ABSTRACTS

Resilience strategies for risk environments in the foreign trade logistics operations of SMEs

(pages 1-11)

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Keywords: resilience, risks, principal component analysis, flow logistic, supply chain.
Abstract: Foreign trade fosters a country's economic growth and ensures that consumers can satisfy their needs and that SMEs can compete in other markets, both domestic and international. International negotiations require multiple strategic decisions between buyer and seller, such as the location of the supplier of inputs or raw materials, price, quality, management of information, the contracting of logistics operators, the terms of international negotiation, and in addition, compliance with international regulations and the legalization of the goods established in trade agreements or free trade agreements between countries. However, multiple internal and external variables in foreign trade logistics processes jeopardize the optimal flow of the chain. In consideration, SMEs are more affected. This research, in addition to identifying and studying, through principal component analysis, the different variables that pose a risk of disruption in the foreign trade logistics operations of SMEs, allows for the alignment of strategic decisions to minimize risk and increase the resilience of SMEs. It should be noted that, in the study, a 26-question survey was designed and applied to a sample of 63 Colombian SMEs, and SPSS version 25 software was used.

Fiscal and regulatory incentives for electric vehicle adoption in Polish micro-enterprises: economic analysis and policy recommendations

(pages 12-30)

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Abstract: Microenterprises constitute the dominant group of companies in Poland, but rarely adopt electric vehicles (BEVs) due to high purchase costs, limited range, underdeveloped charging infrastructure, and the typical short-term investment horizons of microenterprises. This study aims to analyze microenterprises' opinions on BEVs in Malopolskie voivodship and to evaluate the effectiveness of incentives. A CAWI survey of 307 respondents (90% confidence, 10% margin of error) tested the hypothesis that BEVs would become more popular among microenterprises if there were more incentives for their purchase (even though according to respondents, BEVs are suited to city-center access (where combustion engines are banned) or serve as second cars for long trips, given their lower versatility and longer charging times). Results of the survey show that 84.4% of journeys are below 300 km (BEV range), but 65-78% of respondents provide the following barriers to BEV adoption: high price, range anxiety, insufficient charging stations, and long charging times. According to the survey, the following are significant incentives to buy BEVs: subsidies up to PLN 40,000 (8.5%), free city parking, and free city access to low-emission zones. The survey also showed that 20.5% of respondents planned to buy passenger BEVs, and 7.5% planned to buy delivery BEVs.

Transformation of controlling in perspective of reengineering and modification of organizational structures in industrial enterprises

(pages 31-41)

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Abstract: Organizing as a key management function appears in two basic forms, dynamic and static. The dynamic form includes the processes and activities taking place in the organization that ensure its effective functioning. The static form is represented by the organizational structure, which determines the way the organization is structured and the interrelationships between the individual components of the organization. Every organization has some type of organizational structure, which may be informal or formally established. This organizational structure determines the management and coordination of operations in the enterprise. Transformation of organizational structure should be considered when it is unable to respond to the changing conditions of the enterprise functioning. Such a transformation would help to improve the management systems of the enterprise. This paper focuses on controlling as a management support function in industrial enterprises and the reasons for its transformation. The aim of the research was to assess the need for transformation of controlling in industrial enterprises in Slovakia. The research tool used in the paper was a questionnaire, which was distributed to medium and large enterprises in Slovakia. The paper also analyses the reasons for non-transformation of controlling as well as the advantages and disadvantages of this transformation. The transformation of controlling primarily brings standardization and simplification of processes, leading to greater efficiency, cost savings, and improved team coordination. Although the transition may temporarily reduce data quality and affect decision-making, the overall benefits significantly outweigh the risks, making the company more competitive and adaptable to market challenges.

