ABSTRACTS

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Key performance indicators as a tool for evaluating efficiency of production processes

(pages 223-228)

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Keywords: key performance indicator (KPI), non-conforming product, diagnostics, maintenance.
Abstract: This paper deals with the topic of Key Performance Indicators as a tool for evaluating the efficiency of production processes. In the current competitive market environment, manufacturing enterprises face increasing demands for maximizing efficiency and performance. Traditional financial indicators often fail to capture the complexity of process improvement, necessitating a shift towards more comprehensive evaluation methods. Key Performance Indicators (KPIs) have become essential tools for assessing production efficiency, providing a framework for monitoring, measuring, and optimizing various production activities. This paper examines the implementation and benefits of KPIs in an engineering company specializing in CNC machining of metallic and non-metallic components. The research outlines a step-by-step algorithm for KPI integration, including process mapping, identification of process owners, data collection, and performance evaluation. The study specifically focuses on the KPI "number of non-conformities" to assess production stability over a 16-month period, using internal parts per million (ppm) metrics. The results demonstrate the role of KPIs in improving transparency, enhancing decision-making quality, and supporting continuous improvement initiatives. Furthermore, the paper discusses the importance of adapting to market trends, such as technological innovations and legislative changes, to maintain a competitive advantage. The findings indicate that the strategic use of KPIs allows companies not only to track operational performance but also to proactively respond to industry changes, thus fostering sustainable growth.

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Design of handling equipment for logistics operations

(pages 229-238)

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Keywords: flow of material, logistics, lifting mechanisms, stress analysis, optimization.
Abstract: The article deals with the design of a lifting mechanism for trailer trucks used in various logistics operations, e.g. forestry, farms and other areas. The study also includes a demonstration of lifting mechanisms for various logistics operations and their technical description. The lifting mechanisms are used to load loads onto a trolley or to unload loads from a trolley. Lifting mechanisms are usually driven by a separate motor unit. The transmission of forces is provided by hydraulic cylinders. The lifting arm and its parts are modelled in SolidWorks. Material characteristics are assigned to the designed mechanism and the links between the individual structural elements are defined. By meshing the model and modifying the mesh at certain critical points, the lifting mechanism is ready for stress analysis calculation. The results are von Mises stresses, displacements at individual points of the system and total deformations. The critical stresses are removed by optimization, which means designing the best possible dimensions or adjusting the geometry of the arm so that the mechanism is functional and safe. The final section deals with the various accessories that can be easily mounted on the lifting mechanism.

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Implementation of blockchain technologies in logistics: modern challenges, problems and prospects

(pages 239-251)

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Keywords: blockchain, logistics, supply chain, efficiency.
Abstract: The main goal of the study is to substantiate the conceptual aspects of the implementation of blockchain technologies in logistics with argumentation of the main problems and development prospects. A critical and scientific-methodological analysis of existing learning in the field of introduction of blockchain technologies allowed us to argue the relevance and relevance of this learning. A critical and scientific-methodological analysis of existing learning in the

field of evolution of blockchain technologies allowed us to argue the relevance and relevance of this research. Current trends in the introduction of blockchain technologies and their application in all areas and types of activities of modern companies at the global level are stated. The key advantages and disadvantages of blockchain technologies are structured. The main directions and types of blockchain technologies with their subsequent introduction in the logistics activities of companies are argued. To argue the specifics of implementing blockchain technologies in logistics and identifying the main problems and evolution prospects, multidimensional cluster analysis tools were used. The trends in the evolution of logistics activities in countries around the world based on blockchain technologies are assessed. Formalized main prospects for the development of blockchain technologies in the logistics activities of companies. The main business cases for the use and integration of blockchain technologies in logistics by world-class companies are classified. The obtained learning results have their practical value and recommendations for company managers regarding the effective assessment and organization of processes for the application of blockchain technologies in the logistics activities of current companies.

