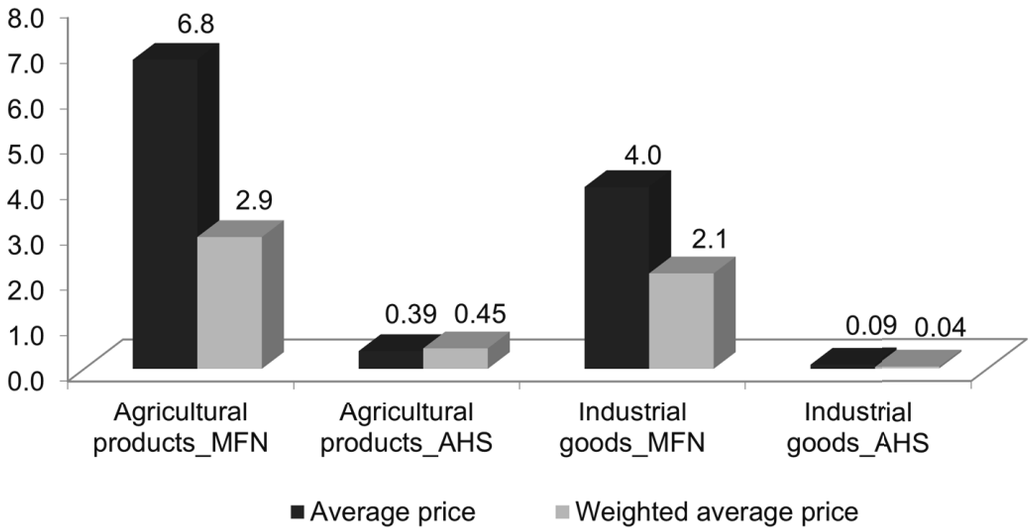

Fig. 1: EU tariff rates for goods originating in Ukraine: current preferential (AHS) and most favoured nation (MFN) duties, 2020
Source: materials used (WITS, 2020)

The DCFTA had a positive impact on the dynamics of bilateral trade in goods with the EU, contributing to the recovery of Ukraine's overall trade after the 2014-2015 crisis. Following the entry into force of the DCFTA, the volume of trade in goods with the EU started to recover and in 2021 the volume of trade in goods with the EU-27 reached a record high for the entire period of cooperation - USD 55.7 billion, which is 32.2% higher than the pre-crisis level of 2013.

The trade deficit in goods with the EU-27 also decreased compared to the pre-crisis period. In 2016-2019, the trade deficit in goods with the EU-27 averaged USD 3.3 billion, compared to USD 9.7 billion in 2013. This reduction is mainly due to the expansion of Ukraine's goods exports to the EU. In 2021, the deficit in trade in goods with the EU-27 shrank even further to USD 2.2 billion (Taran, Shepotilo, Yavorskiy, Bondarenko, 2022). (Fig. 2).

With the entry into force of the EU-Ukraine DCFTA, the growth of Ukraine's exports of goods to the EU-27 resumed, growing by an average of 14.8% per year in 2016-2019. Overall, exports of goods to the EU-27 in 2019 increased by 59.1% (USD 7.5 bn) compared to 2015 (pre-DCFTA) and by 24% (USD 3.9 bn) compared to 2013, before the crisis. Imports of goods from the EU have also recovered rapidly, with imports of goods from the EU to Ukraine growing at an average annual rate of 16.1% in 2016-2019. Overall, imports of goods from the EU-27 increased by 64.2% (+9.5 bn USD) in 2019 compared to 2015, but were still 6.5% (-1.7 bn USD) below the pre-crisis level of 2013.

In 2020, the economic downturn and falling demand in the wake of the global pandemic led to a decline in trade in goods between the EU27 and Ukraine. Exports of goods from Ukraine to the EU-27 fall by 10.9%, while imports of goods from Ukraine to the EU-27 fall by 4.9%. However, in 2021, growth in trade in goods with the EU resumes for both exports and imports, due to a sharp increase in demand and prices on world markets, with exports of goods to the EU growing much faster than imports from the EU. In 2021, exports of goods to the EU-27 grew by 49.4% year on year to reach $26.8 billion, while imports of goods from the EU-27 grew by 25.2% to reach $28.9 billion. Compared to 2013, exports of goods to the EU-27 in 2021 will be almost 65.3% higher than their pre-crisis level (+ USD 10.6 bn), while the corresponding increase in imports of goods from the EU-27 will be much lower, at 11.7% (+ USD 3 bn) (Taran, Shepotilo, Yavorskiy, Bondarenko, 2022).

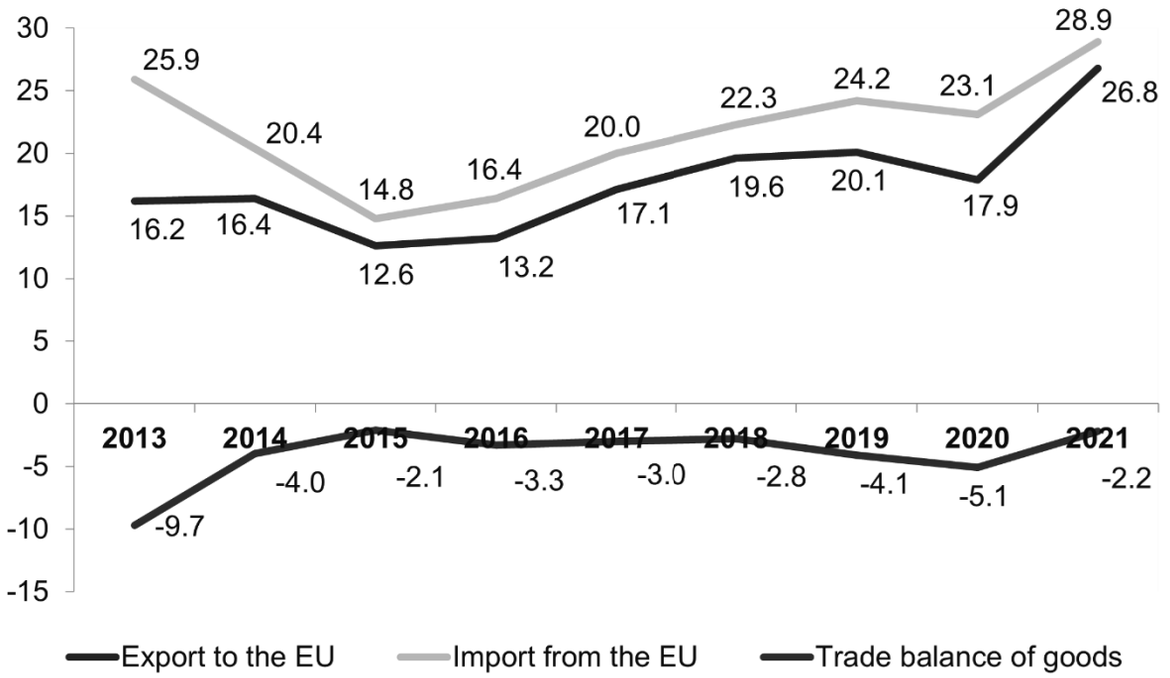

Fig. 2: Exports and imports of goods with the EU-27 countries in 2013-2021, billion USD
Source: materials used (Derzhavna sluzhba statistiki Ukrayini, 2021)

While in 2021 there were almost no major changes in the regional structure of Ukraine's foreign trade, the full-scale invasion of 2022 caused significant changes, which is understandable in wartime, and it is known that such crisis conditions have a significant impact on international markets and foreign trade activities (Benenson, Velesco et al., 2021). The predictable result of Russia's military aggression against Ukraine was a significant reduction in external economic relations with both Russia and its ally, the Republic of Belarus. At the end of 2021, the CIS countries accounted for 19% of Ukraine's imports and 11% of its exports, while at the end of 2022 their share was 14% for imports and 6% for exports. The European Union is Ukraine's main trading partner in both 2021 and 2022. At the end of 2021, the EU's share in Ukraine's external trade in goods was 40% of imports and 39% of exports, and by the end of 2022, the EU's share increased to 46% of Ukraine's imports and 63% of exports (Saliy and Saliy, 2023)

It is noted that the EU remained Ukraine's largest trading partner in 2022, including a decline in the share of Ukrainian exports to other countries and regions of the world, mainly the CIS and Asia, in favour of partnership with the EU. But the EU's decision - especially in June 2022 - was valuable, as Ukraine lost access to its main Black Sea export route and had to quickly reorient itself towards more expensive and difficult land exports. In a situation where other markets were not available, Brussels' decision expanded access to the EU market. What we see after these two years is less the result of the abolition of tariff quotas than of changes in trade logistics. But trade liberalisation was and is necessary for Ukraine. Meanwhile, it should be noted that about half of the total value of Ukrainian exports to the EU in 2023 will be agricultural goods. The most significant growth in Ukrainian exports to the EU has also been driven by agriculture. Under normal circumstances, this would mean that the Ukrainian economy has an advantage in the production of agricultural goods. However, trade liberalisation did not take place under normal conditions, but during the war, when many industrial facilities were destroyed and domestic demand in Ukraine increased. Therefore, this does not mean that Ukraine's mining and heavy industries are less competitive in the current circumstances (BBC News Ukraine, 2024)

Shortly before the introduction of the "visa-free trade regime" in June 2022, the EU also launched the Solidarity Action Plan to create alternative logistics routes for Ukraine, which has generated €50 billion in revenues for the Ukrainian economy in two years. In general, according to the State Customs Service, Ukrainian exports to the EU accounted for 59% of all exports (and just over half of all imports) in January-August 2024).

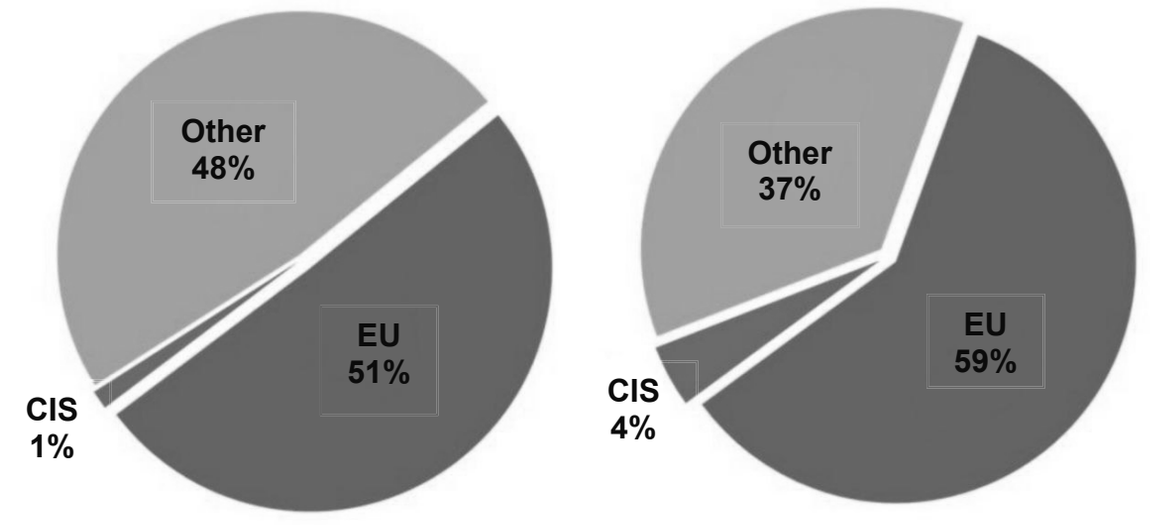

Fig. 3: Structure of imports and exports in January-August 2024
Source: materials used (Derzhavna mitna sluzhba Ukrayini, 2024)

The most important change was that Poland took the lead in terms of exports from Ukraine in 2022, accounting for 15.7% of total merchandise exports. This was followed by Romania with 8.74%, Turkey with 6.66%, Germany with 5.13% and Hungary with 5.15%. The share of exports to China almost halved to 5.59%. Moldova became the main destination of Ukrainian exports in the CIS region with a share of 2.09%. The CIS countries also include the Russian Federation with a weight of 1.08%, but this result was achieved in the first two months of 2022, and after the outbreak of military aggression Ukrainian exports to Russia ceased (Saliy & Saliy, 2023). Among the EU countries, Poland, Italy, Germany, the Netherlands and the United Kingdom are the most cooperative with Ukraine: Poland, Italy, Germany, the Netherlands, Spain, Hungary, the Czech Republic and Slovakia (Trotska, 2023).

It should also be noted that in 2023 Ukraine set a historical record for ice cream exports, with more than 10,000 tonnes exported abroad. Most of the Ukrainian ice cream went to the EU (mainly Germany, Poland, Lithuania and the Czech Republic), where producers received 60% of their profits. Last year, Ukrainian producers sold more than 4,000 tonnes of berries on foreign markets, but due to the border blockade by Polish farmers, blueberry exports to Poland fell by almost 40%, while exports to Germany increased 18-fold. Other buyers of Ukrainian berries include the Netherlands, Spain and the UK. In addition, the first Ukrainian blueberry producers have started to supply blueberries directly to the leading EU chains, where the requirements for product quality and regular supply are very high.

In mid-May, the European Council extended until June 2025 the regime suspending tariffs and quotas on imports of Ukrainian products into the EU. This regime of "autonomous trade measures" to support the Ukrainian economy came into force in June 2022 and was extended in 2023 with an amendment to temporarily ban imports of Ukrainian wheat, maize, soybeans and sunflowers to five countries on the EU's eastern border. This time, however, the updated agreement provides for the possibility of joint restrictions on imports of certain goods from Ukraine. For a number of products, an 'emergency brake' mechanism has been introduced, which means that the liberalisation of trade in 'sensitive' agricultural products can be suspended immediately to protect EU farmers. These include poultry, eggs, sugar, oats, cereals, maize and honey.

Conclusions

Thus, the Deep and Comprehensive Free Trade Agreement (DCFTA) between Ukraine and the EU already offers great opportunities for trade. It is necessary to use them, because in 2022, as a result of the full-scale invasion, Ukraine's foreign economy collapsed due to the reduction of export production, as well as complicated, and in some areas impossible, export logistics, while the only border through which Ukraine's foreign economic relations with the world were maintained was the western border, which had limited capacity due to congestion. According to the World Trade Organisation (WTO), in 2014 the EU applied zero tariffs to goods from Ukraine on around 89% of tariff lines. Two years ago, after Russia's full-scale attack, Ukraine gained virtually free access to the EU market. The share of Ukrainian exports to other countries, mainly the CIS and Asia, has decreased in favour of partnership with the EU. According to the State Customs Service,

Ukrainian exports to the EU accounted for 59% of all exports (and just over half of imports) in January-August 2014.

Ukraine needs to focus on broadening its product range. At present, agricultural products and raw materials (cereals, metals, timber) account for a significant share of exports. There is a need to develop exports of manufactured goods, high-tech products and services, particularly in the IT sector.

Further research could focus on the impact of the Deep and Comprehensive Free Trade Area (DCFTA) on the development of specific sectors of the Ukrainian economy, including agriculture, industry and technology. It would be useful to assess the extent to which the productivity of Ukrainian firms has increased as a result of the removal of trade barriers, and how this process has affected the investment climate. It would also be useful to examine the changes in agricultural exports following the preferences and the war.

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INTERNATIONAL TRADE IN MEDICAL GOODS: LESSONS FROM THE COVID-19 PANDEMIC

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Abstract

The article provides a detailed analysis of the global trade in medical goods, with a particular focus on the challenges and lessons learned from the COVID-19 pandemic. Particular emphasis is placed on the role of the World Trade Organisation (WTO) in regulating trade in medical goods. It examines the dynamics of trade in medical goods before and during the pandemic, focusing on changes in the structure of supply and demand. It analyses the political and economic measures taken by governments to ensure access to medical supplies during the pandemic, and assesses their effectiveness and impact on global supply chains. The authors found that unequal access to vaccines was linked to geopolitical interests and economic imbalances between countries. It concludes that the system for regulating international trade in medical goods needs to be reformed to ensure fairer and more efficient access to vital medical goods in the future.

Keywords

international trade, medical goods, pandemic, COVID-19, exports, imports.

Problem statement

In the 21st century, pandemics are becoming more frequent, spreading over larger areas of the world and affecting millions of people. Despite advances in medicine and science, new challenges such as climate change, population migration and globalisation are increasing the risk of new epidemics. The COVID-19 pandemic has become a vivid example of how quickly and widely infectious diseases can spread. It has also revealed deep inequalities in access to medical goods and services. This includes general access to the health system as well as access to newly developed critical medical products, including vaccines.

Relevance of the chosen topic

Studying the impact of the pandemic on international trade in medical goods is key to understanding global economic processes. The COVID-19 pandemic demonstrated the importance of supply chain stability and the need to adapt trade policies to unforeseen circumstances. Analysing international trade in medical goods in the context of the pandemic allows us to assess the economic impact on different regions of the world and to identify effective strategies to ensure global security and economic well-being.

Analysis of recent research and publications

International trade in medical goods during the COVID-19 pandemic has been the subject of in-depth analysis and numerous studies by national and international researchers (University of Applied Sciences Mittweida, 2024). In particular, (Baldwin & Weder di Mauro, 2020) analysed key issues of international trade in the context of the pandemic response; (Teremetskyi & Duliba, 2020) considered the specificities of international trade in medical goods, highlighting the importance of the WTO in the global response to the pandemic; (Evenett & Baldwin, 2020a) identified problematic issues of foreign trade policy in the fight against the pandemic; (Evenett & Baldwin, 2020b) examined the use of export restrictions and import taxes on COVID-19-related goods; (Chugaiev, 2020) described the peculiarities of foreign trade during the pandemic. These studies play a key role in designing effective trade policies and understanding their impact on global health.

Purpose of the article

The purpose of this article is to provide a comprehensive analysis of the impact of the COVID-19 pandemic on international trade in medical goods and to examine the lessons that can be learned from this crisis. In particular, the study aims to:

- assess the changes in international trade in medical goods caused by the pandemic, and identify the main problems and risks encountered during the crisis;
- analyse the effectiveness of international and national trade policies in response to the crisis;
- evaluate political and economic measures to support trade and access to medical goods;
- identify, based on the results obtained, areas for improving international cooperation in the field of health and further developing international trade in medical goods.

Presentation of the main research material and results obtained

International trade in medical goods is an important part of the global economy and requires careful regulation to ensure that necessary goods are available worldwide. The World Trade Organisation (WTO) system of agreements plays a central role in this process by establishing rules that balance free trade with the protection of national health interests. The General Agreement on Tariffs and Trade (GATT), the General Agreement on Trade in Services (GATS), the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS), the Agreement on Technical Barriers to Trade (TBT), the Trade Facilitation Agreement (TFA), and the Pharmaceuticals and Government Procurement Frameworks are the main instruments that allow WTO members to regulate international trade in medical goods. These agreements establish rules that promote access to medical goods while allowing countries to take measures to protect the health and safety of their citizens. The WTO recognises health risks as a legitimate argument for restricting trade. The establishment of trade barriers as exceptions to general WTO rules can be motivated by the protection of human, plant, animal and environmental health, as long as they are not used as disguised barriers to trade. However, as the COVID-19 pandemic demonstrated, existing mechanisms may not be sufficient to respond rapidly to crisis situations, such as sudden shortages of medical supplies. The lack of effective mechanisms to deal with such crises has led to problems with the implementation of World Health Organisation recommendations and other international standards. Ensuring the availability of medical goods during the COVID-19 pandemic tested international trade and WTO regulatory mechanisms.

Even before the COVID-19 pandemic, trade in medical goods had been growing steadily and significantly. In the decade before the COVID-19 pandemic, trade in medical products grew by an average of 4.7% per year (compared with 2.8% for total merchandise trade), and its share of international trade increased from 4.9% to 9.5%, reaching USD 1.5 trillion in 2021 (Fig. 1). Trade in medical goods has been more stable than trade in general, indicating the stability of demand for essential medical goods.

