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Editorial

Sustainable Supply Chains in Industrial Engineering and Management

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The integration of information technologies with the industry has marked the beginning of the Fourth Industrial Revolution and has promoted the development of industrial engineering. However, the depletion of resources and the creation of industrial waste caused by increasing industrial production pose a huge threats to nature. The application of sustainable supply chains in industrial engineering and management is one of the ways to balance the economy, society, and the environment. Therefore, it is a key concern for us to explore the construction of sustainable supply chains in industrial engineering and management. Moreover, to understand the impact of low-carbon, sustainable, and recycled supply chains on industrial engineering, we need more in-depth investigations. The Special Issue, entitled "Sustainable Supply Chains in Industrial Engineering and Management", has collected 18 recent works from relevant researchers, including research on sustainable supply chain technology in the fields of logistics, intelligent manufacturing (including remanufacturing), and management. The Special Issue is currently available online at: https://www.mdpi.com/journal/processes/special_issues/A47ZFBWQ22 (accessed on 15 July 2023).

1. Sustainable Supply Chain Design and Management

Gong et al. [1] established game models for a live-streaming supply chain and found optimal strategies for live-streaming members on streaming marketing modes, prices, and carbon emission reduction efforts.

Based on data-driven theory, Mu et al. [2] designed a sequence parameter index system for the logistics industry's ESE-B composite system, applied a Z-score to dimensionless data to standardize the original index data, and constructed a collaborative degree model to estimate the collaborative development between various subsystems of the logistics industry's ESE-B system.

Wang et al. [3] proposed a CNN-SA-NGU mixture model for forecasting silver closing prices, in which a CNN is used to extract the characteristics of the input data, SA is used to capture the correlation between different characteristic values, and the new NGU deep learning gating unit is used to predict the silver closing price. This system improves the ability to extract feature data and the non-linear fitting ability of the model.

Guo et al. [4] proposed a data-driven method that can be used to measure, evaluate, and identify the coupled and coordinated development (CCD) of the logistics industry (LI) and the digital economy (DE) to promote the integrated development of LI and DE.

Yang et al. [5] built a data-driven multimodel decision approach to calculate, assess, diagnose, and improve the regional innovation–economy–ecology (IEE) system. This method was used to test the coupling coordination degree of the Anhui IEE system and optimization measures were proposed.

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2. Evaluation of Sustainable Supply Chains in Industrial Engineering

Huang et al. [6] reviewed the literature on the risk management of automotive supply chain interruption in recent years, listed the achievements in automotive supply chain interruption risk management, pointed out the problems in automotive supply chain management, and discussed the most concerned areas and development trends in automotive supply chain management.

Liu et al. [7] constructed an evaluation indicator system to measure organizational quality-specific immunity based on immune theory and introduced interval-valued hesitant fuzzy information and bidirectional projection technology to create bilateral matching evaluation and decision-making models in order to improve the bilateral matching decision making of manufacturing enterprises seeking partners in the manufacturing supply chain. The empirical analysis shows that this model can overcome the problem of information scarcity and help solve interval hesitation fuzzy decision-making problems.

Liu et al. [8] constructed a regression equation with employment in strategic emerging industries as the dependent variable, and the change direction, employment elasticity, and change speed of strategic emerging industries' structures as independent variables to measure the impact of structural changes in strategic emerging industries on employment in China. The research results indicate that the direction of changes in strategic emerging industries and employment elasticity is positively correlated with employment, while the change speed in strategic emerging industries is unstable and negatively correlated with employment.

Shi et al. [9] studied the role of carbon-abatement cost-sharing contracts in supply chains with a capital-constrained manufacturer. The results show that one-way cost-sharing contracts can improve manufacturers' carbon reduction levels, and two-way cost-sharing contracts have potential "economic-environmental" benefits.

Oršič et al. [10] used a new approach to achieve more sustainable deliveries through machine learning forecasts based on real-time data, different dynamic route planning algorithms, tracking logistics events, fleet capacities, and other relevant data. The developed model proposes to influence customers to choose a more sustainable delivery time window with important sustainability benefits using machine learning to predict accurate time windows with real-time data influence. This approach also leads to better vehicle utilization, less congestion, and fewer failures during home delivery.

Yang et al. [11] constructed a duopoly competition game model for channel competition between offline retailers and online retailers, studied the optimal pricing decisions in different scenarios, revealed the conditions for online retailers to provide return strategies and return insurance strategies, and provided management insights for online retailers.

3. Smart Manufacturing Process Monitoring and Control

Sun et al. [12] integrated blockchain and FL technologies in the intelligent manufacturing process, introducing the concept of Sustainable Production concerned with External Demands (SP-ED). The blockchain stores and manages detailed logs to identify defects, FL validates the sustainability and flaw detection for modifying the operations in consecutive operation cycles, which can improve sustainability by 11.48% and flaw detection by 14.65% and can reduce modifications by 11.11% and detection time by 10.46% for the varying energy supply-to-demand factor compared to DDSIM.

Chen et al. [13] proposed a control-centered data classification technology for the detection and analysis of emissions from industrial enterprises. Through intelligent hardware, the intensity, emission rate, and composition of emissions at different manufacturing intervals are obtained, and a repeated analysis is carried out via in-depth learning. Then, previous emission regulations and manufacturing guidelines can be improved to identify high emission intensities and dangerous components in gas emissions.

Bai et al. [14] developed the DECIA improvement model based on the internal quality control of water-saving products and external marketing policies, which promotes the upgrading of production processes or technologies to improve product quality and increase market penetration.

Taking into consideration the impact of lightweight quality on carbon emissions throughout the lifecycle of automobiles, Li et al. [15] proposed a more comprehensive lightweight design method. This method not only provides insight into the lightweight design of automobiles and other equipment against the background of low carbon but also offers a mean to calculate the carbon emission changes across the entire process after the implementation of the lightweight design.

4. Optimized Operation and Management of Remanufacturing Production System

Yang et al. [11] develop a game-theoretic model to examine the selection of different recycling strategies in the remanufacturing supply chain considering blockchain adoption and uncertain demand. Results show that the coefficient of collection investment costs determines the collection method and the incentive for collectors to participate in the blockchain.

Liu et al. [16] have established a remanufacturing supply chain recycling model based on the Bass innovation diffusion model. In this model, a single manufacturer takes the lead, while a single retailer follows. The retailer is responsible for the recycling aspect. The authors have determined the optimal wholesale price, retail price, and recovery effort path with the optimal control theory.

Chen et al. [17] studied the impact of subsidy policies on the donation strategy of the remanufacturing industry and found that the subsidy amount, first-mover advantage, and the form of the subsidy will affect the donation behavior of manufacturers and remanufacturers.

5. Conclusions

This Special Issue has published 18 papers on the sustainable development of supply chains in industrial engineering, including system modeling and simulation, supply chain management and evaluation, the combination of artificial intelligence and supply chains, and supply chain issues in remanufacturing. This Special Issue presents mathematical models for different industrial scenarios, improving supply chain management's efficiency in all aspects. Introducing artificial intelligence technology into industrial production promotes low-carbon and sustainable industrial development. We believe that integrating information technology and industry can promote sustainable supply chain development and accelerate the achievement of carbon neutrality goals in the manufacturing industry in the future [18,19].

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