Unlocking the potential of logistics service quality: insights into customer satisfaction and loyalty via an extended SERVQUAL approach
(pages 42-51)

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Keywords: logistic service quality, customer satisfaction, customer loyalty, SERVQUAL.
Abstract: The rise of e-commerce has intensified the demand for logistics services, emphasizing the need for research on service quality to enhance efficiency and customer satisfaction, ultimately fostering loyalty. This study explores the impact of Logistics Service Quality (LSQ) on customer satisfaction and loyalty in the dynamic logistics market of Ho Chi Minh City, Vietnam. Employing an extended SERVQUAL model, this study investigates six dimensions of Logistics Service Quality (LSQ): tangibility, reliability, responsiveness, assurance, empathy, and the newly added dimension of fairness, thereby providing a more comprehensive and nuanced understanding of logistics service quality. A quantitative approach was employed, analyzing data from 409 logistics service users using Partial Least Squares Structural Equation Modelling (PLS-SEM). The findings indicate that all the service quality dimensions positively influence customer satisfaction, except for reliability, suggesting a potential misalignment between customer expectations and the consistency of service performance in this market. Additionally, customer satisfaction was found to be a strong and positive predictor of customer loyalty. These results provide practical insights for logistics providers to prioritize service attributes that most effectively enhance customer satisfaction and loyalty. The study contributes to the literature by validating an extended LSQ model in a key Southeast Asian context and offers a managerial framework for improving customer relationships and sustaining a competitive advantage. This research is highly relevant for both scholars and practitioners in logistics, offering a solid empirical foundation for improving service quality and fostering customer loyalty in the sector.

Application of machine learning to storage allocation decision making system within air cargo terminals
(pages 52-65)

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Keywords: air cargo terminal, storage allocation, random forest, decision support system, machine learning.
Abstract: The rapid growth of global air cargo demand has intensified the need for more efficient and intelligent storage allocation within airport cargo terminals. Traditional static allocation and rule-based systems struggle to adapt to dynamic cargo flows, leading to operational inefficiencies. This study aims to develop a hybrid decision support system that optimizes storage allocation by integrating machine learning and multicriteria decision-making techniques. A Random Forest Classifier was trained using historical cargo data, including weight, quantity, size, priority, and cargo type, to predict optimal storage zones. To enhance interpretability and expert control, the Analytic Hierarchy Process AHP was used to derive feature weights, while the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) was employed to rank the best storage alternatives. The model was tested on real-world data from Almaty International Airport involving 1,500 cargo orders. Results show that the system reduced average storage time by 14%, minimized cargo redistributions by 22%, increased storage density by 9%, and improved on-time delivery for priority cargo by 17% compared to traditional FIFO-based methods. The integration of data-driven learning with expert judgment offers a robust and transparent decision-making framework. These improvements confirm the value of combining machine learning with AHP–TOPSIS methods in logistics operations. This system presents significant implications for airport terminal managers seeking to enhance operational throughput, academic researchers exploring hybrid intelligent systems, and policymakers promoting digital logistics infrastructure. Future studies may include adaptive learning, seasonal cargo flow modelling, and digital twin-based scenario testing to further generalize the solution.

Driving performance: benefits of operational excellence in the automotive industry
(pages 66-74)

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Keywords: automotive industry, operational excellence, benefits, supply chain management, logistics flows.
Abstract: The rapidly growing Moroccan automotive industry faces intense global competition, demanding cutting-edge operational excellence (OpEx). A major challenge lies in understanding and concretely applying the benefits of OpEx in this specific context, particularly concerning flow and supply chain management. This study aims to explore the impact of implementing operational excellence practices on the performance of companies operating within Morocco's automotive sector, specifically identifying the key dimensions that contribute most to this improvement and their implications for competitiveness and logistical performance. To this end, a structured questionnaire was developed and distributed to 264 firms in the industry. The pilot study yielded 246 valid responses, resulting in a response rate of 93%,

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thereby ensuring a high level of representativeness across the sector. The reliability and validity of the measurement instruments were rigorously assessed, and data analysis was conducted using the statistical software SPSS, version 28. The findings highlight eight core dimensions identified as the most influential drivers of operational excellence in the specific context of the Moroccan automotive industry. Results indicate that the adoption of these practices leads to notable improvements in profitability, customer satisfaction, and organizational responsiveness to market shifts, particularly within logistics operations and the overall supply chain. These insights offer practical guidance for industry stakeholders aiming to strengthen long-term competitiveness and provide a valuable empirical foundation for researchers and practitioners seeking a deeper understanding of the tangible benefits associated with operational excellence in industrial settings, especially regarding logistics management and flow optimization.