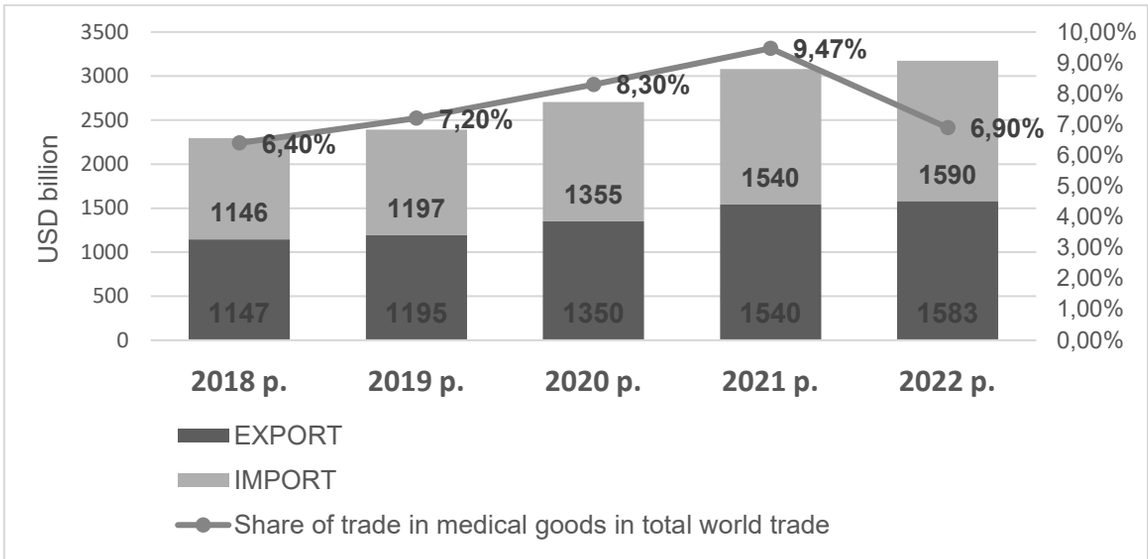

Fig. 1: Trade in medical goods, 2018-2022
Source: prepared by the authors according to (World Trade Organization, 2023)

While international trade has always been important for health and infectious disease control, it became even more so during the COVID-19 pandemic. As the global economy came to a near standstill due to quarantines, border closures and other measures to stop the infection, overall trade in goods declined in 2020. However, trade in medical goods grew by 13.2% and accounted for 8.3% of total merchandise trade. In 2021, the medical goods sector continued to show strong growth, increasing by 14.1% compared to the previous year. In 2022, the situation of global trade in medical goods stabilises and its share in total merchandise trade falls to 6.9%, which is in line with pre-pandemic levels and may indicate a gradual recovery of the global economy and the effectiveness of the measures taken to contain the pandemic.

Between 2018 and 2022, pharmaceutical products held the leading position among the categories of international trade in medical goods (Fig. 2). Their share in total turnover increased from 54.90% in 2018 to 56.70% in 2022. At the same time, the share of medical equipment decreased from 16.90% to 14.90%. Orthopaedic equipment remains the least represented category, with its share fluctuating slightly from 5.60% in 2018 to 4.70% in 2022. A significant increase in the share of personal protective equipment was recorded in 2020 - 16.70%, but it returns to its initial level of 12.8% in 2022. The share of other medical devices remains relatively stable over the analysis period.

The COVID-19 pandemic has led to global changes in the production and trade of personal protective equipment (PPE). Governments around the world responded to the crisis by introducing mandatory masks and raising hygiene standards, leading to a significant increase in demand for medical masks, disinfectants and rubber gloves. In 2020, exports of face masks increased by 481%, disinfectants by 199% and rubber gloves by 113%. Monthly export growth rates peaked in April 2020, when the WHO reported 1 million cases of COVID-19 worldwide. The supply deficit pushed up prices, which was partly responsible for the sharp increase in export prices in 2020, especially for medical masks. The deficit was exacerbated by trade policy interventions by most governments, which restricted exports of medical goods to meet their own needs. In 2021 and 2022, trade in personal protective equipment falls slightly, by 5.7% and 5.2% respectively, due to increased domestic production and lower prices.

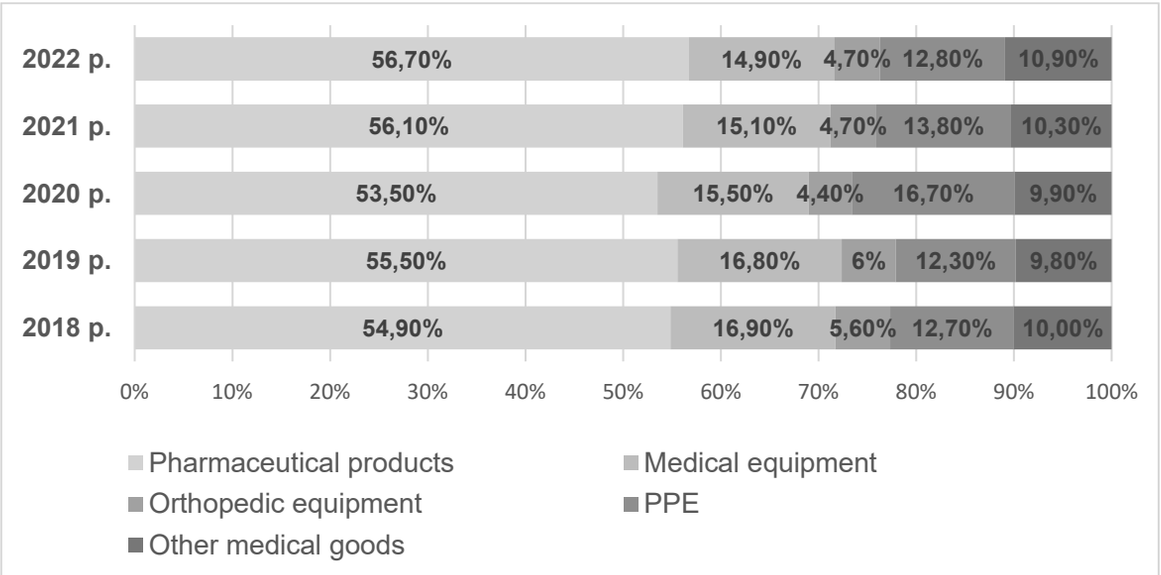

Fig 2. Structure of trade in medical goods in 2018-2022, %*
*Source: *prepared by the authors according to (World Trade Organization, 2023)*

In addition to personal protective equipment, trade in lung ventilators (up 80%) and testing systems (up 43.3%) increased significantly during the first year of the pandemic (World Trade Organization, 2022). On the other hand, the re-profiling of medical facilities to deal with the pandemic led to the postponement of scheduled procedures and diagnostic tests, resulting in a decline in demand for dental and orthopaedic equipment, as well as imaging equipment.

As the global health situation has changed, so has the demand for medical goods, reflecting the importance of these products at each stage of the pandemic. By 2021, the trade profile has changed, with vaccines and medicines replacing personal protective equipment as the fastest growing group with a 20% increase. As most healthcare facilities have already purchased critical equipment, demand for ventilators has declined. At the same time, the number of planned surgeries and hospital admissions recovered in countries such as the US, Canada and Germany, increasing the volume of orthopaedic, dental and other planned procedures that had been cancelled or postponed as a result of anti-epidemic measures. The surge in planned procedures increased demand for medical equipment (Fortune Business Insights, n.d.). Although the use of face masks remained officially mandatory in most countries, trade in face masks fell by almost 13%. With the start of vaccination, the trade in syringes and needles increased by 18.8% (World Trade Organization, 2022).

Global exports of medical devices are concentrated in a small number of countries, mostly members of the Organisation for Economic Co-operation and Development (OECD). In 2022, the top 10 exporters of medical devices accounted for almost three quarters of the world total. Germany was the largest exporter of medical goods with a total volume of USD 202.6 billion. This represented 12.9% of global exports (Table 1). The United States and China ranked second and third with USD 189.6 billion (12% of world exports) and USD 137.3 billion (8.7% of world exports) respectively.

Table 1 - Top 10 exporters/importers of medical goods, 2022 (USD billion and %) *

Rating	Countries	Exports in 2022		Rating	Countries	Imports 2022	
		USD billion	Share, %			USD billion	Share, %
1	Germany	202,6	12,9	1	USA	306	19,2
2	USA	189,6	12	2	Germany	134,2	8,4
3	China	137,3	8,7	3	Belgium	103,4	6,5
4	Belgium	125,9	8	4	China	94,3	5,9
5	Switzerland	118,8	7,5	5	Netherlands	85,3	5,4
6	Netherlands	109,1	6,9	6	Japan	70,4	4,4
7	Ireland	105,4	6,7	7	France	64,3	4
8	Italy	67,5	4,3	8	Switzerland	60,3	3,8

9	France	59,3	3,8	9	United Kingdom	58,4	3,7
10	United Kingdom	46,4	2,9	10	Italy	57,4	3,6
	Other	412,7	26,2		Other	556,9	35

**compiled by the authors according to (World Trade Organization, 2023)*

The structure of exports by product category differs between countries (Table 2). While Germany was the largest exporter of pharmaceutical products, the United States was the largest exporter of medical and orthopaedic equipment. China was the largest exporter of personal protective equipment. The pandemic has shifted the centre of trade in certain medical products from the United States and Europe to Asia. Asia's exports increased mainly due to the production of personal protective equipment, the least technologically sophisticated group of medical products. In this category, Asia accounted for 61% of exports in 2020. Malaysia has long dominated rubber glove exports, accounting for more than half of global shipments. The economies of China, Hong Kong, Japan, Korea, Malaysia, Thailand, Vietnam and Taiwan were among the world's top 15 suppliers of personal protective equipment, with a combined share of 58% in 2020, up 16% from 2019. Other Asian economies accounted for a further 3% (World Trade Organization, 2022).

Between 2019 and 2022, China will significantly improve its position in the medical supplies market, moving from fifth to third place among exporters. This is mainly due to an increase in exports of personal protective equipment. Over the same period, Belgium rose from seventh to fourth place, becoming the second largest exporter of pharmaceuticals. Between 2019 and 2022, the rest of the world, with the exception of Asia, Europe and North America, was poorly represented in global trade in medical goods, with an average export share of 2.4%. In fact, Africa, Latin and Central America, the Middle East, the CIS and the rest of the world consistently account for less than 5% of exports in any category of the medical goods group (World Trade Organization, n.d.-a). These data suggest that the participation of these regions in the global exchange of these products is very limited. This situation may be due to the low level of economic development in many countries in these regions, lack of investment in healthcare, limited infrastructure for the production and trade of medical products, political instability and conflict.

Table 2 - Top 20 medical goods exporting by group (2019, 2022, USD billion) *

Countries	Pharmaceutical products		Medical equipment		Orthopaedic equipment		Personal protective equipment		Other medical goods	
	years									
	2019	**2022**	**2019**	**2022**	**2019**	**2022**	**2019**	**2022**	**2019**	**2022**
Germany	91	125	30,6	33,4	5	5,6	17,1	20	14,3	18,6
USA	58,7	87,5	38,5	43	10	10,7	13,5	17,3	23,7	31,1
Switzerland	86,9	102	7,1	7,6	5	5,4	1,4	1,7	1,6	2,2
Netherlands	49,7	53,2	17,3	22,3	8	9,8	5,7	7,4	11,1	16,4
China	16,5	23,2	15,8	22,8	5,1	6,8	33,7	62,8	7,6	21,6
Ireland	55,4	83,4	6,5	7,2	3,4	3,9	2,7	2,9	6,1	8
Belgium	55,6	105,2	6,4	6,5	3	3,4	4,1	5	4,8	5,9
France	36,1	38,2	6,8	6	2,6	2,1	5,8	7,2	4,4	5,8
Italy	35,4	48,9	4,7	5,5	2,2	2,5	5,2	6,3	3,1	4,4
United Kingdom	28,6	29,2	6	6,6	2,6	2,1	3,5	3,8	4,1	4,8
Japan	6,7	7,8	10,9	11,2	0,5	0,4	6,5	7,3	3,3	3,6
Singapore	9,1	10,5	7,9	9	2,7	2,3	1,8	2,5	3	3,5
India	17,9	21,5	1,1	1,4	0,3	0,4	1,6	1,9	1,9	2,1
Spain	13,3	28,8	1,1	1,2	0,5	0,6	1,8	2,4	1,9	2,6
Austria	12,2	14	2	2,2	0,5	0,4	1,9	2,1	1,2	1,7
Mexico	1,5	1,5	6,5	8,1	1,9	2,1	2,7	4	4,4	5,4
Sweden	11,1	13,7	1,6	1,8	0,4	0,4	1,3	1,6	1,8	2,5
Canada	8,5	10,8	2,3	3,1	0,3	0,3	2,2	2,5	1,9	2,3
South Korea	4,2	6,9	3,5	4,2	0,9	1,1	2,9	3,9	1,2	4,5
Poland	4,1	5,6	1,9	2,6	1,4	2	3	4,2	2,1	2,5

**compiled by the authors according to (World Trade Organization, 2023)*

In 2022, the United States was the largest importer of medical products across all categories, with a value of USD 306 billion (Table 3). This is a significant market share, accounting for 19.2% of the global volume. Germany

ranked second with USD 134.2 billion, almost half the value of the United States. Belgium became the third largest importer in 2022, with the majority of imports being pharmaceuticals. China ranks fourth.

The structure of medical imports reflects global trends and changes in health needs. Pharmaceuticals, as the main category of imports, underline the need for international access to medicines. The growth in medical equipment imports reflects innovative changes in medicine that require modern equipment to improve diagnosis and treatment. As for orthopaedic equipment, its lower share in imports may be related to the specificities of the local market and the development of domestic production to meet the needs of the national health system.

An analysis of intra-industry trade indicators shows that there is a high degree of convergence in imports and exports of medical products from leading suppliers. Countries tended to be both importers and exporters of medical goods. This means that a country may be a leading exporter of one type of medical product, but at the same time be dependent on imports of other types. Such a high level of aggregate intra-industry trade indicates that countries are interdependent in meeting demand and production needs. This suggests that countries are highly specialised in the production of certain types of medical goods, allowing them to use their resources more efficiently and be more competitive on the world market.

Table 3 - Top 20 medical goods importers by group (2019, 2022, USD billion) *

Countries	Pharmaceutical products		Medical equipment		Orthopaedic equipment		Personal protective equipment		Other medical goods	
	years									
	2019	2022	2019	2022	2019	2022	2019	2022	2019	2022
USA	134,6	175	39,1	49,7	15,3	17,9	26,2	37,9	16,3	25,5
Germany	58,9	80,8	15,7	17,4	5,5	5,5	11,9	14,9	10	15,6
China	35,6	42,2	20,4	23,3	3,3	3,5	10	13,8	7,2	11,4
Netherlands	33,5	40,7	12,2	16,9	5,2	7,7	4,7	6,4	8,2	13,6
Belgium	47,2	84,9	6,1	6,5	2,3	3	3,3	4,2	4,2	4,9
Japan	28,3	40	9,8	9,7	4,2	4,1	7,1	8,9	4,3	7,6
France	29	35	7,8	9,1	4,1	4	6,6	8,4	5,5	7,8
United Kingdom	28,3	33,1	6,4	8,5	2,9	2,7	5,2	6,9	4	7,1
Italy	31,2	39,1	5	5,5	2,5	2,6	4	5,3	3,3	4,9
Switzerland	32,5	49,5	3,4	4	1,8	1,6	1,9	2,5	1,8	2,7
Canada	15,2	20,9	5,1	6,2	1,8	2	4,4	6	3,2	6,3
Spain	16,5	24,8	3,6	4,4	1,4	1,8	3,4	4,2	2,6	3,4
South Korea	7,6	11,6	4,9	5,9	0,8	1	3,8	4,9	2	2,9
Australia	9,3	13,7	3,8	4,5	1,3	1,5	2,2	3,4	1,4	3,8
Mexico	4,3	4,9	3,9	4,6	0,7	0,8	5,4	8,9	3,1	4
Austria	10,7	12,2	1,9	2,1	0,6	0,7	2	2,5	1,4	1,6
Poland	7,7	10,5	2,1	2,7	0,9	1	3,3	4,6	1,8	2,2
Brazil	8,3	11,4	2,1	2,6	0,6	0,7	1,5	2,3	2,1	2,3
Ireland	8,6	12,1	1,4	2	0,5	0,8	0,8	1,2	1,5	2,6
Singapore	3,6	5,5	4,3	4,8	0,9	0,9	1,7	2	1,6	2,1

**compiled by the authors according to (World Trade Organization, 2023)*

On the other hand, for many developing and low-income countries, trade in medical goods is one-sided. This means that trade in medical goods between such countries is relatively limited, resulting in significant dependence on OECD and G20 countries for access to these products. This situation carries serious risks associated with dependence on geographically concentrated supplies of critical goods and the need for resilience planning.

The dominance of the United States and Europe in the global trade of medical goods has remained unchallenged, although the centre of trade has shifted to Asia for some less technologically sophisticated products. Both regions are renowned for their respective development and patenting, production and export of medical devices, pharmaceuticals and other medical products. Both the US and EU countries have favourable business legislation and well-developed infrastructure for the production and transport of medical goods. In recent years, however, these countries have faced challenges related to the globalisation of medical goods. The high demand for medical goods, the globalisation of production chains, the dependence on imported raw materials and the economic benefits of relocating production to countries with lower labour costs have created a complex system of international trade. This requires countries to strike a balance between supporting domestic production and

making efficient use of partner countries' resources (Dzyad & Mykhailenko, 2024).

The uncertainty of the extent, intensity and duration of the COVID-19 pandemic, as well as the need to overcome severe domestic shortages of medical products, led to restrictions on trade in medical products and allowed countries to apply discriminatory policies as an exception to WTO principles. At the beginning of the pandemic, one of the most pressing issues for national governments was to ensure access to personal protective equipment, critical medical devices and medicines, given the growing global demand for these goods. A wide range of policies can directly affect trade, such as tariffs, bans, import and export licensing. Others affect trade indirectly, such as trade facilitation measures, policies on trade in services (transport, logistics, insurance), regulatory frameworks, intellectual property rights, which can promote innovation and access to health technologies, and the promotion of technology partnerships, technology transfer through production chains and knowledge sharing.

However, there are issues that complicate the regulatory process. On the one hand, globalisation is increasing international trade, leading to greater accessibility of medical goods. On the other hand, it makes regulation more complex as the number of regulations increases and their complexity grows. The difficulty of regulatory procedures can be a barrier to effective trade, and high regulatory requirements can affect pricing. Delays in licensing and import procedures can have a negative impact on the availability of medical goods, especially when there is a need to respond quickly to changes in supply and demand for medical goods. The multitude of different instruments introduced by different countries creates an additional barrier to international trade, which requires harmonisation of standards and procedures. In addition, the problem of illegal trade in medical goods remains relevant and requires increased attention from regulatory authorities as it poses a direct threat to the health of consumers.

Since the beginning of the pandemic, governments have taken measures to restrict the export of medical products to ensure the availability of these goods in domestic markets. By 2020, almost 100 countries had imposed temporary restrictions or bans on the export of medical goods, raising many concerns, particularly in countries that rely on foreign trade for access to essential goods. The EU, for example, has banned the export of medical equipment to third countries. Italy's only ventilator manufacturer, Siare Engineering, which used to export 90% of its products, has stated that all of its products are reserved for domestic use under government guidelines (Berlinger, 2020). India has restricted the export of dozens of medicines, including acetaminophen and various antibiotics. Switzerland began requiring licences for the export of personal protective equipment. A number of other countries followed suit, imposing various forms of restrictions, ranging from outright bans to extensive licensing requirements that made exports much more difficult.

The main purpose of these protectionist policies was to protect the health of their citizens. Although such measures were ostensibly temporary and covered by international trade rules because they reduced shortages of medical goods and services at the national level, they created huge market failures that harmed both the countries that imposed them and their trading partners. Export restrictions were risky for many countries for several reasons. First, they restricted the availability of goods on international markets. This threatened countries that relied heavily on medical exports. High import concentration in certain products made developing countries extremely vulnerable to changes in exporters' policies. As a result of export restrictions, countries that desperately needed medical supplies and other critical products were deprived of them. Second, by restricting supply on the world market, exporters raised prices, leading to speculation and worsening the supply situation. Third, the restrictions imposed on intermediate products significantly complicated the supply chain, leading to delays or even stoppages in the production of goods and higher production costs. Finally, the countries that imposed export restrictions provoked reactions. Other countries followed suit and 'blocked' access to their own medical products and components. The reaction of foreign partners could even lead to the disruption of regional and global value chains for key products.

In response to the devastating COVID-19 crisis, the search for a vaccine led to an unprecedented level of public investment in global research and technology. As a result of these efforts, the first COVID-19 vaccines were approved and entered the market in an unprecedentedly short time. However, global demand for vaccines far outstripped supply, resulting in an uneven distribution of these life-saving products among countries of different income levels. High-income countries had an advantage in ordering and receiving vaccines.

The COVID-19 vaccine sector was very diverse, with companies offering different technologies and platforms for vaccine production. The largest exporters were the EU, China and the United States, which together accounted for about 87% of world exports (Table 4). Other important exporters were India, South Africa and Russia, although their shares were much smaller.