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Postal optimization by three metaheuristics – a case study

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Keywords: logistics, optimization, real-life postal delivery problem, metaheuristics.
Abstract: The efficiency of postal delivery services impacts various aspects of business operations as well as the daily lives of individuals. With the surge in online shopping, increasing expectations for timely deliveries, and intense competition, postal operators are under pressure to optimize their transportation networks. This poses a significant challenge for traditional postal systems, particularly in such areas as route optimization, resource allocation and network planning. Postal operators recognize that optimizing transportation routes is a critical task to ensure cost-effectiveness and customer satisfaction, which directly influences their business performance and market share. In this paper, we analyze three possible approaches to solving a real-life, practical instance of a postal transportation plan optimization problem. Specifically, we evaluate the performance of three metaheuristic methods: Simulated Annealing, Tabu Search, and a Genetic Algorithm. We analyze which approach performs best in a real-life scenario inspired by the operations of one of the biggest postal operators in Central and Eastern Europe. This scenario mixes elements of multiple standard routing problem specifications, like capacity constraints of vehicles and network nodes, time windows, pickups and deliveries or multiple types of vehicles.

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Key drivers of digital transformation in supply chain management: insights from enterprises in Vietnam's southeastern region

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Keywords: digital transformation, supply chain management, material flow, information flow, logistics.

ABSTRACTS

Abstract: This study aims to evaluate the impact of digital transformation on logistics and supply chain management in the Southeastern region of Vietnam, focusing on material flows, information flows, financial flows, and human flows. The research examines key factors influencing the decision to implement digital transformation, including peer influence, organizational capabilities, conversion costs, advantages of digital technology, digital technology experience, adaptation to digital technology, usefulness, and ease of use. Data was analyzed using Cronbach's Alpha to assess reliability, with AVE (Average Variance Extracted) used to validate the model. The study reports high reliability, with Cronbach's Alpha coefficients ranging from 0.864 to 0.930. AVE values for observed variables range from 0.613 to 0.769, all exceeding the 0.5 threshold, indicating that the variables met the AVE analysis requirements. The results emphasize the significant role of digital transformation in optimizing logistics flows and supply chain management, providing enterprises with enhanced efficiency and competitiveness.

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Changes of competencies in the labour market caused by the implementation of Industry 4.0

(pages 271-279)

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Keywords: competencies, change, labour market, Industry 4.0, future need.
Abstract: The digital transformation associated with Industry 4.0 is fundamentally changing the labour market, creating a need for new but also evolving employee competencies. This paper explores the future need for competencies that will be essential for successful employment in this dynamically changing environment. Based on a survey realized among Slovak industrial companies and using the AHP method, key competencies for employees at the operational management level were identified and ranked. The findings show that a successful operational manager must combine hard skills with digital systems and soft skills. The competencies that were identified as realistically the most important are in line with global trends. This confirms that employees who want to be prepared for the future and new challenges must integrate technological literacy with their personal and managerial competencies. Furethermore, the importance of efficient management of logistics processess, including the optimisation of material and financial flows, is increasing, which requires specific competencies in logistic and financial management. The paper highlights the need for companies to invest in education, reskilling and up-skilling of their employees to increase their competitiveness and at the same time to eliminate the factors that prevent them from successfully implementing Industry 4.0 principles and techniques. The paper concludes with an overview of the expected trends in the labour market and highlights the need to prepare for the new challenges and opportunities that Industry 4.0 brings.

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Transport logistics key in disaster situations: a case study in Mexico

(pages 281-289)

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Keywords: disasters, hydrometeorological phenomena, emergency declaration, humanitarian warehouse, vehicular route problem.
Abstract: Climate change has brought a significant series of environmental, economic, and social problems. An example is the disasters caused by natural phenomena, of which hydrometeorological phenomena stand out. The state of Veracruz is one of the five Mexican entities that has suffered most from these phenomena, and which is reflected in the number of emergency declarations by its municipalities. For this reason, it's essential to determine the location of humanitarian warehouses in Veracruz, to maintain the population's quality of life. With the objective of generating a strategy through which basic necessities can be supplied to victims, the Capacitated Vehicle Routing Problem is applied. This will allow for the establishment of a humanitarian warehouse located in the Altas Montañas (High Mountains) region to supply routes to 66 municipalities located in the aforementioned region together with the Capital Region, whose city governments have made emergency declarations during the period of 2012-2016. The results show 13 supply routes, with an average of 300 km traveled per route. In the normality assessments, the values of $p = 0.511$ for the kilometer variable and $p = 0.603$ for the time variable indicate that both variables do not significantly deviate from normality, suggesting that its distributions are normal.