Optimisation of wind park location
(pages 75-87)

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Keywords: wind parks, location models, multi-criteria evaluation of variants, PROMETHEE II.
Abstract: The development of wind farms within each country's energy system is a significant step towards reducing greenhouse gas emissions and enhancing energy security. Given Slovakia's high potential for wind energy and the limited exploitation of this resource, this study conducted a multi-criteria analysis of factors influencing decisions on the location of wind farms. The effective integration of this renewable source requires optimized planning and management of material, information, and investment flows, which are key elements of logistics management in the construction and operation phases of wind farms. The correct location of wind farms requires an analysis of several logistical and technical elements, such as infrastructure availability, transport flows, energy flows, information flows, legal and environmental constraints, as well as wind conditions (e.g., average wind speed, wind energy density). The PROMETHEE II method was used to assess potential sites, allowing for the comparison of alternatives based on preference flows. The output of the analysis is a map of the logistical suitability of different locations, along with a ranking of areas derived from net flow calculations (location-based logistics). The findings of this study can contribute to the effective management of logistics processes in the renewable energy sector, as well as to better management of investment, information, and material flows in the construction of wind farms in Slovakia.

Changes in resilience models in the healthcare supply chain
(pages 88-97)

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Abstract: The events of the last five years have had a huge effect on the healthcare supply chain. The system has encountered challenges such as the COVID-19 pandemic and political conflicts. At the same time, sustainability pressures are increasing. These disruptive incidents have revealed weaknesses in the supply chain and lack of resilience. As a result, changes in resilience models have begun to be planned and implemented. The article looks at the main changes in resilience models, emphasizing new models, measures, and attitudes to ensure healthcare logistic. Factors such as risk forecasting, diversification of supply sources, the impact of digitalization, timely inventory management, and strengthening cooperation with suppliers are analyzed. Models that are oriented toward greater flexibility and systemic resilience assessment in general are also discussed. Based on the literature review, it can be concluded that the development of dynamic, predictive, and technology-based robustness models can minimize the harm caused by supply chain disruptions and ensure the stability of the healthcare system. The results of the review indicated that the newest direction for models is the flow of smart technologies. This is expensive, but digitalization can ensure a robust supply chain in the healthcare sector.

Data analytics for supply chain resilience: a multiple case study analysis
(pages 98-113)

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Abstract: Developing supply chain (SC) resilience through data analytics has emerged as an important area of research recently. However, the current literature offers a limited common understanding of the impact of data analytics enabling SC resilience across several phases of resilience development. Thus, this study aims to explore the role of data analytics in identifying potential supply chain disruptions, mitigating risks, and improving supply chain performance. We use a multiple-case study qualitative research approach to understand how firms successfully implement data analytics in their supply chain operations. The research data were collected through semi-structured interviews conducted with 7 supply chain experts from six different firms in Finland. The analysis includes investigating specific tools and techniques used, the data sources, and the types of data analyzed. In addition, this study explores the challenges firms face during the implementation of data analytics and how data analytics effectively builds supply chain resilience. The findings highlight that data analytics offers valuable insights into the supply chain and supports firms to proactively identify and mitigate risks. Furthermore, this study highlights the importance of data quality, data integration, and the need for new skills and capabilities in implementing data analytics in the supply chain. This study contributes to the emerging literature on data analytics' role in developing supply chain resilience and offers insights into the challenges and opportunities associated with its practical implementation. This study offers several theoretical and practical implications for supply chain research and managers.

Optimizing logistics and production flows for sustainability in green flexible job-shops
(pages 114-126)

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Keywords: industrial logistics, green flexible job-shop, constraint programming, particle swarm algorithm.
Abstract: In industrial operations, the effective optimization of logistics and production flows, including material, energy, and information flows, is essential for improving operational performance while reducing environmental impacts. The combinatorial complexity of the green flexible job-shop scheduling problem (GFJSP) and its connection to sustainable manufacturing have attracted significant attention in recent research. This study aims to minimize total flow time and carbon emissions by optimizing the management of industrial flows, while accounting for technical elements of logistics such as production sequencing, resource allocation, and coordination of material and energy flows. Two complementary solution approaches are proposed: an exact constraint programming (CP) model for small-sized instances, ensuring optimality, and a particle swarm optimization (PSO) algorithm enhanced with an energy-aware encoding scheme and logistic map-based population initialization for medium and large-scale problems. Numerical experiments demonstrate the effectiveness of both approaches in addressing operational efficiency and environmental objectives. The novelty of this work lies in integrating the management of logistics and production flows with sustainable scheduling through a hybrid exact–metaheuristic strategy. Sensitivity analysis further validates the robustness of the PSO, highlighting how exact and metaheuristic methods complement each other to tackle complex industrial scheduling challenges. Overall, this study provides both scientific insights and practical guidance for managing logistics and production flows in sustainable industrial systems.