Table 4 - Total number of vaccine doses exported by producing countries by 31 May 2022

Country of manufacture	Number of doses (million)	Share of global exports, %
European Union	2.440,4	39,6
China	1.986,4	32,2
USA	968,0	15,7
Republic of Korea	240,4	3,9
India	140,2	2,3
South Africa	110,4	1,8
russian federation	102,4	1,6
Japan	67,0	1,1
Other	113,4	1,8

**Source: (World Trade Organization & International Monetary Fund, n.d.)*

Some governments, such as the United States, the United Kingdom and the EU, have sought to purchase (monopolise) all production of candidate vaccines or to ban their export outside their borders in order to cover their own populations first (an operation known as 'vaccine nationalism') (Velásquez, 2022). The United States, for example, has signed at least six bilateral agreements totalling more than one billion doses, far in excess of the needs of its 328 million people. The EU, UK and Canada have signed seven bilateral agreements with the potential to cover two, four and six times their respective populations (Launch and Scale Speedometer, n.d.).

Vaccine shortages due to production difficulties have led not only to an unevenly distributed market, but also to geopolitical power games known as 'vaccine diplomacy'. Countries have used access to vaccines as a diplomatic tool to strengthen their foreign policy positions and influence. This included providing vaccines to friendly countries or using them as leverage to pressure others for political or economic concessions. For example, China's Sinovac vaccine reached Brazil, russia's Sputnik vaccine reached Argentina, and India's Covishield (from Oxford-AstraZeneca) reached several countries in the Global South (Launch and Scale Speedometer, n.d.).

In addition, a major barrier to getting vaccines from manufacturers to the people in developing countries has often been poor trade infrastructure and logistics, as vaccines have a short shelf life and require proper storage. This is particularly challenging in sub-Saharan Africa, where only 28% of health facilities have a reliable electricity supply (Peacocke, Heupink, Frønsdal, Hoffmann Dahl, & Chola, 2021).

Global production restrictions and direct deals by high-income countries (and some middle-income countries) meant that low- and middle-income countries were left at the end of the supply chain. The first procurement for low-income countries took place in January 2021, thanks to the participation of the African Union in pooled purchases. Many countries in Latin America, Africa and Asia were unable to purchase enough vaccine for their populations. These challenges led to a decline in vaccination coverage, threatening gains made in the fight against infectious diseases.

In summary, in today's world where globalisation and international trade play a key role in ensuring access to medical goods, it is important to understand that the efficiency and fairness of these processes have a direct impact on the health of billions of people. Key issues that need to be urgently addressed include:

- the high cost of medical goods, which remains a serious problem for many countries, especially developing countries;
- the inequitable distribution of research and development of new medicines means that most people in the world do not have access to new and innovative treatments;
- customs duties, tariffs and other trade barriers severely hamper international trade in medical products, leading to shortages and lack of essential medicines;
- complex and bureaucratic procedures for registering and approving medical products prevent them from reaching the market in a timely manner;
- strict intellectual property rules limit access to medicines, and patent abuse leads to inflated drug prices.

The regulation of international trade in medical goods has become a particularly pressing issue in the face of global challenges. The need for a new Agreement on Trade in Health Products arose from the need to adapt to the changing global trade environment and to ensure more effective access to essential health products and services. The current environment requires flexibility and the ability to respond quickly to crisis situations, which has highlighted the shortcomings of existing regulatory mechanisms. Some provisions of the WTO Agreements, which were designed to stabilise and predict international trade relations, may not be conducive to trade liberalisation in the modern era. For example, the rules on domestic market protection and the application of tariffs

have restricted access to essential medical products, especially in developing countries. The complexity of conformity assessment and standardisation procedures has also created barriers to the rapid introduction of new medical products. In addition, intellectual property rules have complicated or restricted access to modern medicines, in particular through excessive patent protection.

In response to these challenges, the international community is considering ways to modernise and update the Agreements to provide greater flexibility and facilitate efficient trade in medical goods. This includes a review of the provisions on temporary measures, which allow countries to impose export restrictions to protect their own populations in emergency situations. Other issues under discussion include trade facilitation, tariff reduction and mutual recognition of conformity assessment standards, which could facilitate faster access to medical products worldwide. In particular, issues related to the pandemic and trade in medical products were discussed at the recent WTO Ministerial Conferences in Geneva in 2022 and in Abu Dhabi in 2024. Despite considerable efforts, attempts to liberalise trade in medical goods have not produced the desired results. This illustrates the difficulty of reaching consensus among WTO members on global trade rules.

Key issues that should be considered and presented in a Health Trade Agreement include

1) ensuring transparency to share information on markets, policies and stocks of key commodities to prevent crises such as panic buying, hoarding or export restrictions. Such transparency, for example through information sharing with the WTO, can increase confidence in global supply and facilitate efficient allocation of resources;
2) reduce tariffs on essential medicines. Countries could consider WTO initiatives to eliminate tariffs on an agreed list of essential medical goods (similar to the agreement on information technology products). Rather than closing markets or relying on domestic production, the elimination of import duties on these goods would allow health systems to receive medical products without interruption;
3) discipline on export restrictions, ranging from an agreement to prohibit export restrictions on certain types of goods to strict conditions on their use. The experience of the pandemic has shown that the imposition of export restrictions at a time of critical need for medical supplies has hampered global supply and seriously undermined supply chain coordination. The overall goal is to strike a fair and beneficial balance between national and global interests, while ensuring compliance with international norms and standards;
4) initial investment in collective solutions. The creation of global stockpiles of medicines that can be used in emergencies, such as pandemics or natural disasters, will ensure access to essential medicines for all countries, especially the most vulnerable. Supporting international research projects to develop new medicines and vaccines and to combat infectious diseases will promote innovation and scientific progress in this field;
5) the protection of intellectual property rights requires the creation of a balanced system that takes into account the interests of both producers and consumers of medical products. On the one hand, it is necessary to stimulate innovation and provide guarantees and incentives for the development of new medicines, vaccines, etc. On the other hand, it is necessary to ensure access to medical products for all population groups, especially for the poorest countries and groups;
6) it is also important to combat counterfeit products, which threaten the rights of intellectual property owners and patient safety. This requires the strengthening of mechanisms for monitoring, control and sanctions in the case of infringements.

Conclusions

The issue of international trade in medical goods is particularly relevant in the context of current global challenges. The COVID-19 pandemic has been an unprecedented test for the global health system and international trade. Demand for personal protective equipment (PPE), COVID-19 tests, vaccines and medical equipment has increased dramatically, outstripping the production capacity of many countries. Global supply chains have been severely disrupted by export restrictions, logistical challenges and other factors. These disruptions have affected the speed and reliability of medical supplies, creating additional challenges for countries most dependent on exports. Asian countries have become major producers of PPE, changing the traditional geography of trade. This shift points to new centres of production and their growing role in the global supply of medical goods. Supply shortages have led to significant increases in the price of medical goods, which has become a serious barrier for many countries in securing the resources needed to fight the pandemic. Low- and middle-income countries have struggled to access the medical supplies they need. Unequal access to vaccines has highlighted existing economic inequalities and raised global concern.

The concentration of production of critical medical supplies in a few countries has made the system vulnerable to shocks. This vulnerability has highlighted the need to diversify sources of supply and production to

increase resilience. The lack of a unified system for collecting and sharing data on production, stocks and distribution of medical supplies has made it difficult to coordinate efforts across countries. The need for transparent and harmonised information systems became apparent. Many countries imposed export restrictions that hampered international trade. Although aimed at protecting national interests, these measures created additional barriers to trade.

Taking into account the lessons of the COVID-19 pandemic, the international community is faced with the need to develop new strategies and policies to ensure greater resilience and efficiency in international trade in health products. In this regard, there is a need to develop a new multilateral Agreement on trade in health products. Such an agreement should aim to ensure the safety, accessibility and quality of medical products in the context of globalisation. The main aspects that should be considered and presented in the new agreement are: ensuring transparency in the exchange of information, reducing tariffs on essential medical products, disciplining export restrictions, initial investment in common solutions, WTO reform and protection of intellectual property rights. The importance of international cooperation, monitoring and analysis of trade measures, and engagement with all stakeholders is key to creating an adaptive system that can effectively respond to future global challenges, while ensuring equitable access to health products for all. In this way, the global goal of ensuring health and well-being, which is key to the sustainable development and prosperity of societies around the world, can be achieved.

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CURRENT TRENDS IN THE DEVELOPMENT OF EU FOREIGN TRADE IN METALLURGICAL PRODUCTS

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Abstract

The article examines the current trends in the development of EU foreign trade in metal products. The purpose of the article is to analyze the dynamics and establish current trends in the development of EU foreign trade in metal products. To achieve the goal, the methods of analysis and synthesis, induction and deduction, comparison, graphic method were used. An assessment of the internal market of metal products in EC was carried out. The dynamics of EU foreign trade in metal products were analyzed and the problems of EU cooperation with leading partner countries were identified. The forecasts are substantiated and the prospects for the development of EU foreign trade in metal products are determined. The practical significance of the study lies in the possibility of their use for further analysis of the current state of EU foreign trade in metal products with the aim of increasing its volumes with key partners on the world market.

Keywords

foreign trade in metal products, export, import, metallurgical industry, metal products, steel, decarbonization, demand.

Problem statement

In today's world, metal is one of the most used commodities, and the metallurgical complex is at the heart of most value chains, supplying the necessary raw materials and materials for economic activities such as metal products, engineering, construction, energy, mining, etc. Given that the metallurgical industry is one of the powerful sectors of the EU and makes a significant contribution to its economy, this topic requires in-depth research.

Relevance of the chosen topic

European metallurgy is a world leader in innovation and environmental sustainability. In turn, steel, as the main engineering material, is also an important factor in the development and implementation of innovative technologies that mitigate CO2, increase the efficiency of resource use and promote sustainable development in the EU, especially within the framework of the "Green Deal" and the trend of decarbonization. At the same time, the EU is one of the main suppliers of crude steel to world markets. But in recent years, negative trends have been

observed in the development of the EU metallurgical sector, including in foreign economic activity indicators. Therefore, the study of modern trends in the development of EU foreign trade in metallurgical products is an urgent issue today.

Analysis of recent research and publications

Many outstanding foreign and domestic scientists, as well as Europeans, were engaged in the study of this topic Commission, European Steel Association, etc. However, a number of important issues remain poorly researched, in particular regarding the features of functioning and prospects for the development of this market in modern conditions.

Purpose of the article

The purpose of the article is to analyze the dynamics and establish modern trends in the development of EU foreign trade in metal products.

Achieving the set goal made it necessary to solve the following tasks:

- carry out an assessment of the internal market of metal products in EC;
- to analyze the dynamics of EU foreign trade in metal products;
- to provide forecasts of the development of EU trade in metal products with leading partners.

Presentation of the main research material and results obtained

The range of metal products is quite diverse in terms of shapes, sizes and manufacturing methods, and can be used in various spheres of activity. The main reason for this is that steel is easily processed, interacts well with other metals, can change its properties when forming metal alloys, is quite widespread in the world and can be recycled. In order to characterize the export-import relations in the trade of metal products of the EU and partner countries, metal products are divided into sheets, rolled products and semi-finished metal products.

The European steel industry is one of the most important strategic sectors of Europe - the backbone of the EU economy and its society. In 2023, in terms of domestic added value, the EU metallurgical industry was in third place (152 billion euros), after the manufacture of beverages (208 billion euros) and the pulp and paper industry (175 billion euros). Metallurgical branch alone with the most economical important in EU. At the same time, she supports the existence of other important industries, such as the production of electric transport, What actively is developing in EU, computer equipment, production highly accurate tools, etc. In addition, Europe ranks second place by volumes crude steel production in the world - share of the region in 2023 amounted to 13.8% or 256 million tons of crude steel in the EU accounted for 6.8% or 126 million tons, which is 7.5% less than the previous year . At the same time, 55% or 69.8 million tons were produced in an oxygen furnace, and 45% or 56.4 million tons were produced by the electric method. It is worth noting that during 2014-2023, the share of crude steel production in the EU in the oxygen furnace decreased from 59% to 55%, and the share of production by the electric method - increased from 41% to 45% (EUROFER , 2024) .

According to Tab. 1, in 2023 the EU imported 26 million tons of finished steel products. At the same time, Asia supplied 16.1 million tons of finished steel products, other European countries, the CIS and Turkey - 7.2 million tons, Africa - 1.8 million tons, South America - 265 million tons, Oceania - 144 million tons, North and Central America - 54.8 million tons (EUROFER , 2024) .

Fluctuations were observed in the dynamics of import volumes during 2014-2023. In 2023, this indicator amounted to 25.6 million tons, increasing during the period under review by 29.3%, however, compared to 2022, there was a drop of 11.5%, mainly due to a drop in the supply of flat products by 8%. It is worth noting that 78.6% of imports of metal products account for flat rolled products, 21.4% for long products (EUROFER, 2024).

Table 1. Dynamics of imports to the EU by types of products during 2014-2023, million tons

Product type	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Share in 2023
Flat rental	15,165	13,988	20,542	20,782	22,348	20,115	17,166	23,987	21,862	20,116	78,6%
Long rental	4,649	3,929	6,156	6,13	7,865	6,234	5,247	6,34	7,007	5,466	21,4%
Finished products	19,814	17,917	26,698	26,912	30,213	26,349	22,413	30,327	28,869	25,582	100%

**Source: EUROFER , 2023*

The largest share of imports of flat products to the EU in 2023 was hot-rolled wide strip (42,4%), hot-rolled metal coating (20,8%), cold-rolled flat products (14,3%), etc. At the same time, the share of hot-rolled wide strip and hot metal coating in the total volume of imports of flat rolled products to the EU during 2014-2023 increased, on the other hand, a decrease in this indicator was observed for other types of this product. The largest share of imports of long rolled products to the EU in 2023 was wire rod (36%), fittings (29,8%), commercial bars (26,9%), heavy sections (5,8%) (EUROFER, 2024) .

The main countries from which the EU imported metal products in 2023 (Tab. 2) are South Korea (12% or 3.177 million tons), India (11% or 2.863 million tons), Taiwan (9.3% or 2.391 million tons), Turkey (8.8% or 2.269 million tons), China (8.6% or 2.206 million tons), Vietnam (8.5% or 2.165 million tons), Japan (6.9% or 1.776 million tons), Egypt (5% or 1.287 million tons), Ukraine (4.6% or 1.169 million tons), Indonesia (3% or 0.767 million tons). At the same time, the volume of imports of metal products to the EU in 2023 decreased from Turkey, China, and Ukraine (EUROFER , 2024) .

The main exporters of flat products to the EU in 2023 were such countries as South Korea (13.2% or 3.053 million tons), India (12.8% or 2.726 million tons), Taiwan (10.8% or 2.374 million tons), Vietnam (9.7% or 2.120 million tons), Japan (8.9% or 1.749 million tons), long rolled products – Turkey (20.4% or 0.833 million tons), China (8.1% or 0.753 million tons), Egypt (7.1% or 0.461 million tons), Switzerland (6.6% or 0.370 million tons), Malaysia (5.4% or 0.363 million tons), Algeria (5.3% or 0.337 million t) (EUROFER , 2024) .

Table 2. TOP-10 exporting countries to the EU of all finished products during 2014-2023, million tons

Country	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
South Korea	1,397	1,897	2,523	2,884	3,194	2,683	2,622	2,286	2,951	3,177
India	1,391	1,14	1,822	3,568	2.67	2,123	1,872	3,536	2,681	2,863
Taiwan	0, 636	0,412	0,705	1,062	1,511	1,22	0,951	1,7	2,149	2,391
Turkey	1,254	1,295	2,044	3,42	5,833	5,472	3,876	4,588	4,329	2,269
China	3,855	6,17	5,249	3,11	2,781	2,348	1,182	1,442	2,524	2,206
Vietnam	0,030	0,043	0,045	0,279	0,495	0,425	0,285	1,583	1,553	2,165
Japan	0,140	0,135	0,283	0,151	0,197	0,188	0, 252	0, 854	1,461	1,776
Egypt	0, 200	0,037	0.0 84	0,572	0,453	0,208	0,347	0,955	0,787	1,287
Ukraine	2,215	2,5	2,942	2,11	1,821	1,718	1,6	2,543	1,264	1,169
Indonesia	0,002	0,011	0,088	0,160	0,160	0,260	0,228	0,462	0,733	0,767
Others	8,694	11,211	10,913	9,596	11,098	9,704	9,199	10,378	8,438	5,503
Together	19,814	24,851	26,698	26,912	30,213	26,349	22,414	30,327	28,87	25,573

**Source: EUROFER, 2023*

According to Tab. 3, in 2023 the EU exported 16.3 million tons of finished steel products. At the same time, other European countries, the CIS and Turkey supplied 1.7 million tons of finished steel products, North and Central America 4 million tons, Africa - 1.75 million tons, Asia - 1.73 million tons, South America - 585 million tons, Oceania - 118 million tons (EUROFER , 2024) .

The dynamics of export volumes during 2014-2023 is negative. In 2023, this indicator amounted to 16.3 million tons, decreasing by 42% during the studied period. It is worth noting that 65.5% of the export of metal products is accounted for by flat products, 34.5% by long products. In 2023, the volume of exports of flat products from the EU decreased by 7.5% to 10.66 million tons, compared to the previous year, and of long products - increased by 9.8% to 5.6 million tons (EUROFER , 2024) .

Table 3. Dynamics of exports from the EU by types of products during 2014-2023, million tons

Product type	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Share in 2023
Flat rental	17,989	16,785	16,471	17,079	15,769	16,031	13,349	12,892	11,517	10,66	65.5%
Long rental	11,374	10,937	10,392	9,182	8,402	7,794	6,539	6,539	5,111	5,614	34.5%
Finished products	29,363	27,722	26,864	26,261	24,17	23,824	19,888	19,431	16,628	16,274	100%

**Source: EUROFER , 2023*

The main countries to which the EU exports metal products (Tab. 4) are Turkey (14% or 2.288 million tons), the USA (13.7% or 2.233 million tons), Switzerland (8.1% or 1.321 million tons), Mexico (6.9% or 1.127 million tons), Canada (3.9% or 649 million tons), Egypt (2.8% or 464 million tons), Morocco (2.7% or 441 million tons), Ukraine (2 .6% or 430 million tons), China (2.5% or 414 million tons), etc. At the same time, the volume of exports of metal products from the EU in 2023 decreased to all main recipients, except for Mexico, Canada, Egypt, Morocco and Ukraine (EUROFER , 2024) .

Table 4. TOP-10 countries-importers from the EU of all finished products during 2014-2023, million tons

Country	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Turkey	3,923	4,152	3,936	4,458	3,023	3,656	3,186	2, 961	2,488	2,288
USA	3,581	3,255	3,044	3,224	3,276	2,473	1,647	2,227	2.35	2,233
Switzerland	1,828	1,703	1,838	1,886	1,871	1,702	1,554	1,701	1,543	1,321
Mexico	716	577	730	870	1,197	1,012	961	1,228	909	1,127
Canada	551	744	619	531	664	713	732	722	538	649
Egypt	320	425	465	475	537	596	643	494	451	464
Morocco	641	582	655	642	598	613	524	431	333	441
Ukraine	226	199	245	237	234	271	287	221	250	430
China	1,059	882	991	1.12	1,085	887	1,042	842	548	414
Serbia Montenegro	363	425	439	429	446	492	430	383	297	381
Others	16,155	14,778	13,902	12,389	11,239	11,409	8,882	8,221	6,921	6,526
Together	29,363	27,722	26,864	26,261	24,17	23,824	19,888	19,431	16,628	16,274

**Source: EUROFER, 2024*

The main importers of flat products from the EU in 2023 were such countries as Turkey (17% or 1.809 million tons), the USA (15% or 1.593 million tons), Mexico (7% or 0.787 million tons), Switzerland (6% or 0.674 million tons), Egypt (4% or 0.432 million tons), long-rolled goods - Switzerland (12% or 0.647 million tons), the USA (11% or 0.641 million tons), Turkey (9% or 0.479 million tons), Canada (7% or 0.392 million tons), Mexico (6% or 0.340 million tons) (EUROFER , 2024) .

In 2023, flat rolled products accounted for 67.3% of imports of finished stainless steel to the EU , long products - 32.7%. In 2023, flat rolled products accounted for 70% of finished stainless steel exports from the EU, long products accounted for 30% (EUROFER , 2024) .

Metallurgy is an industry on which most other industries depend. Coal and steel are the basis of economic cooperation between European countries. Metallurgy as a strategic industry attracts significant risks due to the high energy intensity of production, work with hot liquid metal and high level of dependence on raw material suppliers.