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Optimizing suburban public transport through smart city logistics: a study on information flow and passenger management

(pages 291-299)

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Keywords: smart city, public transport, optimization, intelligent transport systems, suburban mobility.
Abstract: The study explores how Smart City technologies influence logistics operations in suburban public transportation systems. By enhancing passenger and vehicle movement, the study assesses the role of sensor data, real-time information, and data analysis in improving the flow of materials, personnel, and information in suburban transit. Findings demonstrate that Smart City initiatives lead to shorter wait times, improved route optimization, and greater reliability, thereby boosting overall transport logistics. Through real-time data processing, suburban systems can manage flow dynamically, offering valuable insights for scalable implementations in both urban and suburban logistics.

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A study of vehicle speed distribution influenced by urban traffic conditions

(pages 301-310)

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Keywords: transportation, urban traffic, traffic conditions, traffic flow management, speed distribution.
Abstract: The most common approach in forecasting vehicle speed is to estimate the average value of this variable on a short segment or at some cross-section on the road. Since many factors influence the speed variable, determining the speed distribution law remains actual. Given that the numerous studies confirm the normally distributed free-flow speed on intercity roads and a minority of urban speed studies, the mentioned task is especially relevant for urban transport planning which often requires consideration of traffic conditions far from the free-flow ones because of traffic signalling and other factors, which complicate driving and decrease the speed compared to the desired one. This paper explores the speed influenced by two types of places frequent in urban areas – signalized intersections and narrow carriageway sections. The data for the study were collected in Kharkiv, the second-largest city in Ukraine. During the study, it was determined that the narrow carriageway decreases the speed in a way that speed values can be described by the gamma distribution, while the influence of signalized intersections results in the possibility of using both exponential and gamma distribution to represent the speed variable. To measure the speed during the surveys, a novel methodology that considers the waiting for the green signal was applied. The research results showed that the urban traffic environment decreases the mean of the speed variable, increases its standard deviation and changes the normally distributed free-flow speed to the gamma-distributed.

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A business continuity-based framework for risk management in smart supply chains: a fuzzy multi-criteria decision-making approach

(pages 311-322)

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Keywords: smart supply chains, business continuity, risk management, fuzzy risk assessment, multi-criteria decision making.
Abstract: The aim of this study is to develop a novel framework for managing risks in smart supply chains by enhancing business continuity and resilience against potential disruptions. This research addresses the growing uncertainty in supply chain environments, driven by both natural phenomena-such as pandemics and earthquakes—and human-induced events, including wars, political upheavals, and societal transformations. Recognizing that traditional risk management approaches are insufficient in such dynamic contexts, the study proposes an adaptive framework that integrates proactive and remedial measures for effective risk mitigation. A fuzzy risk matrix is employed to assess and analyze uncertainties, facilitating the identification of disruptive events and the selection of appropriate risk treatment plans. Moreover, the framework leverages a fuzzy reasoning system in conjunction with a multi-criteria decision-making method to process ambiguous information, thereby enhancing decision accuracy and reliability. The findings demonstrate that this comprehensive approach not only prioritizes risks effectively but also supports companies in refining their response strategies, ensuring the efficient delivery of services under challenging conditions. Ultimately, the study redefines resilience as a dynamic process of navigating and adapting to chaos rather than merely resisting it.

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Identification of the bottlenecks in the non-production conveyor system using a simulation model