The success factors and objectives of strategic monitoring practices in Sub-Saharan Africa: a case study of Moroccan exporting SMEs
(pages 127-136)

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Keywords: strategic monitoring, information behaviour, uncertainty, risk, SMEs.
Abstract: The aim of this paper is to clarify the role of the strategic monitoring in the process of internationalization of the Moroccan SMEs in the Sub-Saharan African market and to identify the determinants and risks that influence the success or the failure of this internationalization. The objective is to assess a roadmap for the practice of strategic monitoring adapted to SMEs in the African context. By conducting a study on 14 Moroccan SMEs, the study's findings

confirm that the strategic monitoring practices are influenced by the perceived uncertainties of internationalization relative to six environmental sectors. The management of uncertainty depends on the company's ability and its informational skills to access useful and valid information on the national and international markets. Managing the complexity of a constantly volatile environment requires strategic intelligence stimulated by strategic uncertainty. The results of analysing the collected information enable exporting SMEs to make the right strategic decisions and consequently reduce and/or eliminate perceived uncertainties.

Simulation-based universal model for food SMEs: material flow optimization using Tecnomatix Plant Simulation
(pages 137-149)

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Abstract: Small and Medium Enterprises (SMEs) in the food and beverage sector face significant challenges in developing standardized production models that can be universally applied across different business scales and configurations. This study aims to develop a universal production model for grilled chicken rice SMEs using Tecnomatix Plant Simulation software to optimize workstation configuration and worker allocation. The research analyzed production data from 10 grilled chicken rice SMEs in Makassar City to establish baseline parameters for simulation modeling. Three workstation scenarios (4, 5, and 6 workstations) were simulated with varying worker allocation strategies: single worker per workstation, worker merge scenarios, and no-worker configurations to determine optimal resource utilization. The simulation results identified 4-workstation configuration with worker merge strategy as the optimal model, achieving 42.52% working time, 0.11% setup time, and theoretical maximum throughput of 295.89 units per day with 21:57 minutes average lifespan. The developed universal model includes standardized operating procedures and layout recommendations that can be adapted by various grilled chicken rice SMEs regardless of their current scale or configuration. This research contributes to simulation-based optimization methodology for small-scale food businesses and provides practical implementation guidelines for SME production standardization.

FinTech and digital platforms for financial inclusion in Jordan: logistics and operations aspects of sustainability
(pages 150-161)

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Abstract: The study aims to analyze the role of financial technologies (FinTech) and digital platforms in expanding access to financial services in Jordan, taking into account the logistical and operational aspects of sustainable development. The goal of the work is to determine how innovative tools of mobile banking, digital wallets, crowdfunding and blockchain contribute to increasing financial inclusion, supporting small and medium enterprises and achieving sustainable development goals. The study assesses the impact of FinTech on the management of information and financial flows, identifies key barriers (technological, educational, regulatory) and formulates recommendations for improving the efficiency of the national financial sector. The methodological base includes a comprehensive analysis of quantitative indicators of the use of digital financial services and a qualitative assessment of the factors determining the readiness of the Jordanian financial system to implement FinTech solutions. This approach allows us to compare the level of digitalization of the financial sector with the possibilities of optimizing logistics and information flow management. The results show that FinTech tools expand access to finance for socially vulnerable groups, including rural communities and women entrepreneurs, stimulate entrepreneurial activity and strengthen market resilience. Prospects for further development are associated with improving public policy, creating intersectoral cooperation and developing digital competencies of the population. These measures will increase the competitiveness of the Jordanian financial system and accelerate its integration into the global digital economy.