The main risks associated with metallurgical production are the following: import of cheap steel from countries outside the EU; high costs of environmental protection; dependence on suppliers of coking coal, iron ore and scrap metal; malfunction of technologies leading to interruption of activity; strict rules of occupational health and safety; steel and aluminum tariffs; inconsistency of the carbon border adjustment mechanism (CBAM); balancing supply and demand (Atlantic Council , 2023; Ecopolitic , 2023; RENOMIA , 2024) .

It is worth noting that across Europe the threat is from cheap imports produced by overseas suppliers who can offer low-cost alternatives thanks to cheap labor and lower environmental standards. Trade defense instruments, such as anti-dumping or anti-subsidy measures, are designed to protect European businesses.

Some companies from outside the EU operate with a loss leader strategy and price their products below the cost of production in order to attract customers and penetrate new markets.

However, loss-making strategies can harm the surrounding competition, especially for small and medium-sized enterprises, which may have to keep their prices low in order to attract business.

Practices such as dumping – when a product is sold abroad at a lower price than in the country of origin – and subsidies create unfair competition for EU companies. The EU uses the following trade protection tools to combat this practice: anti-dumping, anti-subsidy, protective (Euronews , 2024) .

Global demand for steel will recover by 1.7% in 2024 and grow by another 1.2% in 2025. By the end of 2025, it is predicted that the total global steel production will exceed 1.8 billion tons (Metal Center New , 2024) . Steel consumption in the EU will grow by 5.3% in 2025 to 148.1 mt. Germany is expected to remain among the world's top 10 steel-consuming regions. Steel consumption in Germany is forecast to grow by 3.2% in 2024 to

28.9 million tonnes, followed by a 10% increase in 2025 to 31.8 million tonnes. A large part of the projected increase in consumption in Europe is explained by the development of green infrastructure (MEPS International , 2024).

The 2020s will be key years for the steel industry in Europe and even around the world. The industry is at the beginning of a technological transition that is necessary and politically necessary to reduce CO2 emissions from energy-intensive steel production. This transition to green steel requires significant investment, and it is imperative that adoption ramps up this decade. Consequently, the capacity of new resources must be determined today, so estimating the future demand for steel is an important decision-making variable (Bronk & Company GmbH , 2024).

Based on a study by Bronk & Company, global steel demand is set to grow to approximately 2.0 billion tonnes in 2030. This corresponds to an average annual growth rate of approximately 1.06% or 11% in absolute terms compared to 2020. Growth in this decade mainly driven by increased industrialization in developing countries such as India and regions of Africa. China will continue to maintain its status as the world's largest producer and consumer of steel. However, steel demand in China is likely to stop its former exponential growth and is likely to stagnate in the coming years. Western countries also contribute to the growth of world demand (Bronk & Company GmbH , 2024).

Demand for steel in the main European steel sales areas is forecast to increase to approximately 395 million tons in 2030, which is an increase of approximately 27% compared to 312 million tons in 2020 (Bronk & Company GmbH , 2024).

Demand for steel in Western Europe will remain almost unchanged at the level of 2023. In contrast, a moderate but steady upward trend is forecast for North America. For Eastern Europe, the forecast also predicts an almost continuous upward trend, so the demand for steel in this region is expected to exceed 100 million tons by 2030 (Bronk & Company GmbH , 2024).

Europe has a window of opportunity to lay the foundations for greater strategic autonomy and sustainability for its strategic metals through optimized recycling, domestic value chain investment and more active global sourcing. But decisive action is needed in the near future to avoid problems for several materials that risk becoming global shortages at the end of this decade (Eurometaux , 2024).

Europe is planning a rapid transition from the modern fossil fuel system to clean energy technologies. This energy transition is metal intensive. Electric vehicles, batteries, solar PV systems, wind turbines and hydrogen technologies require significantly more metals than their conventional alternatives to replace fossil fuel needs.

According to the International Energy Agency's various clean energy technology scenarios, the global climate trajectory aligned with the Paris Agreement will require nearly twice as much metals by 2050 as the world continuing its current climate policies (Eurometaux , 2024).

Bulk base metals such as aluminum and copper dominate in terms of their tonnage used in clean technologies, but several smaller metals such as lithium, cobalt and dysprosium will be in extremely high demand due to the transition.

Europe's 2050 climate neutrality target and 2030 medium-term target mean it is already accelerating faster than other regions of the world and plans to install most of its new clean energy capacity over the next 1-2 decades. Europe will only need direct supplies of metals for the technologies it produces domestically (as opposed to imported products) (Eurometaux , 2024).

European steel producers may face moderate growth in their core markets until 2030. In addition, global steel demand will remain on a strong upward trend during this decade (+11% or 2 billion tons). This means there is potential for additional sales alongside existing markets for the European steel industry. Despite the fact that the huge costs associated with environmental transformation are likely to make it difficult for European industry to compete on the international stage in the next few years without appropriate competition balancing rules. However, pioneering a green transformation today may well unlock new potential tomorrow (Bronk & Company GmbH , 2024).

Decarbonization is becoming increasingly relevant for European metallurgists as industry moves to greener means of production (Fastmarkets, 2024) . Steel is a vital component of many value chains, especially in the area of clean technologies. Without this metal, it is difficult to build a decarbonized and sustainable economy. According to the European Commission, today the metallurgical industry is responsible for about 5% of CO2 emissions in the EU and 7% worldwide. In order to achieve the EU's ambitious goal of becoming a community with zero emissions by 2050, the metallurgical industry must transform (Fastmarkets , 2024) .

Developed countries, especially in the EU, are seeking to decarbonize the industry by shifting steel production from coal-fired furnaces to electric or water-fired furnaces (green steel). Many clean technologies,

such as wind turbines and electric vehicles (EVs), are based on steel. In this context, the priority is to ensure a successful transition to "green" steel while preserving the competitiveness of the steel industry on world markets (Dnipropetrovsk Investment Agency , 2023) .

Currently, 55% of the steel produced in Europe comes from the integrated blast furnace/basic oxygen furnace (BF-BOF) (EUROFER , 2024) . According to IEEFA, carbon emissions from this production route are approximately 2.0-2.2 t CO2 (direct and indirect emissions). Over the past few years, major European steel producers have announced ambitious decarbonization strategies and developed their own green steel brands. Most steelmakers are taking the same approach, seeking to replace BF-BOF capacity with hydrogen-fueled electric arc furnaces and DRI modules.

The EAF-DRI production route is much less polluting, with direct and indirect CO2 emissions estimated at 1.4 t CO2 per 1 ton of steel. They can be further reduced by using renewable energy sources and green hydrogen to power DRI modules (Fastmarkets , 2024). Also, one of the ways to reduce the burden on the environment, that is, to reduce CO2 emissions, is to expand the use of ferrous metal scrap and DRI/HBI production technology (METINVEST , 2021) . The scrap-based EAF process results in the lowest carbon emissions of only around 300 kg CO2 per tonne of steel. This production route has the potential for zero emissions if powered by renewable energy. The green transition to EAF and EAF-DRI steelmaking will require more high-quality scrap to support new EAF capacity. Europe is currently a net exporter of scrap, but as new EAF-based steelmaking facilities become operational, the region could become an importer of certain grades (Fastmarkets , 2024) .

Another strategy for decarbonization of the EU steel industry is the use of hydrogen. The REPowerEU plan highlights that around 30% of primary steel production in the EU is expected to be decarbonised by 2030 using renewable hydrogen (European Commission , 2022) . However, currently using hydrogen for existing DRI modules in Europe is quite expensive (Fastmarkets , 2024) .

In the short to medium term, low CO2 steel production is likely to be more expensive than current steel production costs. The future costs of hydrogen-based steel production are highly uncertain because they depend on the future costs of renewable hydrogen and electricity. With significant reductions in renewable hydrogen costs and increased CO2 prices, hydrogen-based steelmaking could become cost-competitive with current steelmaking costs by 2050.

However, the large investments required to deploy low-CO2 steel plants must be accompanied by investments in the infrastructure needed to implement these solutions (renewable electricity and transmission networks, hydrogen-related infrastructure or CO2 transport and storage infrastructure) (European Commission , 2022) .

The Clean Steel Partnership, formally established in June 2021, aims to bring to large-scale demonstration a number of revolutionary technologies for clean steel production by 2030. The partnership estimates that R&D investment needs by 2030 will be around 2.6 billion euros. The partnership will be funded by both Horizon Europe and the Coal and Steel Research Fund, with the EU providing €700 million through this mechanism (European Commission , 2022) .

European governments plan to provide assistance in various forms: direct grants, soft loans, compensation for operating costs, etc. The European Commission believes that all support measures will contribute to the implementation of the EU Hydrogen Strategy, the achievement of the goals of the European Green Deal and the rapid green transition within the framework of the REPowerEU plan (Infographic . Ecopolitic, 2023).

Conclusions

The conducted research indicates that metal products have a diverse assortment. Modern manufacturers produce a fairly wide range of metal products that are used in various spheres of life. Metal products are especially important in construction, transport, as well as in the field of security, infrastructure, mechanical engineering, manufacturing of household appliances and metal household goods, etc. The internal market of EU metal products is quite large. The largest producer of crude steel is Germany, and the EU ranks second in the volume of deliveries of metal products to world markets. However, a rather unstable situation has developed in the world and it is currently very difficult to make predictions regarding trade in metal products, especially in the light of recent events. It can be noted that the situation on the European market of metal products should stabilize in the coming years, and the 2020s will be decisive for the transformation of the EU metallurgical industry. In particular, in recent years, there has been a steady trend in the world to reduce the "carbon footprint" and transition to the technologies of the so-called "green metallurgy", which is actively supported by the European government and is a promising direction for the further development of the EU metallurgical industry.

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OPTIMIZATION OF INTERNATIONAL LOGISTICS PROCESSES AS A STRATEGY FOR INCREASING THE EFFICIENCY OF THE INTERNATIONAL MANAGEMENT OF UKRAINIAN COMPANIES

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Abstract

The article examines the optimization of international logistics processes as a key tool for increasing the effectiveness of management strategies of companies in the world market. The topicality of the topic is due to the need for Ukrainian companies to adapt their international management strategies to global challenges and conditions of the competitive environment. The purpose of the work is to identify effective methods of logistics optimization that will help reduce costs and increase the effectiveness of international management in companies. Methods of analysis, analogy, and comparison were used to achieve the goal. The tasks of the research include the analysis of the current state of international logistics, the identification of existing tools for optimizing logistics processes, as well as the assessment of the impact of these measures on the international management of Ukrainian companies.

Factors affecting the efficiency of logistics, including transport costs, infrastructural constraints, customs barriers and the level of digitalization, were studied. The impact of logistics optimization on increasing the competitiveness of Ukrainian companies on the world market is analyzed. The practical significance of the work consists in providing recommendations for improving logistics processes, in particular through the introduction of innovative technologies and adaptation to global challenges.

Keywords

optimization of logistics processes, international management, supply chains, efficiency, transportation costs, automation, competitiveness.

Problem statement

In today's global market, the speed of adaptation to new conditions and optimization of logistics processes are crucial for the successful development of a company. Modern challenges, such as the instability of transport infrastructure, customs barriers, high transportation costs and the need to integrate digital technologies, create additional difficulties for the international logistics of Ukrainian enterprises.

These challenges, in turn, negatively affect the efficiency of international management, as delays in order fulfillment and high costs undermine the company's financial performance and reputation. The instability of global supply chains, changes in trade policies and other factors make it difficult to adapt to international requirements.

Many Ukrainian companies do not realize the full potential of optimizing international logistics processes and do not use modern management methods. This leads to a failure to achieve maximum results in international supply, loss of competitiveness and unmet customer needs, which negatively affects their position in global markets.

Thus, the key challenge for Ukrainian companies is to find tools and strategies that will optimize international logistics processes, ensure flexibility, efficiency and resilience to changes in the external environment.

Relevance of the chosen topic

International logistics is an important element of successful business operation in global markets. It ensures not only the physical movement of goods between countries, but also coordinates the processes of supply chain management, interaction with partners, customs procedures, warehousing, transport and other components. Following global crises such as the COVID-19 pandemic and geopolitical instability, global supply chains have undergone significant changes, requiring a rethinking of logistics management approaches.

For Ukrainian companies seeking to consolidate or expand their presence on international markets, effective logistics becomes a key factor in competitiveness. Without proper attention to this aspect, they risk losing their positions in the conditions of fierce competition, where speed, accuracy and cost-effectiveness of processes play a decisive role.

Analysis of recent research and publications

The issue of optimization of international logistics processes, especially in the context of increasing the efficiency of international management, attracts the attention of many famous scientists, in particular, M. Christopher, P.P. Datta, S. Fawcett, L. Ellram, J. Ogden, D. Lambert, M. Cooper, J. Mentzer, W. Pienaar, D. Rogers, and others. S. Fawcett, L. Ellram and J. Ogden consider the practical aspects of optimizing logistics processes in their work "Supply Chain Management: From Vision to Implementation". The authors emphasize that collaboration and integration with suppliers and partners is necessary to achieve optimal performance and meet customer needs. In their study Logistics Research: A Critical Analysis, Partha Priya Datta and Martin Christopher focus on a critical analysis of logistics research. The authors emphasize how important the optimization of logistics processes is for improving quality, speed of delivery, reducing costs and customer satisfaction.

Such domestic scientists as V.G. Alkema, V.V. Baginov, V. Berestenko, D. Wood, V.G. Gerasymchuk, V.K. Gizhevskyi, M.Yu. Hryhorak, L.V. Kostyuchenko, L.G. Melnyk, V.M. Nazarenko, M.L. Pogrybytskyi and V.V. Sabodash, are engaged in the study of issues related to the development of the theory and practice of optimization of logistics support for international trade. Scientific works of N.G. Mitsenko, I.P. Mishuka and A.L. Shevchuk focus on the analysis of international logistics systems under conditions of uncertainty, which is relevant in today's global environment. However, despite the considerable amount of research, there are questions that remain unresolved and require further study.

Purpose of the article

The purpose of this article is to study and explore ways to optimize international logistics processes in order to improve the efficiency of international management of Ukrainian companies in the context of globalization and competition in world markets.

To achieve the goal, the following tasks were defined:

— analyze the current state of international logistics;
— research existing methods and tools for optimizing logistics processes;
— assess the impact of logistics optimization on the overall effectiveness of international management;
— identify key challenges for Ukrainian companies;
— formulate recommendations for Ukrainian companies regarding the implementation of logistics optimization strategies to increase the efficiency of international management.

Presentation of the main research material and results obtained

International management covers the complex management of the company's activities in global markets, where one of the key tasks is to ensure the continuity and efficiency of operations, in particular logistics processes. International logistics is a complex of processes that includes planning, implementation and control of the movement of goods between countries, ensuring their delivery from the manufacturer to the final consumer (Mitsenko & Mishuk, 2022). International logistics include such elements as (Fig. 1):

The current state of international logistics is characterized by growing globalization, which leads to increased trade volumes and more complex supply chains. Technological advances, including automation, e-commerce and artificial intelligence, are greatly simplifying the management of logistics processes, making supply chain management systems more integrated and adaptive.

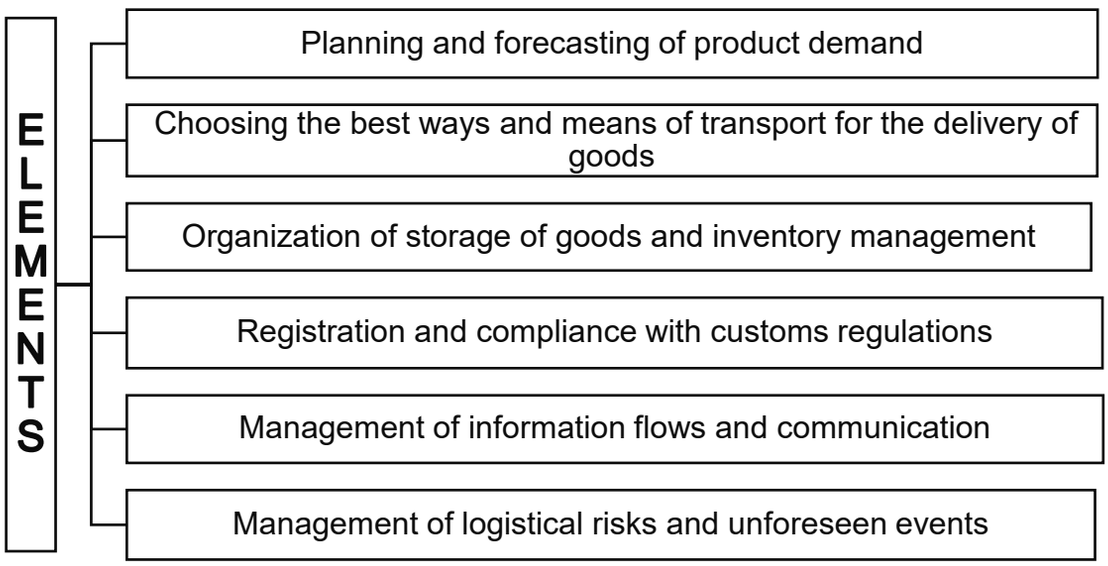

Fig. 1: The main elements of international logistics
Source: compiled by the author

At the same time, customs procedures, regulatory barriers, and geopolitical risks that may delay the movement of goods remain the main challenges. The COVID-19 pandemic has exposed the vulnerability of global supply chains, forcing companies to rethink their logistics strategies.

In addition, there is a growing focus on environmental sustainability, which is driving the adoption of green technologies and practices in logistics, such as the use of alternative fuels and route optimization to reduce CO2 emissions.

Optimization of logistics systems is a complex process aimed at increasing the efficiency of all components of logistics operations (Kovalska, Barskyi, & Onishchuk, 2023). The main goal of this process is to automate routine tasks, reduce the costs of transportation, storage and inventory management, while maintaining or even increasing the quality of service.

In order to successfully implement the optimization of logistics processes, it is important to clearly define goals and objectives at the initial stage. This will help to understand what specific results are planned to be achieved and what aspects of logistics need improvement. Formulating goals makes it possible to focus on the most critical problems.

The goals of optimizing logistics processes may vary depending on the specifics of the company's activities, but the following can be identified among the main ones:

1. Reducing logistics costs: improving processes to reduce the cost of transportation, storage, inventory management, etc.
2. Improving the quality of customer service: ensuring fast and uninterrupted delivery, correct and timely order fulfillment, and effective response to customer requests.
3. Rational use of resources: increasing the efficiency of warehouse space, vehicles, human resources and other resources to improve the overall productivity of logistics processes.
4. Flexibility in responding to market changes: the ability to quickly adapt to changes in demand, pricing policy and market conditions.

5. Reducing the negative impact on the environment: implementation of environmentally friendly solutions, such as reducing pollutant emissions and using energy-efficient transport (Nikolenko, 2024).

Optimization of logistics processes plays a key role in supply chain management, as it is aimed at increasing efficiency and rational use of company resources. Improving logistics operations significantly affects the effectiveness of international management, allowing to improve such indicators as the speed of order fulfillment, logistics costs, quality of customer service and other important aspects of activity.

Optimizing logistics processes involves systematic analysis and improvement of various stages of the supply chain, including procurement of raw materials, production operations, storage, transportation and delivery of products to end users. This requires careful planning, effective coordination and cooperation between all participants in the supply chain to achieve the highest level of service and minimize costs (Alkema, 2017).

Let's look at the main tools used to optimize international logistics processes:

1. Application of information systems and technologies. The introduction of modern software systems, such as SCM, OMS, TMS and WMS (Table 1), allows automating logistics operations, as well as collecting and analyzing large amounts of data. This improves forecasting accuracy, reduces the likelihood of errors, and facilitates informed management decisions. Such tools significantly improve the efficiency of supply chain management and simplify processes at all stages.

Table 1: Software tools for supply chain management

System	Description	Benefits for logistics processes
OMS (Order management system)	Software that allows you to control the entire process of order fulfillment — from the moment of its creation to delivery to the end consumer.	Increases order fulfillment efficiency, provides transparency and control at all stages of order fulfillment.
SCM (Supply chain management)	A system that allows you to coordinate all stages of the supply chain: from the purchase of raw materials to delivery to the final consumer.	Improves coordination between supply chain departments and control over the movement of goods, optimizes costs.
TMS (Transportation management system)	A tool for managing transport operations, planning routes and choosing optimal vehicles for the delivery of goods.	Reduces transportation costs, provides operational route management, and allows for real-time cargo tracking.
WMS (Warehouse management system)	A system for automating warehouse processes, including storage, inventory control and organization of warehouse space.	Increases the accuracy of inventory management, reduces processing time, reduces storage costs, and improves service.