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Keywords: simulation, conveyor non-production system, bottlenecks, Tecnomatix Plant Simulation, Anylogic.
Abstract: The performance of industrial systems is influenced by external factors, such as supply chain disruptions. The system usually cannot influence them much and must actively adapt to those external factors. On the other hand, there are also internal factors such as process synchronization and communication or resource allocation, which are entirely within the control of the system. Communication and synchronization need to be continuously monitored and assessed for various standard and non-standard situations. For such complex problems, which usually cannot be solved in acceptable time and resources by simple or exact methods, simulation is suitable and often used. This study uses simulation models to identify bottlenecks and propose corrective measures in a conveyor system used for processing customer-returned goods. Two simulation tools, Tecnomatix Plant Simulation (TPS) from Siemens PLM Software and AnyLogic software from AnyLogic Company, were used to model the system and test potential optimizations. The analysis identified critical bottlenecks, allowing targeted interventions, such as increasing conveyor speeds and optimizing input rates, which led to significant improvements in throughput and operational efficiency. Furthermore, the study demonstrates how simulation results can guide decision-making in areas such as resource allocation, capacity planning, and maintenance scheduling. While TPS proved more effective for detailed bottleneck analysis, AnyLogic's multi-method capabilities highlight its suitability for hybrid applications. The findings underscore the value of simulation in optimizing complex systems and provide insights applicable to other industrial sectors, emphasizing the potential of emerging technologies such as digital twins and AI-enhanced models to drive further innovation.

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ESG reporting in the automotive industry

ABSTRACTS

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Keywords: automotive industry, carbon footprint, energy transformation, ESG, non-financial reporting.
Abstract: The aim of the article is to discuss the reporting of environmental information regarding sustainable development and ESG regulations in automotive companies listed on the Warsaw Stock Exchange. The article presents the results of own research on the scope of disclosure of information on ESG reporting in the field of environmental information among 5 companies from the automotive sector listed on the Warsaw Stock Exchange in 2022-2023. The methodology was based on a review of the literature on the subject, legal acts and own research, in which non-financial reports of listed companies in the automotive sector concerning environmental information and indicators were used. The research problem addressed by the authors was to investigate whether automotive sector companies disclosed environmental information in the period prior to mandatory regulations in this area. The results of the research confirmed the authors' assumptions that these companies published such information. At the same time, the scope of information disclosed varied significantly between companies. According to the authors, the article adds value to the literature on the subject, especially in terms of the collection, presentation and discussion of source material. The information collected in the empirical chapter can be used, among other things, to compare the scope of environmental information disclosed by companies from Poland with companies from other countries in the automotive sector. The subject of the article can provide a basis for further detailed empirical research in this area.

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Enhancing logistics of intermittent demand items: optimization via simulation based stock control using empirical method

(pages 349-358)

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Keywords: supply chain management, stock control, intermittent demand, optimization via simulation, empirical method.
Abstract: In this paper we examine whether empirical method can replace bootstrapping in intermittent demand stock control based on simulation. Thus, we generate artificial demand data with 30; 50 and 70 % of zero demand periods and simulate reorder point/fixed order quantity inventory control policy using past stock movement simulation and the local search to obtain the optimal trade-off between holding and ordering costs and the required fill rate for order lead time 2; 6; 12 and 18 periods. The outputs from simulation experiments prove that empirical method outperforms bootstrapping in term of the consumption of computational time while maintaining similar ability to overestimate lead time demand. Thus, empirical method can become a suitable substitute of bootstrapping in the local search. Moreover, it can be successfully used to generate an initial reorder point in a more on a one-way neighbourhood search oriented optimization. As empirical method copes both with theoretical and empirical demand distributions and does not require a deciding on number of sampling runs, an optimization of smoothing constants based on a selection of an appropriate accuracy metric, an adoption of a demand classification schemes or a data aggregation it is well predetermined to become an important part of a simulation-optimization software solution focusing on sporadic demand inventory control in large scale real life tasks.

ABSTRACTS

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Smart solutions for importing automotive components from Europe to Mexico

(pages 359-368)

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Keywords: AHP technique, Weber problem, location allocation problem, exportation efficiency, consolidation centre.
Abstract: This study presents a strategic approach to optimizing the importation of automotive components from Europe to Mexico, aimed at enhancing operational efficiency, reducing costs, and ensuring timely deliveries. Using the Analytic Hierarchy Process (AHP) as a structured decision-making tool, the research evaluates and selects the optimal port of departure based on criteria such as cost, transit time, and port capacity. The Weber Location Problem (WLP) is also applied to determine the ideal consolidation center (CC) location to streamline cargo collection from multiple European suppliers. Through a Mexican automotive company case study, the research highlights the importance of integrating Full Container Load (FCL) and Less Container Load (LCL) operations to improve traceability, reduce handling errors, and optimize supply chain performance. The findings emphasize the critical role of port selection and cargo consolidation in mitigating risks associated with supply chain disruptions. The proposed methodology provides importers practical tools to strengthen their logistics strategies, offering valuable insights for enhancing global automotive supply chain competitiveness. This work contributes to maritime logistics and supply chain management, guiding importers, shipping companies, and policymakers in improving port efficiency and cross-border operations.