Applying Bayesian Neural Networks to optimize maintenance logistics
(pages 162-173)

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Abstract: In maintenance logistics, optimising material and information flows requires predictive methodologies that cope with uncertainty and support decision-making across the maintenance supply chain. This paper proposes a Bayesian Neural Network (BNN) approach to predict maintenance demand and improve logistical planning of spare parts and technician deployment in flow-based production systems. By incorporating uncertainty directly into model outputs, the BNN provides probabilistic predictions that enhance robustness, precision, and responsiveness within logistics operations. The model is trained and validated on historical maintenance data and synthetic scenarios generated to reflect stochastic degradation and repair behaviour typical of industrial flow environments. Compared to deterministic benchmarks, the proposed approach demonstrates superior logistics performance, with improvements in downtime reduction, spare-parts availability, and overall material-flow efficiency. These insights highlight the benefit of probabilistic modelling as a decision-support tool for maintenance logistics in complex manufacturing logistics systems.

ABSTRACTS

Methodology for inventory management with sporadic demand in the conditions of custom production of a small and medium-sized enterprise

(pages 174-185)

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Keywords: demand forecasting, sporadic demand, Croston's method, bootstrap method, custom production.
Abstract: The article deals with the very actual topic of inventory management with sporadic demand in small and medium-sized enterprises. The research aims to propose an easy-to-apply procedure for predicting dependent demand or consumption based on the analysis of the inventory assortment. The proposed methodology is particularly suitable for small and medium-sized enterprises and therefore does not require any special software products. The requirement is that it must be sufficiently reliable in terms of prediction accuracy. The methodology can be applied using commonly available spreadsheets. The solution is based on dividing the inventory assortment into nine groups based on the results of ABC/XYZ analyses. The sample consists of 60 inventory items with fluctuating demand predominating. Six forecasting methods were tested on this sample (naive forecasting, shorter and longer moving averages, linear regression with and without seasonal indices, and Croston's method). The solution was then supplemented with a bootstrap simulation. The reliability of each method's forecast was evaluated using the metrics of mean absolute error, mean absolute percentage error, and demand planning accuracy. Based on the empirical results, recommendations were formulated for selecting a suitable forecasting method for each inventory group.

Electric vehicles for cleaner urban logistics: what motivates consumers to choose green delivery?

(pages 186-197)

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Keywords: behavioral intention, electric vehicles, last-mile logistics, sustainable development.

ABSTRACTS

Abstract: The rapid expansion of e-commerce has intensified pressures on urban logistics and last-mile logistics flows. This study examines psychological drivers of consumers' intention to select electric vehicle based last-mile logistics within a green logistics flow perspective, integrating the Value-Belief-Norm and Theory of Planned Behavior frameworks. We explicitly frame the problem as reducing the environmental burden of material, information, and financial flows in the last mile while maintaining service quality; the goal is to identify value- and norm-based antecedents that strengthen intentions to choose electric vehicle delivery services. Using a structured survey (n = 618) and PLS-SEM, results show altruistic and biospheric values shape ecological worldviews, which activate perceived adverse consequences and ascription of responsibility, forming pro-environmental personal norms that raise attitude, subjective norms, and perceived behavioral control, thereby increasing behavioral intention toward electric vehicle delivery. This study contributes by theorizing electric vehicle (EV) adoption as a green logistics flow decision rather than a matter of personal mobility, integrating value-to-norm pathways with the flow management requirements of last-mile logistics operations, and proposing actionable strategies for logistics providers to design value-aligned nudges and communicate flow efficiency with lower emissions.

Towards a sustainable automotive supply chain: a critical and systematic literature review of supplier selection criteria
(pages 198-209)

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Abstract: The automotive supply chain faces increasing pressure to align supplier selection processes with sustainability and resilience goals while adhering to rigorous industry standards. However, many companies still rely on the traditional approach by considering mainly the piece price as criteria for supplier selection, and this approach can destroy the logistic flows and the supply chain performance. In this context, this paper aims to present a systematic literature review of over 100 peer-reviewed articles and studies that broaden current theoretical knowledge by identifying key Sustainable Supplier Selection Criteria. The methodology consists of three main steps. Firstly, the research was conducted using major academic databases between 2014 and 2024, such as Scopus, Web of Science, and Elsevier. Secondly, a database was developed to extract the most cited dimensions in the literature review. Finally, the criteria and sub-criteria identified from the reviewed literature were analyzed through a frequency analysis to determine the most frequently cited sub-criteria within each dimension. The findings show that six main dimensions are most cited in the literature: Economic, Social, Environmental, Green, Circular, and Resilience. Based on these results, we proposed the Sustainable Supplier Selection Concept (3SC Model), which integrates the six dimensions and will be further detailed through the criteria identified and presented in the results section. This model provides a comprehensive framework to guide both researchers and practitioners in developing more sustainable and resilient supplier selection systems.