**Source: compiled by the author*

2. Optimization of warehouse management. Effective management of warehouse stocks and use of space is one of the main components of logistics optimization (Pavlyuk, Polusmyak, Onoprienko, & Potapenko, 2024). Technologies such as inventory control systems (ICS) allow companies to accurately track inventory, avoid product overages or shortages, ultimately reducing storage costs. In addition, the implementation of automated warehouse systems and technologies such as the Pick-to-Light (PLS) system helps improve labor productivity by speeding up the picking process and reducing the likelihood of errors during order preparation. This allows companies to complete more orders in less time with fewer resources.
3. Optimization of transport processes. Analysis of traffic flows and selection of optimal routes are important aspects for reducing transportation costs and reducing delivery time. The use of different types of transport and competent route planning allow you to minimize logistics costs. In addition, cargo tracking technologies (Track and Trace Systems, TTS) provide companies with the opportunity to monitor the delivery status in real time, which increases the reliability and predictability of the transportation process. This ensures a high level of customer service and guarantees timely fulfillment of orders, which is critical for international operations (Pavlyuk, Polusmyak, Onoprienko, & Potapenko, 2024).
4. Establishment of partnership relations. Long-term and reliable partnerships with suppliers and customers

contribute to the stability of supply chains. The partnership helps reduce the risks of delays and disruptions in supply. The use of electronic platforms for communication facilitates the exchange of information between participants in the supply chain, increasing transparency and speeding up the decision-making process.

5. . Implementation of "green logistics" principles. In modern conditions, more and more companies are focusing on ecological practices in their logistics operations. Using environmentally friendly vehicles, optimizing routes to reduce CO2 emissions, waste management and the use of renewable energy sources are just a few examples of "green" solutions that help companies not only reduce costs, but also improve their image in the market. Implementation of such environmentally responsible practices increases the competitiveness of the enterprise and has a positive effect on its long-term sustainability.
6. Training and professional development of staff. Optimizing logistics processes requires a high level of professional knowledge and skills in supply chain management. Investing in the training and development of employees allows the company to have qualified specialists who are able to implement the latest solutions and work effectively with modern technologies. Conducting specialized courses, seminars and trainings in logistics and supply management will help to significantly increase the level of competence of employees and adapt them to new challenges in the market.
7. Continuous improvement and monitoring of processes. One of the key aspects of logistics optimization is the continuous improvement of existing processes. Companies should regularly analyze the performance of their operations, identify weaknesses and implement corrective measures to ensure sustainable development. Monitoring the results after the implementation of optimization solutions allows you to evaluate their effectiveness, and also provides the opportunity to make the necessary corrections in a timely manner. This approach ensures the company's competitiveness and its flexibility in rapidly changing market conditions.

International management is a complex and multifaceted process that covers the management of enterprises and organizations that operate in the international arena. In today's globalized world, international management plays a critically important role in achieving strategic goals of companies, because it not only regulates business processes in different countries, but also adapts them to changing market conditions, culture, legislation and economy (Perevozova, Shaiban, & Dedelyuk, 2023).

Optimization of logistics processes is an important element of international management that ensures the continuity and efficiency of the supply of goods and services. It has a significant impact on a company's overall performance and its ability to compete in international markets. First of all, optimization of logistics contributes to the reduction of transportation and storage costs. This is achieved through more efficient use of resources, which in turn allows companies to reduce supply chain maintenance costs. Cost reduction directly affects the company's financial results, improving its profitability and ability to invest in development.

Secondly, the optimization of logistics processes allows to reduce the time of delivery of goods. In international business, service speed is an important factor in competitiveness. The faster the company can meet the needs of its customers, the more likely it is to successfully execute deals and strengthen partnerships. In particular, prompt delivery of goods has a positive effect on customer satisfaction, which can lead to repeated orders and the formation of brand loyalty.

In addition, the optimization of logistics processes contributes to better coordination between different divisions of the company. This makes it possible to achieve greater consistency in work and respond more promptly to changes in market conditions. Clear communication and interaction between management teams ensure better adaptation to international standards and practices.

An important aspect of optimization is its ability to stimulate innovation in management. The introduction of advanced technologies, such as process automation and data analysis, allows not only to improve existing operations, but also to create new products and services that meet the needs of the global market. This contributes to strengthening the competitive advantages of companies and their long-term development.

Ukrainian companies that are integrated into international markets face many challenges that significantly affect their ability to effectively manage logistics processes. One of the biggest challenges is the war in Ukraine. The hostilities led to large-scale destruction of infrastructure, including transport routes, railways and ports, which seriously affected logistics operations (Kuziak, 2022). The loss of access to some modes of transportation, such as by ship through ports in the Black Sea, forces Ukrainian companies to rebuild their routes and look for new logistics solutions, often transporting goods through EU countries. This leads to a significant increase in costs and delivery time of goods.

Another significant problem is the unsatisfactory state of the infrastructure. Even before the start of the war, the state of roads, railways and ports in Ukraine required significant modernization. During the hostilities,

the situation only worsened due to the destruction of transport routes. Many companies are forced to use significantly longer routes to transport goods, which leads to higher costs and delays in delivery (Kuziak, 2022).

Additional difficulties arise in connection with customs barriers that complicate export-import operations. Customs procedures are bureaucratic, require numerous documents and are not automated at the appropriate level, creating additional opportunities for errors and delays. In addition, customs regulations of Ukraine often do not meet international standards, which further complicates the work of Ukrainian companies on international markets.

The growth of transport costs is another significant challenge for Ukrainian companies. High fuel prices, lack of alternative modes of transport and ineffective logistics planning lead to increased costs of transportation. Transport costs in Ukraine can reach 15-20% of the company's total costs, which is a much higher indicator compared to European countries. This puts Ukrainian companies at a disadvantage, forcing them to raise product prices to cover these costs.

Despite the fact that in Europe and other developed countries, digital solutions are actively used to increase the efficiency of logistics, the level of digitalization in Ukrainian companies remains low. Only about 30% of companies implement modern technologies to automate their processes, other Ukrainian companies have a low ability to quickly process orders and control logistics flows. The lack of full integration of digital tools in logistics is an important barrier to improving the international competitiveness of Ukrainian companies.

These challenges require Ukrainian companies to find an effective approach to logistics management, to implement innovative solutions and strategies for adapting to changing conditions.

Due to the economic crisis, political and demographic situation in Ukraine, the costs of logistics operations have increased. This makes it especially important to clearly define the priority tasks that will help to achieve optimization of logistics processes (Zotov & Pozniak, 2023).

First of all, Ukrainian companies need to conduct a detailed analysis of each stage of the logistics chain, starting from the supply of raw materials and storage, to the transportation and delivery of goods to end consumers. A thorough review will help assess the efficiency of operations, identify the strengths and weaknesses of the process, and identify areas for improvement.

The next important direction is the optimization of warehouse operations. Ukrainian companies need to automate storage and inventory management processes to increase the speed of order processing and reduce warehouse maintenance costs. Automated systems such as WMS help in fast tracking of goods, optimization of warehouse space and reduction of time required to prepare shipments.

Optimization of delivery routes is the third important component. Through the introduction of digital technologies such as transportation management systems (TMS), Ukrainian companies can improve delivery routes. The use of algorithms and real-time data helps to determine the fastest and most cost-effective routes, which reduces fuel costs and ensures on-time delivery.

Inventory management is another critical aspect for optimizing logistics processes. Effective inventory management helps to avoid excess inventory, which reduces the risk of losses and increases the turnover of goods. Ukrainian companies should develop a system that will ensure accurate forecasting of demand, optimization of inventory levels and prompt response to changes in market conditions. The use of demand forecasting methods can provide more accurate procurement planning and reduce costs associated with product storage.

Finally, the implementation of modern technologies in logistics is a key optimization tool. Automation systems, digital platforms and data analysis tools enable companies to achieve all of the above goals. This improves overall productivity, reduces costs and improves customer satisfaction, which is critical for international markets.

Thus, these tasks are the basis for strategies to optimize logistics processes, which will allow Ukrainian companies to remain competitive on international markets.

Conclusions

To summarize, optimization of logistics processes is a strategy that helps Ukrainian companies not only to increase the efficiency of international management, but also to ensure the stability and sustainability of their operations in the face of modern challenges. It should be noted that even the most successful and efficient logistics strategies need to be revised and improved over time. The dynamics of international markets and changes in customer requirements require constant adaptation of logistics management tools. For Ukrainian companies integrated into global markets, this means the need to respond flexibly to new challenges, invest in innovative technologies, and review their approaches to supply chain management. This is the only way to ensure not only short-term efficiency but also long-term success in a competitive environment.

Further research in this area should focus on an in-depth study of the impact of digital technologies on

the optimization of international logistics processes, as well as on the development of innovative strategies for adapting logistics systems to global crises and dynamic market changes. It is also worth focusing on the analysis of successful practices from other countries and the possibilities of their implementation in the Ukrainian logistics system to increase its competitiveness at the international level.

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CREATION AND MANAGING OF ADDED VALUE CHAINS IN THE CONDITIONS OF GLOBALIZATION

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Abstract

In the conditions of the growing influence of globalization processes, which change approaches to international trade, production and distribution of resources in the system of international economic relations, the creation and functioning of value-added chains play an important role in the business processes of international companies. Chains of added value, as a category, have become an important element of the economic strategy of companies and countries, contributing to their competitiveness and economic development. The purpose of the study is to identify the features of the creation and functioning of value-added chains, as well as to determine their impact on the development of international economic relations. The tasks of the work are the analysis of the main stages of the formation of value-added chains, the study of their impact on international cooperation, the determination of factors affecting the effectiveness of value-added chains and the assessment of the role of technologies in their development, as well as the establishment of correspondence between the level of development of countries and their involvement in the system global chains of added value. To achieve the goal, the research used methods of system analysis, comparative analysis, theoretical generalization, and economic and statistical methods. As a result of the study, it was found that globalization contributes to the formation of complex chains of added value that integrate the economies of different countries, ensuring the effective distribution of resources and promoting specialization at individual stages of the production process; technological innovations change the nature of chains, increasing their productivity and adaptability to new challenges; the inclusion of countries in the global system of value-added chains increases their competitiveness in the world market. For effective integration into the global system of value-added chains, countries need to modernize infrastructure, introduce the latest technologies, attract investments and improve the legal framework.

Keywords

value added, value chains, global value chains.

Problem statement

The problem of the functioning of value-added chains in the global economy is extremely urgent in the conditions of growing international competition and integration processes. It is related to the need for a deep understanding of the mechanisms of distribution of added value between participants of global markets and their role in creating

competitive advantages. At the same time, there are issues of effective coordination and management at various stages of the production process, which includes the supply of raw materials, production, distribution and marketing. This has a significant impact on the development of companies' development strategies.

Relevance of the chosen topic

With the rapid development of technologies and their introduction into the economic processes of the global economy, the question arises of studying the nature and features of the formation of added value chains both at the micro-level and at the macro-level. Understanding these things allows us to identify those factors that will help developing countries in the future to develop their own strategies for joining global value chains. Participation in the processes of formation of chains of added value is an indicator of the economic well-being of countries.

Analysis of recent research and publications

The topic of value chains is becoming increasingly popular among researchers. The first person in the modern economy to investigate the issue of added value chains was the American researcher Michael Porter (1998), who in his work "The Competitive Advantage" gave a thorough description of the model of the added value chain. His ideas about value added chains became the basis for this study. The World Bank, the United Nations Conference on Trade and Development (UNCTAD), the Organization for Economic Co-operation and Development (OECD), McKinsey & Company, the World Economic Forum (World Bank, 2019; OECD, 2020; World Economic Forum, 2017; McKinsey & Company, 2020) and others are among the organizations and institutions engaged in researching the problems of the functioning of value-added chains.

Purpose of the article

To determine the peculiarities of the formation and functioning of chains of added value and their influence on the development of international economic relations. The task of the research is the analysis of the main stages of the formation of value-added chains, the study of their impact on international cooperation, the identification of factors affecting the effectiveness of the functioning of value-added chains, the assessment of the role of technologies in their development, the determination of the correspondence between the level of development of each country and its participation in the global system value chains, as well as identification of challenges on the way to integration into the system of global value chains and benefits from it.

Presentation of the main research material and results obtained

Globalization, as a phenomenon, encompasses the processes of economic, political, social and cultural integration of countries, which have significantly increased due to the development of technology, transport infrastructure and the development of the system of international economic relations. The process of globalization creates favorable conditions for the integration of the economies of different countries thanks to the simplification of international trade procedures and the creation of free market conditions. This contributes to the fact that countries that are part of the global world market can specialize in certain stages of production processes or areas of the economy where they have comparative advantages. For example, countries with cheap labor may be major producers of raw materials or semi-finished products, while high-tech economies are engaged in processing and final production of high-value-added products. Also, globalization significantly strengthens the ties between states and international companies. Large multinational corporations can purchase components or raw materials in one country, and place their own production facilities in another, exporting the final products in general to the markets of third countries.

One of the economic manifestations of globalization was the emergence and development of global value-added chains, which allow the distribution of production and processing of goods between different countries of the world, using their competitive advantages. The value-added chain is a complex network of various elements involved in the development, production and sale of finished products on the market. The essence of the functioning of value-added chains in the conditions of globalization is that the production process can be divided into many stages, each of which is implemented in the country where the best conditions are implemented for it. That is, it is a kind of implementation of the theory of relative advantages, when each country, which is a subject of international economic relations, implements those factors of production that are not only the most effective, but also use less costs in the production and sale of products. This provides not only a reduction in costs, but also increases the flexibility of companies in responding to changes in market demand, the development of new technologies, or changes in the economic situation (World Development Report 2020).

The modern concept of the value chain was first presented by the American researcher Michael Porter in his 1985 work "Competitive Advantage: Creating and Sustaining Superior Performance." In this book, the scientist presents his own model, which includes the following elements: inbound logistics, outbound logistics, operational activities, marketing and sales, and service (service); Also, the business model of the value chain includes supporting activities, namely the company's infrastructure, technological process, personnel management (management) and logistics (procurement). Each of the elements of activities can be broken down into smaller processes, during which added value is created. For example, taking such an activity as marketing, you can break it down into the following components: marketing management, advertising, sales department management, sales department work, technical manuals and instructions, promotion. So, in general, the value chain according to Michael Porter will look like this (Fig. 1.)

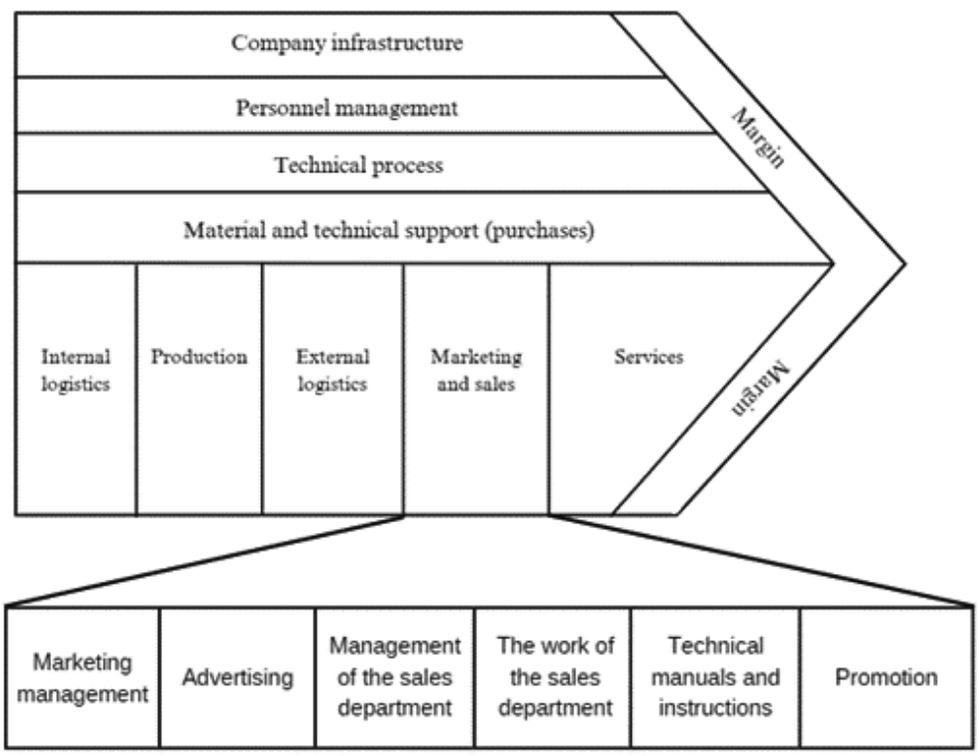

Fig. 1: Michael Porter's value chain model
Source: materials used (Porter, 1998)

The basic value chain model is a combination of three important components: design (product development), production and service. When developing a product project, various methods are used, including research and development (R&D), marketing research, market and consumer analysis, etc. The production phase, in addition to the direct production of products, includes the purchase of raw materials and logistics (internal, at the enterprise, and external - to the market). The service, as an element of the post-production phase, includes support and reinforcement of the main product, as well as the implementation and implementation of measures within the framework of the enterprise's marketing strategy. This model can be clearly seen in Fig. 2.

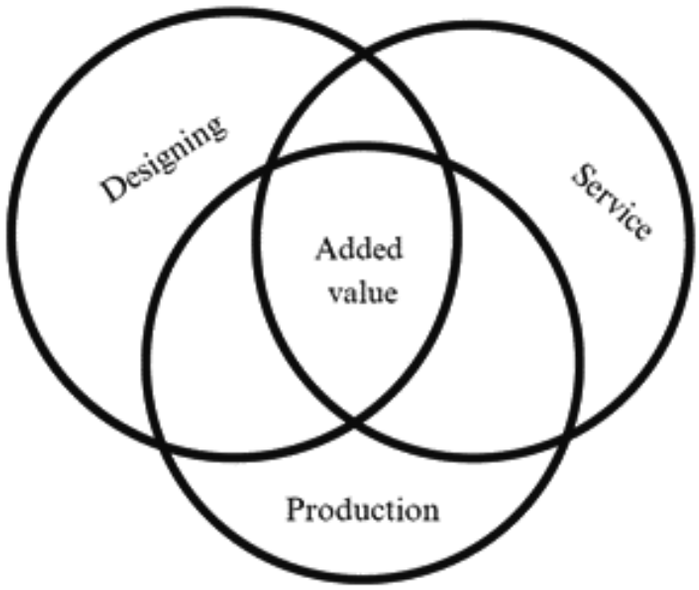

Fig. 2: The triune model of elements of added value
Source: materials used (Porter, 1998)

Speaking about technological innovations, it is worth noting that they are currently the driving force of modern economic processes and are significantly transforming the structure of global value-added chains. Automation - the process of introducing machines and technologies to perform production processes without or with minimal human intervention - contributes to increasing efficiency and productivity at all stages of production. This allows enterprises to reduce production costs, increase the accuracy and speed of production, as well as reduce the dependence on the human factor, which minimizes the risk of errors. Automation has a direct impact on global value chains, changing not only the production processes themselves, but also the geography of production. Thanks to automated systems, production can be redirected to more developed countries (Belknap Press: An Imprint of Harvard University Press, 2019).

Along with automation of production, digitization plays an extremely important role in the modern functioning of global value-added chains. Digitization opens up new opportunities for the development, coordination and management of value-added chains. Information technologies, in particular the Internet of Things (IoT), big data (Big Data), blockchain technologies and cloud solutions, provide a continuous flow of data between different participants and elements of value chains, which allows for improved monitoring, control and forecasting of production processes. The introduction of blockchain technology, for example, allows for transparency and traceability of goods at all stages of the supply chain, which increases trust between partners and reduces the risks of fraud or losses. In addition, technologies contribute to the development of innovative business models, such as "just-in-time production" or mass customization, which allows companies to quickly adapt to the needs of specific consumers. Thanks to digitalization, enterprises can manage supply chains in real time, which increases efficiency and reduces delays at every stage of production (World Economic Forum, 2017; OECD, 2024).

Speaking about the stages of formation of chains of added value, it is necessary to determine those constituent elements that are part of the total added value of the finished product. As mentioned above, the triune model of added value includes design, production and service. It is worth breaking down each of these parts into its constituent elements in order to understand exactly which factors are involved in the process of creating added value (World Investment Report, 2021).

1. Projecting. Preliminary development of the product layout, its component parts, design, reinforcement, and later MVP (Minimum Viable Product) - all this is an important stage operated by R&D (Research and Development). In the conditions of the global market, the development stage is extremely important, because its entire life cycle will depend on how the product will be designed: from the stage of implementation to withdrawal from the market. R&D, in turn, is also engaged in market research. It is important to understand the tastes of consumers, who is the target audience, what is the size of the market, who are the main competitors, etc. At the design stage, the conditions for the further formation of added value in the structure of finished products are already laid.