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Digital marketing in logistics: how new technologies change the rules of the game

(pages 369-380)

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Keywords: digital marketing, logistics, technology, efficiency.
Abstract: In the conditions of the rapid development of technologies, digital marketing in logistics undergoes significant changes. The article examines how innovative technologies - such as artificial intelligence (AI), blockchain, the Internet of Things (IoT), and automation - are transforming traditional approaches to logistics, providing improved customer interaction, supply chain optimization, and increased transparency of operations. The main goal of the research is to analyze the influence of new technologies on marketing and logistics processes, as well as to identify relevant strategies for increasing the efficiency and competitiveness of companies. The research methodology includes the use of data analysis, statistical models and examples from the practice of leading global companies. The main tasks of the article are to reveal how digital marketing contributes to the improvement of the customer experience and how technologies allow companies to adapt to modern market conditions. The main results made it possible to substantiate that the implementation of AI allows to improve the personalization of offers and increase the accuracy of demand forecasts, while the blockchain contributes to increasing trust and transparency in supply chains. IoT allows companies to track goods in real time, and automation reduces costs and speeds up order processing. On the basis of the obtained results, it is proved that the digitalization of marketing and logistics processes of modern companies contributes to the strengthening of positions on the market and creates a basis for sustainable growth in the conditions of a rapidly changing economic environment.

ABSTRACTS

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Route analysis of waste transportation vehicles in urban areas using the saving matrix method

(pages 381-390)

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Keywords: waste transportation, vehicle capacity, tangkasaki truck, route optimization, saving matrix.
Abstract: The increase in population in Indonesia, particularly in the city of Makassar, will be followed by an increase in the volume of waste generated. Tamalate District, as part of Makassar City, has a waste generation volume of 583 m³/day, requiring waste management to be addressed through waste collection services to handle the amount of waste produced. This study identifies the existing conditions of tangkasaki truck service routes to obtain data on service locations, number of vehicles, travel distance, travel time, and operational costs. The identification shows that there are 37 waste disposal sites served by 11 trucks at night, but the waste transportation is considered inefficient due to the underutilization of vehicle capacity. This study aims to optimize waste transportation routes with using the saving matrix method by maximizing vehicle capacity. The saving matrix method is used to evaluate fleet requirements on existing routes by considering vehicle capacity, working time, and predetermined fuel consumption. The research results show that proposed routes with the implementation of the saving matrix method can reduce the number of tanker truck fleets from 11 units to 9 units. The efficiency of travel distance is 21.7%, previously 294.4 km/day reduced to 230.4 km/day. The efficiency of travel time is 8.9%, previously 2,063 minutes/day reduced to 1,880 minutes/day by maximizing the working time of each service route and operational cost efficiency within one month of service is 22.6%, previously IDR 99,330,000.00 reduced to IDR 76,900,320.00.

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Mitigating the effects of Russia's invasion of Ukraine on global food security – does the transit of Ukrainian cereals through Poland matter?

(pages 391-398)