Balancing profits and planet: a game-theoretic particle swarm optimization for green inventory routing
(pages 210-221)

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Abstract: In an era of heightened environmental awareness and increasing energy costs, sustainable logistics has become a critical focus in supply chain management. The Green Inventory Routing Problem (GIRP) extends the classic Inventory Routing Problem (IRP) by integrating environmental objectives—such as minimizing greenhouse gas (GHG) emissions—alongside traditional economic costs. This study proposes a novel Game-Theoretic Particle Swarm Optimization (GT-PSO) algorithm to address the GIRP, conceptualizing the discretization process as a strategic game to transform continuous swarm behavior into discrete logistics decisions. The objective minimizes a weighted cost function of transportation, inventory holding, and carbon emissions, supporting efficient management of material and transport flows. Thirteen benchmark instances representing different logistics network scales were used to evaluate performance against Genetic Algorithm (GA), Simulated Annealing (SA), and the commercial solver Gurobi. Results show that GT-PSO achieves the best-known solutions for medium- and large-sized problems with an average gap below 0.97%. ANOVA tests confirm statistically significant superiority, and coefficient of variation analysis highlights consistent performance. This research contributes an advanced optimization tool for sustainable logistics and distribution systems, helping managers balance economic efficiency with environmental responsibility.

Barriers to green manufacturing implementation in industrial enterprises
(pages 222-233)

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Abstract: The paper analyses barriers to the implementation of green manufacturing in industrial enterprises in Slovakia, focusing on financial, technological, and organizational barriers. Based on a questionnaire survey, the main obstacles were identified, including insufficient investment, a lack of skilled labour, and limited access to green resources. To evaluate regional and size-related differences, the Chi-square test was applied to determine whether the occurrence of barriers varies according to the geographical location or size of the enterprise. The results of the analysis did not show statistically significant differences between regions in Slovakia or between enterprise size categories, indicating that the barriers to implementing green manufacturing have a nationwide character. However, the most frequent barriers were found to be insufficient financial resources, a shortage of qualified employees, and limited availability of raw materials and technological infrastructure. These factors negatively affect the eco-innovation performance of enterprises, reducing their ability to implement green manufacturing principles and respond effectively to identified barriers. A comparison with the Eco-Innovation Index 2024 further confirmed Slovakia's below-average performance within the European Union, highlighting insufficient investment in eco-innovation, weak cooperation between the public and private sectors, and limited government support. The findings suggest that overcoming these obstacles requires the development of targeted financial mechanisms, stronger institutional support, and the integration of environmental training programs for employees. This paper aims to identify the main barriers to the implementation of green manufacturing in industrial enterprises in Slovakia and to analyse their differences between regions and individual enterprise size categories.

Developing statistical models to analyze traffic accidents and estimate their economic costs in Jordan

(pages 234-243)

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Abstract: This study investigates the behavioral and situational determinants that disrupt the efficient flow of road traffic in Jordan, framing the issue within the broader discipline of transport logistics and flow management. Official crash data obtained from the Public Security Directorate and cost records from local insurance companies were utilized to develop twelve multiple linear regression models that quantify the relationship between human factors and interruptions in traffic, informational, and financial flows. Six models examined the frequency and severity of accidents, while another six analyzed their associated economic impacts. The modeling results identified a consistent set of influential predictors most notably failure to take necessary driving precautions (X8), violation of traffic priorities (X9), and lane misuse (X4) that significantly contribute to both accident occurrence and the resulting financial losses. Most models achieved R^2 values exceeding 0.95, indicating a strong relationship between behavioral inefficiencies and breakdowns in overall road logistics performance. The findings emphasize that driver behavior represents a primary bottleneck in the mobility and cost flow system, directly influencing logistical efficiency across the transport sector. The study highlights the necessity of integrating traffic safety with logistics management by developing preventive strategies, improving regulatory enforcement, and enhancing driver awareness programs. Future research is encouraged to include environmental,

temporal, and infrastructural variables to establish a more comprehensive logistics-based framework for understanding and mitigating crash dynamics in Jordan.