2. Production. After preliminary market research has been conducted and a model of the product to be sold on the market has been designed, the production stage comes. Production itself is impossible without the prior purchase of all raw materials. In the conditions of the global economy, an extremely important tool for effective resource management is the optimization of procurement, transport and warehouse logistics processes. The production process directly allows you to transform raw materials and materials into a product that will meet the design criteria that were laid down at the development stage. Production is the main carrier of added value, because during the production of products, raw materials become the goods that will be introduced on the market in the future.
3. Service. After production, the product enters the global market, where it can be purchased by consumers. In the conditions of international competition, it is worth understanding that the simple fact of appearance and display of goods for sale is not a decisive factor that will force the end consumer to purchase the products. This is where such a tool as marketing comes into play, which helps to improve the product, distribution, price and communication policy of the company. This is extremely important to understand in the conditions of the global market, where many companies compete with each other. After-sales service is a tool for maintaining consumer loyalty to the brand promoted by the company. The post-production stage, which includes sales, marketing, and service, strengthens the finished product, increasing the amount of added value in the product's value structure.

In this way, it was revealed how exactly the elements of the added value model affect the final amount of added value. However, it is worth noting that depending on the products produced by the enterprise, the variability of the factors affecting the amount of added value may change. For example, you can consider the high-tech industry. Enterprises in this field produce products that require a lot of investment in development and design, as well as in research and development (R&D). An extremely important factor that will influence the amount of added value of finished products is the innovative potential of the enterprise: what budget the company spends on research and development, what is the level of education and qualification of personnel, what developments they are able to develop and implement - all this is a significant influencing factor on the final amount of added value, and therefore this factor can be considered as a separate factor of production in high-tech companies (UNCTAD, 2024).

In the conditions of globalization, in addition to the factors that were mentioned above, it is worth highlighting those that have an external effect on the final amount of added value in the overall chain. Extractive factors influencing the company environment and the formed value-added chain can be considered (OECD, 2022):

— International competition: affects the company's strategic decisions in the field of management, planning, pricing policy, as well as the global competitiveness of both individual products and the entire company or country in general;
— International marketing: has a significant impact on the analysis of the target audience, consumer tastes, communication (with counterparties, businesses, states, consumers), as well as on the promotion and formation of a sustainable international brand;
— Technological development: globalization has significantly affected not only the speed of information transfer, but also the transfer of technology from one country to another, thus forming a global ecosystem where the level of environmental development in the industry affects the final amount of added value.

The general view of the value-added chain in the global economy, taking into account the model of value-added elements and extractive factors, can be presented in Fig. 3.

The inclusion of countries in the system of global chains of added value provides significant advantages for their economy, in particular, it allows to significantly increase the competitiveness of manufacturers on the world market. The main advantage of countries' participation in global value-added chains is the opportunity to gain access to international markets and technologies, which contributes to the modernization of their industrial sectors, increasing productivity and quality of finished products. Countries are not limited by the need to carry out all stages of production themselves, but can specialize in specific stages, such as manufacturing components, processing materials or providing services. The main advantage of the system of global value-added chains is that instead of trying to control all stages of production, countries can focus their resources and efforts on those sectors and stages where they can use their comparative or competitive advantages. The efficient allocation of resources through the operation of global value chains allows economies to focus on those aspects of the production process that are most profitable for them and where they can provide the greatest efficiency and productivity. For example, countries with a large number of raw materials may specialize in its extraction and primary processing, while countries with more developed industries may engage in the manufacture of final products or their assembly. Thus, each country fulfills its role in the global production process, which allows for the most efficient use of available resources.

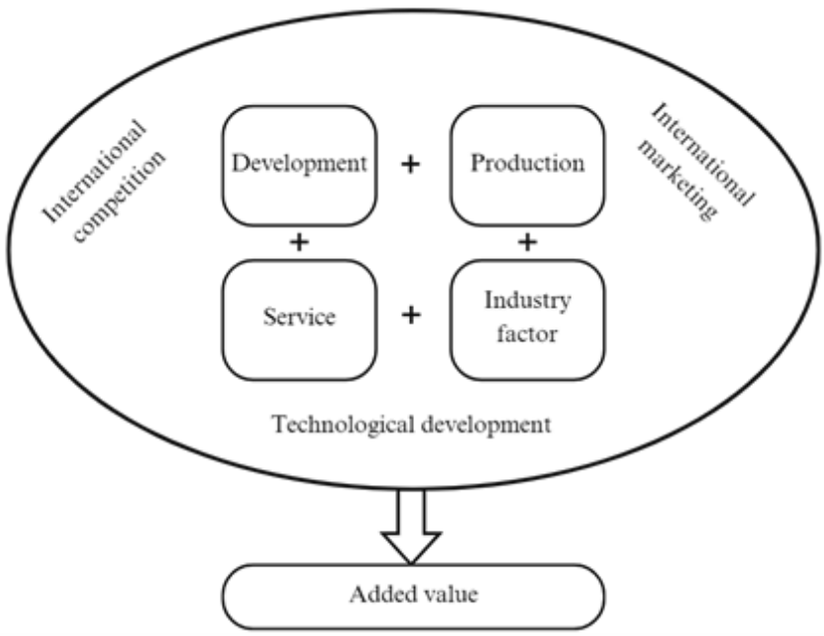

Fig. 3: Model of the value-added chain in the global economy
Source: materials used (OECD, 2022)

It is worth noting that the process of integration of countries into global chains of added value is quite complex and directly related to the economic policy implemented by this or that country. Developing countries face a number of significant challenges in integrating into global value chains, which in turn require well-functioning transport, energy and communication networks that ensure the efficient movement of goods, capital and information. However, many developing countries do not have a sufficiently developed infrastructure to actively participate in global production chains. Thus, the main challenges facing developing countries are shown in Fig. 4.

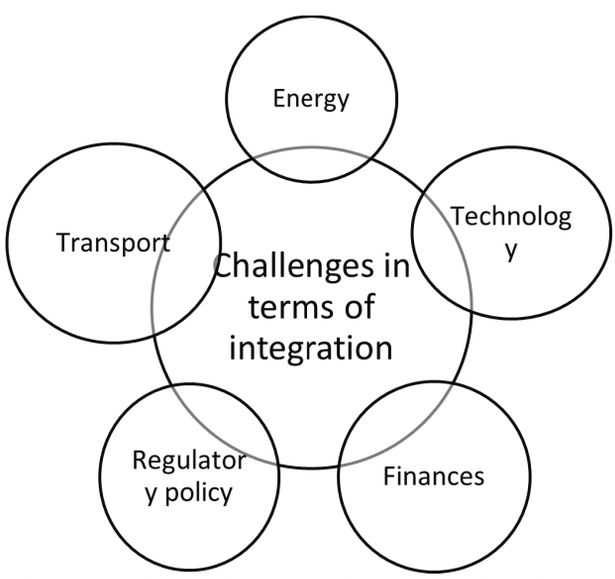

Fig. 4: Main challenges for developing countries on the way to integration into the system of global value-added chains
Source: materials used (World Economic Forum, 2023)

Insufficient transport infrastructure is one of the most serious problems in the context of the integration of developing countries into the system of global value-added chains, because the chains themselves need fast and reliable logistics solutions so that goods can move between different countries in the shortest possible time. The problem arises of the development of the logistics infrastructure of the country or individual regions: insufficiently developed roads, railways and ports, which significantly slows down the supply of components, parts, assemblies

or finished products. This leads to an increase in the cost of transportation and delays in the production process, which reduces the competitiveness of such countries in the system of global value chains. For example, in some African countries, due to the lack of modernized transport networks, the transportation of goods takes much longer and costs more than in developed regions. At the same time, the countries of Western Europe (Great Britain, Germany, France) have a high level of logistics infrastructure development, and therefore costs for logistics operations based on transportation and storage of goods are lower (World Economic Forum, 2023).

In addition, energy infrastructure in many developing countries is also underdeveloped to support participation in global value chains. Production, especially at the modern technological level, requires a stable and affordable source of energy. In countries with frequent power outages, underdeveloped energy infrastructure, or high energy prices, industrial processes can be unpredictable and economically unprofitable, which makes the path to integration into global value-added chains more difficult (OECD, 2022).

Another important barrier is technological backwardness. Chains of added value are largely based on the use of the latest technologies and innovations, as well as the implementation of new technological solutions that ensure the efficiency and productivity of production processes. However, many developing countries have limited access to modern technologies due to low levels of investment in R&D and research and development, as well as limited technology transfer from developed countries. This means that they cannot implement innovative solutions that are necessary to integrate into the system of global value-added chains. For example, automation, implementation of cloud and SaaS solutions, and digitization of production processes require highly qualified personnel and modern equipment, which is often unavailable in countries with a low level of technological development (World Development Report, 2020).

As mentioned above, along with technological backwardness, countries also face a lack of investment. Limited access to finance is another barrier to integration into global value chains. Many enterprises in developing countries do not have the opportunity to attract capital to modernize production facilities or introduce new technologies. This puts them at a disadvantage compared to companies from developed countries, which can access global financial markets and attract investment for development. Lack of investment in infrastructure and technology hinders the ability of these countries to increase their competitiveness in international markets. In addition, another important aspect of financing is investment in human capital. It has been established that countries with a high level of development invest significantly more in human capital, compared to developing countries. The pre-production phase, which includes R&D, is impossible without highly qualified specialists and scientists. This is especially relevant for those industries that require significant scientific potential. For example, it can be the previously mentioned high-tech industry, which requires significant financial investments as well as investments in qualified personnel (McKinsey & Company, 2019).

In addition to economic and infrastructural challenges, developing countries also face regulatory challenges. The imperfection of the legal and judicial systems, corruption, the diminution of the economy, and the instability of political institutions can significantly reduce the investment attractiveness of countries, and as a result, their international competitiveness may decline. Investors and international companies are not ready to invest in high-risk regions, which limits the ability of developing countries to integrate into the global economy. Therefore, a broad problem in the context of the integration of countries into global chains of added value is macroeconomic and socio-political stability.

The specialization of countries in the system of global value-added chains allows countries to optimize their production processes, reduce costs for raw materials and labor, and also increase overall labor productivity. This is one of the key factors that makes integration particularly advantageous for developing countries, since they can join world markets by participating only in certain stages of production where their costs are lowest. Specialization in certain stages of production processes allows countries to more effectively use their comparative advantages, such as cheap labor, access to natural resources, or technological expertise. This increases their productivity and reduces production costs, which in turn allows national producers to offer competitive prices in international markets. As a result, participating countries in the system of global value-added chains can quickly develop their export capabilities, attract foreign investments and improve conditions for the development of domestic business. Fig. 5 presents a map that demonstrates how the countries of the world are integrated into the system of global value-added chains.

Countries highlighted in purple specialize in innovative solutions and developments; dark blue - developed production and service sector; blue - small-scale production; red - raw materials with a high cost; orange – medium-cost raw materials; countries with a low level of involvement in global value-added chains are highlighted in light yellow. The tendency towards such a distribution of the participation of countries in the system of global chains of added value persists even now: countries with a higher level of technological development are engaged in the development of innovations and high-tech production. There are certain exceptions. For example,

the image shows that Norway belongs to those countries in which the share of participation in global value chains is accounted for by the export of high-value raw materials (oil). The same picture is observed in the countries of the Middle East and the Arabian Peninsula, whose main export is oil and petroleum products.

Fig. 5: Participation of countries in the system of global value-added chains as of 2015
Source: materials used (World Development Report, 2020)

Speaking about the benefits that countries receive from integration into the system of global value-added chains, the following aspects should be noted here. First, participation in the system of global value-added chains allows companies and countries to minimize the risks associated with economic fluctuations or local crises by distributing production processes between different countries. For example, components for one product can be manufactured in several countries, and the final assembly takes place in another, which reduces dependence on one market or region. It also increases the overall resilience of the system to disruptions in the supply chain, as production can be moved to other sites or suppliers can be changed if necessary (International Monetary Fund, 2019).

Second, integration into global value-added chains contributes to the upskilling of the workforce, as specialization at certain stages of production requires the development of specific skills and knowledge. For example, countries specializing in technological processes invest in human capital, creating a layer of highly qualified specialists, researchers, specialists in the high-tech industry, which positively affects their economy in the long term. This not only increases production efficiency, but also provides an opportunity to participate in more complex and profitable segments of value chains. Participation in global value-added chains promotes the exchange of qualified specialists in various fields, as well as the creation of research centers developing new products or technologies, as well as enterprises with a high level of specialization in specific fields.

Third, there is a technological modernization of economies, as international companies and transnational corporations often transfer technology and know-how to local partners. For example, companies from highly developed countries of the world can create production sites or enter into partnership agreements with local firms in developing countries. As a result, such countries gain access to modern technologies and processes that they could not develop on their own. This process of technological diffusion is particularly important for developing countries, as it contributes to increasing their level of technological development and improves their capacity for innovation. This can be especially important for developing countries that have limited access to modern technologies and production methods. Due to inclusion in the system of global chains of added value, they get the opportunity to master new technologies, which contributes to the improvement of the qualifications of the workforce and the overall development of the national economy.

The fourth important advantage is export diversification. Countries that integrate into value-added chains can avoid excessive dependence on raw material exports or a narrow range of goods, which increases their economic resilience to the challenges of macroeconomic instability. Due to the fact that the model of functioning of value-added chains covers many different markets and stages of production, they allow countries to be less dependent on economic crises in specific regions or industries. This increases the stability of the economy, reduces risks and ensures the stability of the national currency and export revenues. It also allows them to participate in the production of products with a higher added value, which creates new jobs and stimulates the development of scientific research activities.

Therefore, the integration of countries into the system of global chains of added value has a positive effect

on the well-being of national economies, opening up a wide range of opportunities for the further development of economic cooperation between countries.

Conclusions

As a result of the research, it can be noted that value-added chains are a complex and multifunctional system that includes the processes of creating new product value. Value chains have become an important component of the global economy, significantly influencing the structure of international trade and economic growth. Globalization contributes to the formation of complex chains of added value that integrate the economies of different countries, ensuring the efficient distribution of resources and promoting specialization at certain stages of the production process. Technological innovations such as automation and digitalization are changing the nature of chains, increasing their productivity and adaptability to new challenges. The inclusion of countries in the global system of value-added chains increases their competitiveness in the world market, creating conditions for the exchange of knowledge, technology and capital. However, developing countries face serious obstacles due to insufficient development of infrastructure, energy, technology, insufficient level of investment and regulatory restrictions. In order to effectively integrate into the global system of value-added chains, they need to modernize the infrastructure, introduce the latest technologies, attract investments and improve the legal framework. As a result, value chains act as a key mechanism of global economic cooperation that provides equal opportunities for development and growth at the international level, although countries have different starting positions and resources to be included in this process.

Further research on value chains can focus on several important aspects. First, a deeper assessment of the impact of the latest technologies, such as artificial intelligence, robotics, and blockchain technologies, on the transformation and functioning of value chains is an urgent issue. Given the rapid development of technologies, it is important to study their role in increasing efficiency and reducing costs in production processes. Secondly, a promising direction of research is the analysis of the interaction between chains of added value and the sustainable development of the global economy. In the face of climate change and environmental challenges, it is necessary to explore how value chains can contribute to environmentally responsible production and sustainable use of resources. Thirdly, further analysis of ways to improve the integration of developing countries into the system of global value-added chains is important. The issue will include an examination of policies, investment strategies and infrastructure projects that can help such countries overcome barriers. In addition, it is promising to study the impact of geopolitical factors and trade conflicts on the stability and development of value chains, especially in the context of international politics and changes in global trade.

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DIGITAL TRANSFORMATION IN INTERNATIONAL MANAGEMENT: HOW TECHNOLOGY IS CHANGING THE MANAGEMENT OF GLOBAL OPERATIONS

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Abstract

The article analyzes the impact of digital transformation on the management of global operations in international management, which is a key trend in the development of the modern economy. Digital technologies, such as big data, artificial intelligence, automation, cloud services, and blockchain, are fundamentally changing management approaches and creating new opportunities for international companies. The transformation helps to improve the efficiency of business processes, optimize management decisions and adapt to rapidly changing market conditions. Meanwhile, companies are facing challenges such as cybersecurity, resistance to change from employees, and the need to develop new competencies.

The purpose of the study is to examine the impact of digital technologies on the management of global operations and to develop recommendations for the successful adaptation of companies to the new conditions of the digital economy. To achieve this goal, several tasks were performed: a theoretical review of the concept of digital transformation and its role in international management was conducted, key digital technologies that affect operations management were studied, and the benefits and risks of implementing digital solutions in international companies were analyzed. The paper also examines successful examples of companies that have implemented digital innovations to improve management.

The study uses the methods of theoretical analysis of scientific publications and empirical analysis of practical examples, which allows to obtain a complete picture of the impact of digital technologies on international management. The findings underline the need to adapt management strategies to new conditions, develop digital competencies and an organizational culture focused on innovation and flexibility. The article provides recommendations for the effective implementation of digital technologies to increase the competitiveness of companies in global markets.

Keywords

digital transformation, international management, global operations management, artificial intelligence, automation, organizational culture, adaptation to digital changes.

Problem statement

The modern business world is experiencing profound changes under the influence of digital technologies, which are significantly transforming the management approaches and structures of international companies. Traditional methods of conducting global operations are giving way to new models based on the use of big data, artificial intelligence, automation, cloud services and blockchain technologies. At the same time, this transformation requires companies to revise their management strategies, decision-making approaches and ensure competitiveness in international markets. However, insufficient adaptation to new technologies can lead to a loss of positions in global markets and a number of management problems.

Relevance of the chosen topic

The digital transformation of international management is a key trend driving the global economy. It not only improves the efficiency of business processes, but also creates new opportunities for companies to develop through innovative business models and expanded channels of interaction with customers. In particular, the automation of operations and the introduction of analytical tools allow companies to quickly adapt to changing market conditions. However, despite the obvious benefits, companies face challenges such as cybersecurity, resistance to change from staff, and the need for new competencies. This underlines the need for a comprehensive study of the impact of digital technologies on international management.

Analysis of recent research and publications

Digital transformation issues are actively discussed both in academic circles and in the business environment. Researchers such as Kulyk M., Bugrimenko R., Smirnova P., Kobushko Y., Manzhola B., Andriyiv N., etc. emphasise that digitalisation contributes to the development of all business processes and changes management paradigms, focusing companies on innovation and flexibility. Works by other authors, such as: Kravchuk O., Varis I., Zaryvnykh K., Bey G., Sereda G., Dergachova V., Koleshnya Y., Golyuk V., Melnychenko S., Lositska T., Bediaieva N., etc. focus on the need to develop new digital competencies and transform organisational culture. Despite the existence of a significant body of research, the question remains as to how various digital technologies affect the management of global operations and how to effectively integrate these technologies into international business processes.

Purpose of the article

The purpose of this paper is to study the impact of digital technologies on the management of global operations in international management and to develop recommendations for the effective adaptation of companies to the new conditions of the digital economy.

To achieve this goal, the following tasks have been identified: conducting a theoretical review of the concept of digital transformation and its role in international management, studying the main digital technologies that affect the management of global operations, identifying the benefits and challenges associated with the implementation of digital solutions in international companies, analysing practical cases of successful digital transformation in international business, etc.

Presentation of the main research material and results obtained

Digital transformation is a complex process of integrating modern digital technologies into all aspects of an organisation's activities in order to increase its efficiency, flexibility and competitiveness (Bugrimenko & Smirnova, 2024). Unlike the mere implementation of information technology, digital transformation encompasses changes in business processes, organisational structure and culture, as well as in interaction with customers and partners. It is based on the active use of big data, artificial intelligence (AI), cloud computing and blockchain, which allows companies to radically change the way they do business and manage (Kulyk, 2024).

Digitalisation is not limited to the introduction of new technologies; it changes approaches to strategic thinking, value formation and business models of companies. One of the key aspects is customer focus and personalisation of products and services through data analytics. From the perspective of internal processes, digital transformation involves the automation of routine operations, allowing management to focus on strategic initiatives.

In the context of international management, digital transformation plays an important role as it contributes to the development of global operations and enhances competitiveness in global markets. The main areas of its impact include globalisation and integration of business processes. Thanks to digital platforms, companies can integrate operations in different countries faster, coordinate branch operations and ensure process continuity. Cloud technologies make it easier to access real-time information for different departments in different parts of the world, which ensures the unity of strategic decisions (Pankratova, 2021).

Optimising management processes is another important aspect. The introduction of digital solutions allows for improved management of international teams through the use of automated project control tools and effective communication. ERP (Enterprise Resource Planning) and CRM (Customer Relationship Management) systems provide centralised data accounting and increase the efficiency of customer and partner relationship management.