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Keywords: international agricultural trade, export route, grain transit, food security, Russia-Ukraine war.
Abstract: The article presents the results of empirical research, which constitutes a case study focused on the route through Poland as an alternative export channel for Ukrainian grain, developed under the conditions of the Russia-Ukraine war. It employs analytical methods and statistical description. By analyzing the volume, dynamics, structure, and geography of the transit, the significance of this route in unleashing Ukraine's export capabilities and its role as a substitute for traditional routes during periods of disruption is assessed. It was established that almost exclusively corn and wheat are transited (in a quantitative ratio of 2:1). The railway crossings in Dorohusk, Medyka, and Hrubieszów are of key importance, as rail transport dominates in land transport, handling over 4/5 of the total mass of transited goods. More than half of the transited grain is transported by rail and road in scattered European directions, and only less than half reaches Polish Baltic ports, mainly Gdańsk (over 3/5) and Szczecin (almost 1/5). The degree of containerization exceeds 1/4. Practically all container cargo reaches the terminal in Gdańsk, while the port in Szczecin is the leader in bulk transport. The volume of Ukrainian grain transited through Poland is relatively small compared to Ukraine's export potential, and intercontinental transport concerns only a tenth of the grain transited through Poland. It was concluded that the route through Poland primarily serves as a new export channel for Ukrainian grain to the European market and only marginally substitutes traditional routes.

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Evaluating the efficiency of consulting officers in managing the implementation of engineering construction projects in Iraq

(pages 399-416)

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Keywords: consulting project factors, TOPSIS, AHP, quality criterion, Delphi method.
Abstract: This research examined the engineering projects supervised by Iraqi internal management teams and evaluated the role of consulting firms in this area. The principal elements evaluated in analyzing engineering project execution management tools, methodology, objectives, resources, and success rates were time, cost, quality, and project scope. This research aims to create a detailed inventory of the services, functions, and requirements of the technical control and engineering consulting sectors in relation to national and international standards. This work utilized pertinent data and expert opinions to analyze the operations of consulting companies in Iraq via the Delphi method. The preliminary phase, considering workplace variations, was the creation of a related matrix utilizing local data to determine the relative significance of each component. After evaluating the second phase's data utilizing the Excel-based TOPSIS methodology, the factor ratings were calculated. The AHP-TOPSIS method assessed the ability to reason and resolve difficulties, handle conflicts, additional project expenditures, cost differences across four orders, and financial flow. In assessing variables, here is where the outcomes truly excelled. The research further concludes that the efficiency of consulting officers plays a pivotal role in overcoming the challenges of project execution in Iraq. Their ability to address time, cost, and quality issues directly influences the overall success of engineering construction projects.

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Managing supply chains amidst geopolitical instability

(pages 417-426)

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Keywords: global supply chains, supply chain management, uncertainty, risks, supply chain optimisation.
Abstract: The stable functioning of global logistics supply chains is a necessary condition for meeting consumer needs, developing production and growing the economy as a whole around the world. The current situation with global economic uncertainty is seriously testing the sustainability of international supply chains, revealing their vulnerabilities and the need for diversification. The study aims to analyse the transformation of global supply chains in the context of geopolitical changes to substantiate adequate directions and tools for managing and optimising logistics processes to achieve a competitive advantage in a dynamic business environment caused by geopolitical uncertainty using modern supply chain management platforms. The study is based on theoretical and statistical data and comparative analysis to identify the impact of global geopolitical changes on supply chain management. The publication explores the world economy's challenges due to changes in global trade relations caused by factors, including the pandemic and military conflicts. It is proved that the dynamics of international associations and the growth of protectionist policies are the driving forces that lead to the destabilisation of global supply chains and the intensification of trade contradictions. The study identifies ways to optimise global supply chains, considering integrating digital technology tools into supply chains, which can provide more accurate tracking of goods, increase transparency of operations and reduce the risks of counterfeiting and fraud.

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Study on the supply chain for spare parts

(pages 427-436)

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Keywords: logistics, supply chain, spare part.
Abstract: The study aims to analyze the reasons for unpunctual service - aspects related to the absence of a spare part during and immediately after the launch of a new product (New Product Interoduction - NPI flag). The data collection for the survey research is based on customer interviews. The customer surveys were conducted with the help of the computer manufacturer of one of the companies that provide after-sales service for computer devices that are not manufactured by the same company and are therefore suitable for the research in order to determine the existing level of after-sales service with spare parts and the possibilities for its improvement. Data collection for the supply chain performance study was conducted from January 1, 2023 to January 1, 2024. The study covered 149,937 processed customer warranty claims from a computer manufacturer and showed the level of customer service over a one-year period. The biggest weaknesses in the supply chain for spare parts that provide after-sales service for new products are the uncertainty of future demand and warranty failures that these products will cause.