Digitalisation also contributes to the development of innovative business models, such as sharing platforms (Uber, Airbnb), which are rapidly scaling globally. In international management, the ability of companies to quickly adapt to market changes and innovate to meet customer demand in different regions is becoming important. The use of big data and analytics helps to predict risks and develop preventive measures. However, digitalisation poses new challenges, in particular, cybersecurity threats, which forces international companies to invest in secure IT infrastructures (Melnychenko, Lositska, & Bieliaieva, 2021).

Changes in culture and competences are also important consequences of digital transformation. It changes the requirements for staff competencies and organisational culture. International companies face the need to develop digital literacy of their employees and implement flexible approaches to managing teams working remotely (“15 Effective Ways HR Teams Can Leverage Big Data,” 2021).

Consider the digital maturity model developed by MIT and Capgemini (Fig 1), which classifies companies along two dimensions: the level of digital transformation and the degree of readiness for change. Start-up companies, which are just beginning their digital transformation journey, are characterised by a low level of digital infrastructure and a lack of strategic vision, and usually face difficulties in implementing new technologies due to a lack of skilled personnel and internal resistance to change. In contrast, digirati companies, being ‘digital from birth’, demonstrate high digital maturity and an innovative culture. Such companies are actively experimenting with new business models that help them respond quickly to market changes. Google or Amazon are vivid examples of digirati, which have turned digital solutions into the basis of their competitive advantage (Dergacheva, Koleshnia, & Golyuk, 2022).

Between these two poles are companies that are either overly focused on technology without a strategic vision (mods) or have progressive management but lag behind in digital development (conservatives). Trendies often implement the latest technologies without a clear understanding of how they will affect the company's long-term strategy, which can lead to wasted resources. Conservatives, on the other hand, although they have a strong corporate culture and management practices, risk losing their competitive position due to slow innovation.

Each of these categories requires an individual approach to formulating a digital transformation strategy. While the priority for newcomers is the introduction of digital tools, digital leaders have already turned digital technologies into a driving force for their business.

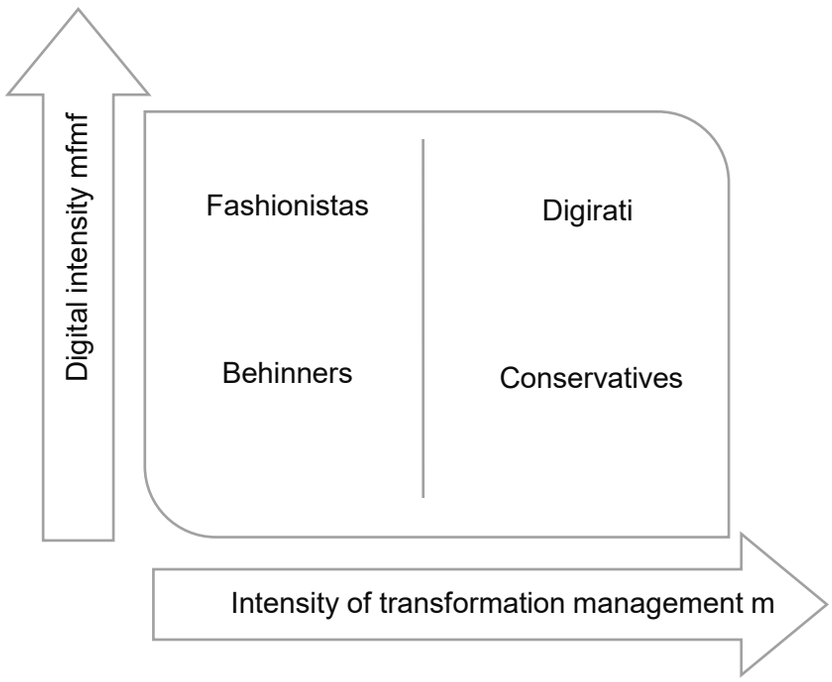

Fig. 1: Levels of digital maturity of a company
Based on data from: (Dergacheva, Koleshnia, & Golyuk, 2022).

In general, the digitalisation of human resources management involves changes in three areas: digital workforce (attracting employees with innovative thinking, bridging digital skills gaps, ensuring continuous improvement of knowledge, skills, and abilities through digital technologies); digital workplace (creating a work environment that ensures productivity, collects information on tasks, uses modern means of communication, and supports digital feedback from employees); digital HR (transformation of personnel management functions based on the latest computer technologies, use of digital tools and software products) (Fig 2).

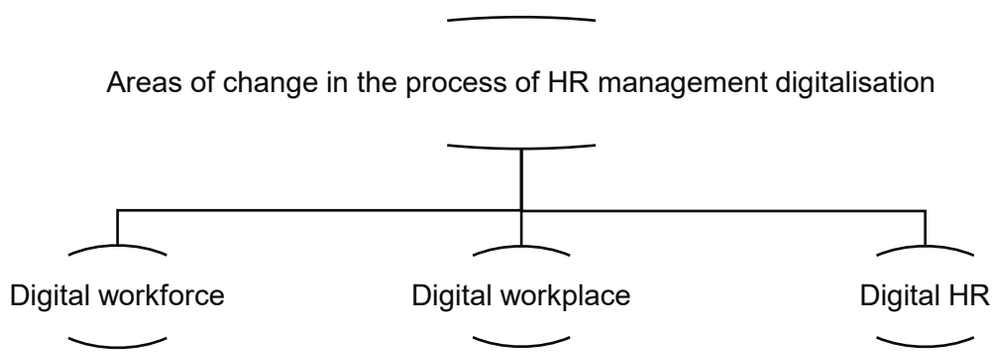

Fig. 2: Changes due to digitalisation of the enterprise's HR management system.
Source: Based on data from: (Melnychenko, Lositska, & Bieliaieva, 2021)

The technological revolution is digitising HR technologies and automating most HR functions at the enterprise. One of the most common functions to be digitised is the automation of the recruitment process. With the help of specialised platforms and systems based on artificial intelligence (AI), companies significantly speed up the search and selection of candidates. Automatic resume analysis tools allow you to quickly filter out the most relevant applications. An example of this approach is Unilever, which implemented an AI solution for pre-selection of candidates, which reduced the time for recruitment by 75% and increased the accuracy of personnel selection (Melnychenko, Lositska, & Bieliaieva, 2021). Let's take a closer look at the opportunities provided by the digital transformation of HR and consider specific examples of companies that use these improvements (Table 1).

Table 1 shows that digital changes in HR have a significant impact on the effectiveness of HR management and help optimise business processes in modern companies. Integrated mobile applications, cloud

services, artificial intelligence, virtual reality and data analytics are significantly transforming traditional HR functions, making them more automated, flexible and efficient.

Table 1: Opportunities that enterprises use due to digitalisation of HR management systems and examples of such enterprises

№№	Digital change	Functionality	Companies that use this
11	Automation of HR processes through the use of integrated mobile applications	Helps to execute: - simple management functions (time management, meeting location, movement tracking and delay notification, multimedia messaging, optimisation of the workday plan); - specific HR functions (online recruitment, automation of HR services, online training, quality tracking and assessment, measurement and improvement of engagement, providing feedback).	Uber, Uklon, Arbnb, KFS.
22	Digital integration of HR with cloud services.	Helps to execute: - the recruitment process (streaming requests from multiple sources, automatic processing of a large amount of information for decision-making, quick feedback tools); - quality of labour communication (automation of evaluation and rating, achievement of greater fairness in results, facilitation of communication between subordinates and management); - sncreased accessibility of innovations (preservation and dissemination of creative ideas); - reducing workload (automation of routine processes, reduction of working hours).	Talentsoft, Android, Twitter
33	Predicting human analytics	Helps to execute: - visualising and analysing large amounts of data on a global scale and scope; - combining methods of forecasting development scenarios and intellectual analysis; - is an effective tool for decision-making and forecasting, avoiding the subjectivity of human thinking.	Amazon, Wallmart, Tesco
44	Virtual reality (VR)	Helps to execute: - giving new candidates an insight into the organisation and execution of work in the company by virtualising the company's internal space; - expanding opportunities for talent acquisition, training and development.	Hilton hotel chain, Deutche Bank offices, Vantage Point
55	Artificial intelligence (AI)	Helps to execute: - integration of software products, complex algorithms for responding to the actions and words of consumers, creation of a «human likeness» that can effectively interact with job candidates; - calculating salaries and bonuses.	Most modern businesses

**Based on data from: (Melnychenko, Lositska, & Bieliaieva, 2021).*

In general, digital innovations in HR help to increase the productivity and efficiency of management processes, reducing routine tasks and creating conditions for the growth of an innovative culture. Companies that actively implement these technologies are gaining competitive advantages in global markets through more flexible and adaptive human capital management.

Digitalisation has brought modern systems to the HR sector that can integrate and automate key HR business processes. Such solutions include SAP HCM, Oracle HCM, Dynamics 365 Human Resources, Workable, Hurma,

PeopleForce, BambooHR, Zoho People and BAS ERP Human Resources Management (Varis, Kravchuk, & Paraschuk, 2022). Each HRM system has its own unique functionality that allows them to perform different tasks. Some of them specialise only in certain processes, such as HR records, while others cover a wider range of functions, including recruitment, onboarding, assessment and development of employees. These solutions can operate as standalone applications or integrate into comprehensive business platforms to automate the entire enterprise.

When choosing an HRM system, it is important to consider not only its functionality but also the level of security. Companies need to understand which modules they will use most often in order to choose a platform that provides the most relevant features. Today, the most popular HR processes automated through HRM systems are: recruitment, performance management, HR administration, career planning, time tracking, HR analytics, and automation of routine tasks.

Some HR processes are partially supported by the existing functionality of the systems, such as workforce planning and forecasting, employee assessment, competency management, employment contracts, employee onboarding, operational team management and staff incentives. At the same time, certain aspects of management remain less automated. These include: analysis of work processes, management of employee training, organisation and maintenance of workplaces, labour standardisation, labour cost control, occupational safety and health, and personnel cost management (Varis, Kravchuk, & Paraschuk, 2022).

In the context of using the latest HRM systems at enterprises, it is worth noting that, according to the World Economic Forum experts, in the future, about 70% of the total value will be created by digital products and the introduction of digital business models. As can be seen from Fig 3, the share of global GDP generated by digitalised businesses increased 3.3 times between 2018 and 2022. At the same time, the contribution of non-digitalised companies decreased by 0.77 times (Fig 3).

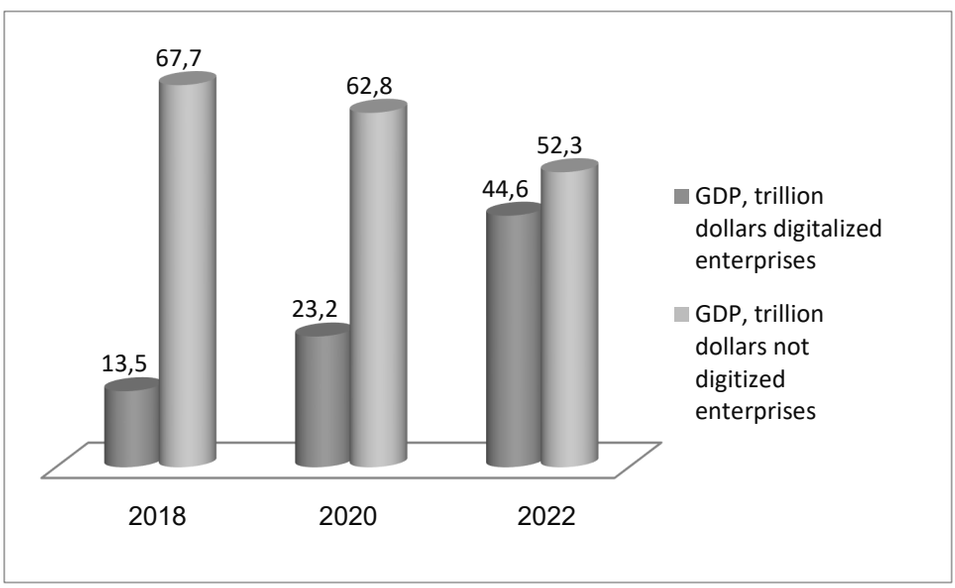

Fig. 3. Dynamics of global GDP with the participation of digitalised and non-digitalised enterprises, trillion USD

Source: Based on data from: (Varis, Kravchuk, & Paraschuk, 2022).

According to Fig 3, we see that digital transformation is an inevitable process that affects all areas of business, including HR. Companies that do not adapt to new realities risk losing their competitiveness.

Therefore, in order to effectively implement digital technologies to increase competitiveness in global markets, companies need to develop a comprehensive digital transformation strategy that takes into account their business needs, resources and industry specifics. An important first step is to conduct an audit of the current level of digital maturity, which will help identify weaknesses and priority areas for transformation (Kravchuk, Varis, & Zaryvnykh, 2021). The use of digital maturity models, such as those developed by MIT and Capgemini, will help to classify the company and focus efforts on specific areas of development, whether it is improving technological readiness or strengthening strategic vision.

Companies are advised to gradually introduce cloud technologies and integrated HRM systems, such as SAP HCM, Oracle HCM or BambooHR, to help automate HR processes, improve recruitment and performance management. When choosing such systems, it is important to focus on platform flexibility, functionality, and

security compliance. Integration with cloud services will simplify access to real-time data, which will ensure the coordinated work of global teams and speed up management decision-making.

In addition, companies can implement artificial intelligence and analytical tools to make objective management decisions based on big data (Kobushko & Manzhola, 2023). AI will help automate routine processes, predict market trends, and improve customer experience. The use of human capital analytics will help to better manage staff and predict productivity. Investments in digital security are also important, as the growing number of cyber threats can be a significant obstacle to successful digital transformation.

Overall, successful digital transformation requires a systematic approach that combines technological innovation with organisational change. Companies must be prepared to constantly adapt strategies and business processes to remain competitive in dynamic global markets.

Conclusions

Summing up all of the above, we can conclude that digital transformation has become a key factor in the development of modern international companies, radically changing approaches to managing global operations. Analysing the impact of digital technologies on international management, it can be concluded that traditional business models are gradually giving way to new solutions based on big data, artificial intelligence, automation, cloud services and blockchain technologies. The implementation of these innovations provides companies with increased process efficiency, flexibility and competitive advantage in global markets.

Globalisation and integration of business processes are accelerated by the use of cloud solutions and integrated management systems, such as SAP HCM, Oracle HCM and Dynamics 365 Human Resources. They allow companies to centralise management, provide real-time data transparency, and improve communication between divisions in different countries. At the same time, AI helps automate routine processes, improve decision-making accuracy, and reduce the subjectivity of HR management. This provides companies with the ability to adapt quickly and increase innovation.

HR technology is an important element of digital transformation that significantly improves the efficiency of HR management. HR data analytics plays an important role in helping to predict productivity and increase employee engagement. However, some important HR processes, such as labour rationing or cost management, are not yet sufficiently covered by digital solutions, which requires further development of systems.

An important aspect is the ability of companies to integrate innovations into existing business processes. The digital maturity model proposed by MIT and Capgemini shows that companies are at different stages of digital transformation: from beginners to leaders (digirati). Successful digital transformation requires a comprehensive approach that includes adapting organisational culture and developing digital competencies of staff. The use of remote work and virtual reality (VR) technologies helps to attract the best talent and improve learning processes. At the same time, companies should invest in cybersecurity systems to minimise risks in the face of increasing cyberattacks.

In summary, digital transformation is not only changing the way global operations are managed, but also opening up new opportunities for international business development. Companies that can effectively integrate digital solutions and build flexible management models will gain significant competitive advantages. However, success will depend on the ability of management to make informed decisions, support innovation and respond effectively to new challenges arising from the transformation process.

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ASSESSMENT OF THE EFFECTIVENESS OF STRATEGIC MANAGEMENT OF INVESTMENT ACTIVITIES OF ENTERPRISES IN TIMES OF CRISIS

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Abstract

The article defines the problems faced by industrial enterprises due to the crisis situation associated with a full-scale invasion of Ukraine. Measures are proposed to improve the economic situation at enterprises, in particular by attracting investment, which can become the basis for additional opportunities for economic growth and sustainability in conditions of financial instability.

The article also substantiates the expediency of applying a strategic approach to the investment activity of an enterprise. The analysis of the dynamics of production volumes at industrial enterprises and their analysis of the dynamics of their financial results is carried out. A scientific and methodological approach to assessing the effectiveness of Strategic Investment Management at enterprises in times of crisis is proposed.

In addition, based on the results of the analysis of theoretical approaches to assessing the effectiveness of Strategic Investment Management in enterprises, the article offers a set of indicators for effective strategic investment management.

Keywords

industrial enterprise, investment activity, full-scale invasion, crisis, strategic management.

Problem statement

The domestic economy faced serious difficulties, which is associated with the conditions of martial law as a result of a full-scale invasion of the territory of Ukraine. Many industrial enterprises suffered significant losses: a number of them were completely destroyed, and some of them were relocated to other regions. In such circumstances, the future of the business and its economic performance remain uncertain. Since the beginning of the war, more than a third of Ukraine's industrial enterprises have ceased their activities, and according to the Kiev School of Economics, 412 objects were destroyed by September 2022. Direct losses at the end of 2022 amounted to about 1 13 billion. Although, the dynamics of performance indicators of industrial enterprises in Ukraine over the past two years is ambiguous. So, after the activity of industrial enterprises in Ukraine decreased

by 37% in 2022, last year these indicators increased by 5.9%. Last year, the State Statistics Service published only industrial production indices, while not disclosing production volumes in physical terms due to martial law.

Relevance of the chosen topic

In order to improve the economic situation, it is advisable to actively conduct investment activities based on a strategic approach. In conditions of economic instability, modern methods for evaluating the effectiveness of investment projects are becoming relevant. Presenting the value of an investment project is important for attracting investment, since only the most promising projects receive financing. Investment management requires highly qualified management personnel to ensure the development and competitiveness of enterprises in both the short and long term.

Analysis of recent research and publications

Various aspects of the chosen topic are thoroughly studied in the works of modern domestic and foreign specialists. Key works of such scientists as S. I. Bessonov, V. Berens, G. Burman, V. V. Kovalev, I. V. Lipsits, A. F. Goiko, A. Ya.Kuznetsov, A. A. Peresad, V. S. Ryzhikov, V. P. Savchuk, U. sharp and others should be noted. These authors mainly focus on the analysis of individual aspects and research of the investment potential of enterprises, which is becoming less relevant in modern conditions. Today, the most important thing is the development and justification of methodological approaches to assessing the effectiveness of Strategic Investment Management in industrial enterprises.

Purpose of the article

The aim of the work is to develop a scientific and methodological approach to assessing the effectiveness of strategic management of investment activities of an industrial enterprise.

In order to achieve this goal, the paper used appropriate general scientific and special research methods, including scientific abstraction, analysis of scientific facts, deduction, as well as analysis and synthesis. These methods contributed to the study of the current state of the industrial sector and Strategic Investment Management. This, in turn, is the basis for the development of scientific and methodological approaches aimed at evaluating their effectiveness.

Presentation of the main research material and results obtained

Industrial enterprises are key to our country's economy, but in the context of the current financial crisis, they are in dire need of additional investment to adapt and resume their economic activities. It is these companies that experience the most difficulties associated with financial instability and security issues.

Investment is the basis of investment activity, acting as the main tool for the formation of micro - and macroeconomic indicators that directly affect the rate of economic growth. According to the law of Ukraine «on investment activity», investments are recognized as all types of material and intellectual values aimed at making a profit and achieving social and environmental results (Verkhovna Rada of Ukraine, 1991).

Both foreign and domestic scientists offer similar definitions of the concept of «investment». For example, Hitman L., and Jonk M. consider them as a way of investing capital to preserve or increase assets (Tolkien & H., 2010), and Zagorodny A. G., and Voznyuk G. L. add that these are monetary and intangible resources invested for the purpose of making a profit or social influence (Zagorodny, 2021).

Thus, investment in industrial enterprises can be the key to their development, but achieving sustainable results requires effectively organized and systematic investment activities.

Investment activity plays a key role in the economic processes of industrial enterprises in a crisis situation. According to the law of Ukraine «on investment activity», investments are a set of actions of individual citizens, organizations and the state aimed at their implementation (Verkhovna Rada of Ukraine, 1991). These actions include investments from individuals, non-state enterprises, associations, as well as state and local financing, support for investment projects, and foreign and joint investments.

According to scientists, investment activity is associated with investing in various objects in order to make a profit. An in-depth study of this topic allows us to clarify the analyzed definition, namely: investments can be both tangible and intangible, aimed not only at financial benefits, but also at obtaining additional positive effects.

To assess the effectiveness of investment activities, it is important to take into account its impact on the enterprise at various levels and determine the usefulness of the resources attracted. The creation of joint industrial parks becomes an attractive way to attract investment, as it brings not only financial resources, but also access to

equipment and new markets, while the enterprise forms infrastructure and provides production space.

At the present stage, the advantages of creating industrial parks in Ukraine are to attract foreign investment, increase the efficiency of enterprises that have been relocated from the war zone, and create new jobs with high labor standards. The state provides various benefits to encourage the development of parks, such as: exemption from duties on new equipment and property tax.

The continuation of the military conflict affects the reduction of investment activity, as well as reduces the interest of investors in investing in industrial enterprises. The decline in available funds for investment is happening faster than the decline in production in 2022. However, in 2023, investment activity slightly stabilized, which led to increased competition among enterprises (Bessonova & Komarov, 2023).

Given the current circumstances and the growing competition for investment, it is necessary to form a sustainable investment policy. This means not just a one-time attraction of external financial resources, but the constant implementation of measures aimed at their effective attraction and use. It is necessary to create a department in the company or appoint a person responsible for managing investment activities on a permanent basis. This will significantly increase investment attractiveness and efficiency, selling the funds raised with maximum profit and liquidity. Such measures will help build investor confidence, improve business reputation and level of competitiveness in the market. The procedure for organizing and managing investments at the enterprise should be systematized in accordance with existing conditions. Important aspects of the organization of investment activities are:

1. Defining the goals, objectives and objects of investment;
2. Assessment of resources, time frames, and sources of funding.

An effective investment management system will allow us to take into account the economic potential of the enterprise and adapt to changing market conditions, which is important for further development in modern realities (Dzoba, 2018).

In order to develop an effective investment strategy, it is advisable to define the principles of investment management (Fig. 1)

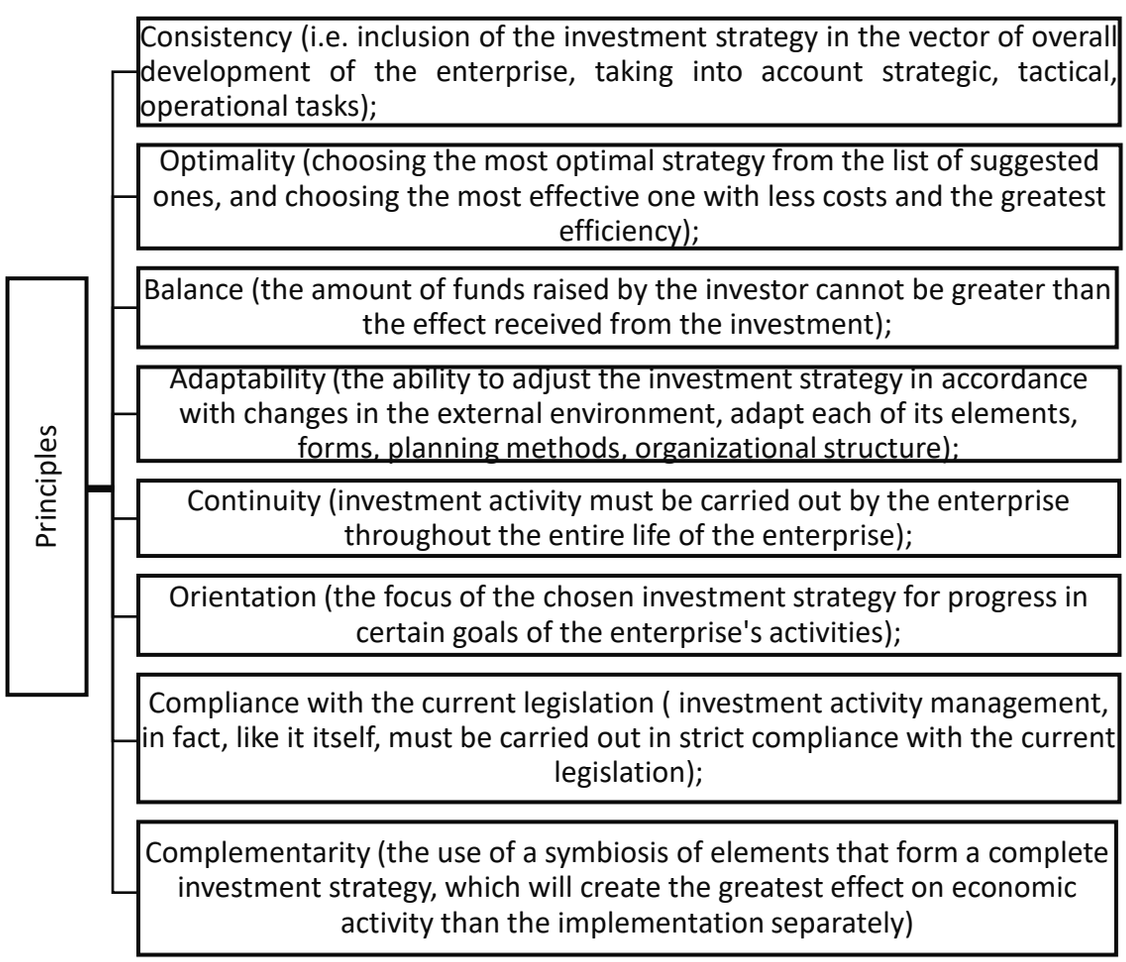

Fig. 1. Investment Management Principles
Source: compiled by the authors from source 7

An enterprise that manages its investment activities taking into account these principles and applies the proposed methodology can become a leader in the investment market among companies in the industry due to its balance and stability.

Taking into account the consistency and consistency in the implementation of investment activities, the company should carefully analyze all factors and factors of Strategic Investment Management.

Applying a strategic approach to investment management will allow you to develop a long-term plan, taking into account all the features of the industry, as well as identify and implement strategies to achieve your goals, taking into account external and internal factors of the economic situation. In addition, it will help to strengthen control over the implementation of plans and constantly adapt them in accordance with changing operating conditions (Bessonova & Komarov, 2023).

The advantages of strategic management of investment activities of an industrial enterprise include the following factors (Fig. 2).

Therefore, for the successful implementation of a strategic management system in an industrial enterprise, it is important to periodically evaluate its effectiveness using methodological approaches. This will allow you to make the necessary adjustments and achieve the best results.

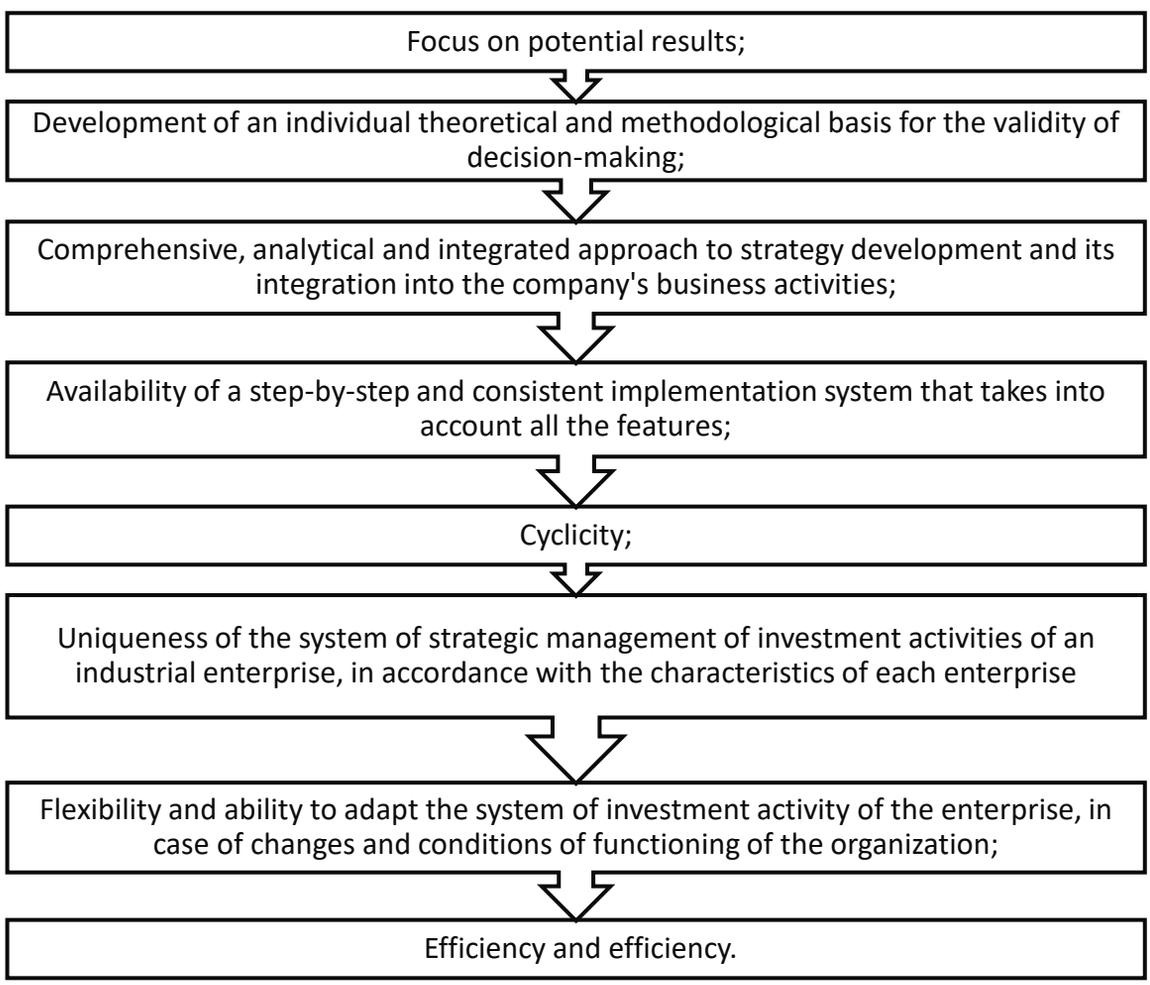

Fig. 2. advantages of strategic management of investment activities of an industrial enterprise
Source: compiled by the authors from Source 1

The effectiveness of Strategic Investment Management at the enterprise should correspond to the following key aspects (Pisarevsky, 2009). To achieve a high level of effectiveness of strategic management, it is necessary to strictly adhere to the relevant processes for its implementation in the enterprise (Fig. 3).

Thus, the assessment of the effectiveness of Strategic Investment Management at the enterprise is important in two key aspects: in scientific — as a basis for future theoretical and methodological research, as well as for the development of regulatory documents, and in practical — which allows the company to assess the overall effectiveness of its activities in the chosen area and the effectiveness of individual divisions in achieving

competitive advantages.

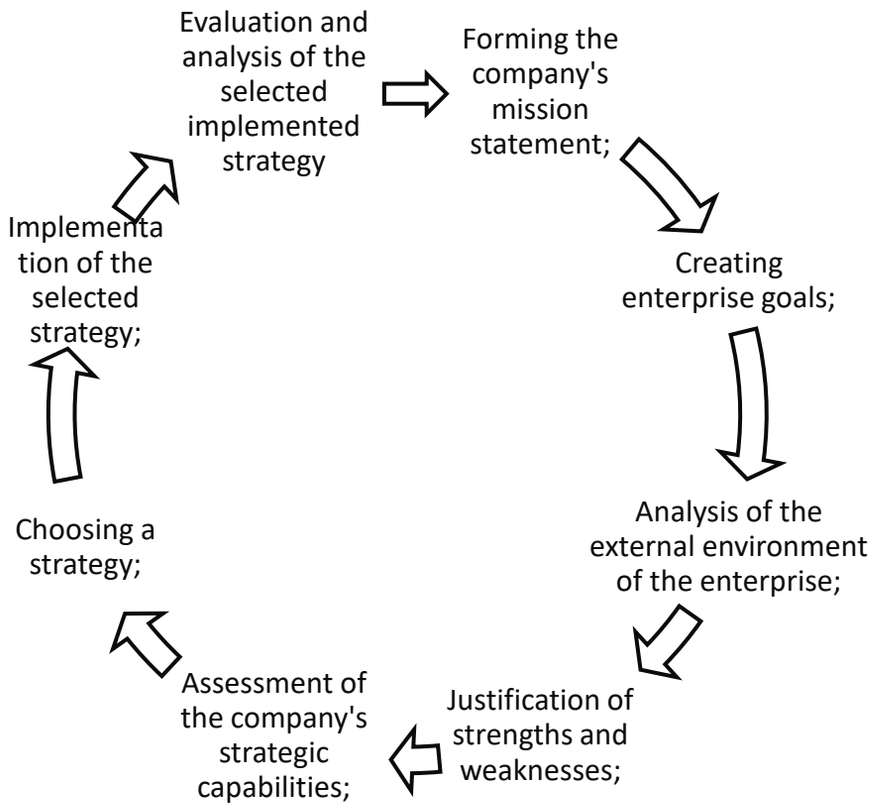

Fig. 3. stages of Strategic Management
Source: compiled by the authors from source 11

To evaluate the effectiveness of strategic management, it is necessary to first analyze it as a whole, and then consider each function in more detail in the context of the overall investment strategy. In addition, it is important to ensure consistency between operational and strategic planning, as well as preliminary evaluation of investment projects that form the basis for the implementation of the investment strategy, and monitoring their implementation (Bessonova & Komarov, 2023).

The methodological approach to evaluating the effectiveness of strategic management should be based on the following principles (Fig. 4).

Assessment of the effectiveness of strategic investment management should include analytical studies that allow identifying general conditions for investing capital, analyzing the company's investment needs, determining the availability of investment resources and checking their compliance with the investment strategy, taking into account all the necessary aspects.

A key role in this assessment is played by the analysis of production and financial activities of industrial enterprises. Based on the data obtained, it is possible to conduct a comprehensive assessment of Strategic Management and form a list of measures aimed at improving the financial condition of the enterprise. In addition, we can present another methodological approach to assessing the effectiveness of Strategic Investment Management, which is based on the corresponding components (Fig. 5).

A company's sustainability is its ability to achieve investment goals despite changes in the external and internal environment, while maintaining its core goals and potential for growth.

Congruence means that all members of the organization work together to achieve common goals.

Business progress, being a subjective concept, is evaluated depending on the interests of individuals. The effectiveness of the business process includes: regular management decision-making to evaluate alternatives, planning business processes to maximize results, and eliminating processes that do not create added value.

Conflicts of interest require taking into account the mutually exclusive interests of all parties, which affects the effectiveness of management, especially in the investment sphere, since different views can change the assessment of results.

Consistency means that the results correspond to the goals set and includes two functions: motivating,

which changes the perception of the results achieved, and corrective, which allows you to improve actions based on the identified inconsistencies.

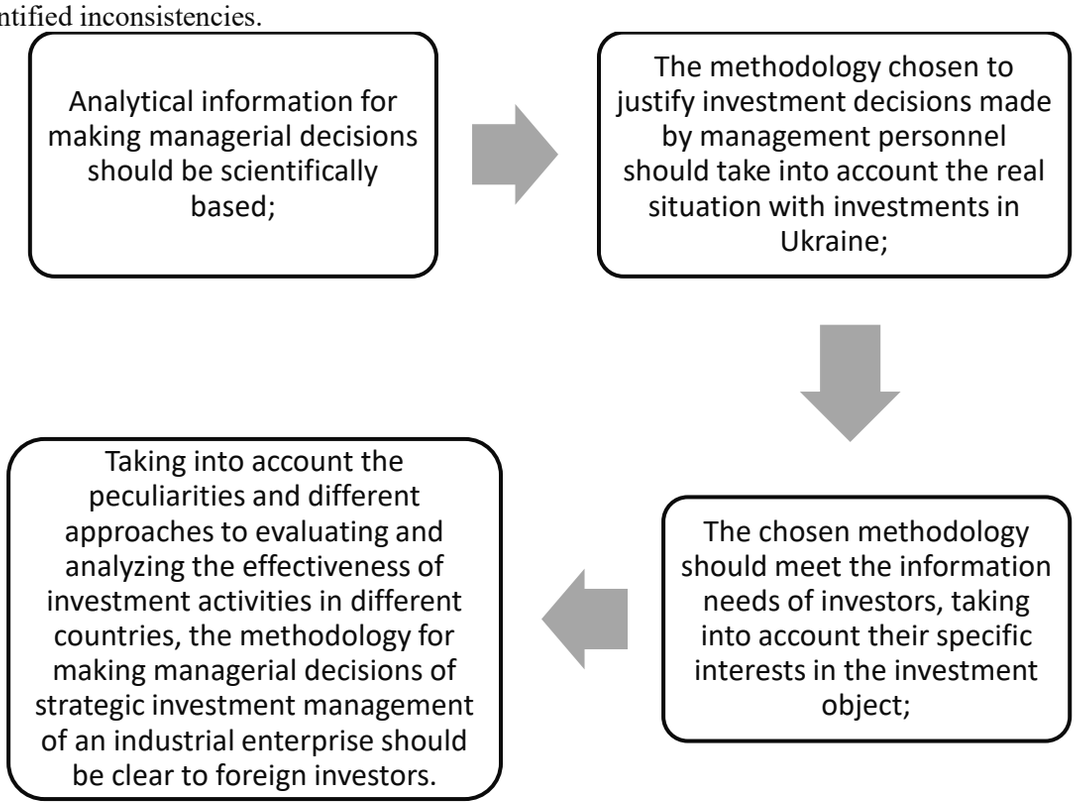

Fig. 4. methodological approach to evaluating the effectiveness of Strategic Management
Source: compiled by the authors from Source 1

The analysis of strategic management of an enterprise shows that success in achieving investment goals depends on the stability of the organization in a changing environment. The ability to adapt to internal and external challenges is key to survival and growth. Congruence, in turn, underscores the importance of joint efforts by all participants. Well-coordinated work of employees contributes to more effective achievement of common goals. It is important to ensure that individual interests do not contradict the collective goal, which requires clear communication and alignment of interests (Guzenko, 2022). Business progress should be evaluated taking into account the subjective opinions of each participant, while it is necessary to regularly review management decisions and optimize processes to improve their effectiveness. Eliminating inefficient processes increases added value. Finally, consistency between an organization's results and goals is critical.

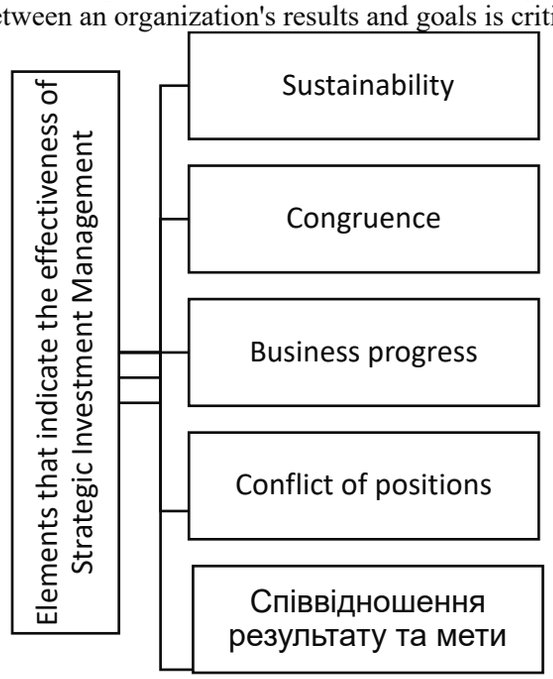

Fig. 5. components of effective strategic investment management
Source: compiled by the authors from Source 6

Effective management requires constant monitoring and adjustment of actions based on the information received to achieve the desired results and harmony in the team. Thus, strategic management involves balancing interests, sustainability, congruence, and consistency that determine business success.

Conclusions

Currently, our country's economy is facing serious challenges, and major industries are in dire need of financial injections to upgrade and modernize their production facilities. In the context of an economic crisis, the best way to raise funds for business development is to invest. For industrial enterprises, investment is a vital resource, but in order to achieve sustainable results and improve their financial condition, it is necessary to actively conduct investment activities. This activity should be based on a strategic approach to management, which allows you to achieve long-term goals and optimize the development of the company. It is also important to be able to evaluate the effectiveness of implementing an investment management strategy and develop methods for their unified analysis. Efficiency may vary depending on the economic situation, and it is necessary to compare the competitiveness of companies. The higher the position of an enterprise in the market, the greater its investment attractiveness, and the more funds will be allocated for the development of the country's economy. Timely assessment of the effectiveness of investment management can strengthen the company's position. Despite the existing interest of researchers and various methods of analysis, the issue requires further study.

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