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Editorial

Risk-aware supply chain intelligence: AI-enabled supply chain and logistics management considering risk mitigation

Modern supply chains are a major part of the world economy affecting the success of regional and global economic growth. With the globalization of business operations, supply chains especially the logistics process are threatened by all kinds of uncertainties and disruptions, which have resulted in an increasing interest in supply chain and logistics management considering various risk factors [1,2]. As modern supply chains and logistics systems are dynamic [3], complexly networked [4] and sometimes difficult to model using mathematical tools [5], their efficient management becomes a challenging task and often requires rich information, mass data and intensive human knowledge to accomplish.

This special track incorporates articles using intelligent approaches to solve various supply chain problems where risk factors are taken into consideration. The brief outlines describing these research articles are listed below.

Zhen et al., in the paper "Capacitated closed-loop supply chain network design under uncertainty," optimized a closed-loop supply chain network subject to uncertainty in demands for new & returned products. To address uncertainty in decision-making, they formulated a two-stage stochastic mixed-integer non-linear programming model to determine the distribution center locations and their corresponding capacity, as well as new & returned product flows in the supply chain network. A tabu search algorithm combined with inequalities added to the conic model showed the ability to improve the computational efficiency for large-scale problem instances.

He et al., in the paper "Yard crane scheduling problem in a container terminal considering risk caused by uncertainty," pointed out that yard crane scheduling problem faced many uncertainties including the arriving times and handling volumes of vessels, the arriving times of container trucks and the number of containers to be manipulated. To deal with this problem, they proposed a mathematical model for optimizing the extra loss caused by uncertainties and the efficiency of yard crane operations at the same time. A GA-based three-stage algorithm was developed for solving the optimization model and demonstrated its ability in reducing schedule adjustments under uncertainties.

For risk analysis and measurement, Xu et al., in the paper "Data-driven operational risk analysis in e-commerce logistics," proposed a quantitatively analysis approach for operational risks in E-Commerce Logistics (ECL) based on extensive historical e-commerce transaction data. They analyzed the diverse distributions of operation time in different ECL operation phases, and adopted a Gaussian Mixture Model-based method to synthesizes all the time distributions. Their risk measurement method was proven to be effective with real-life data. It thus enables a clear understanding of ECL operational risks and facilitates conducting targeted risk mitigation strategies.

Ali et al., in the paper "Risk assessment of China-Pakistan Fiber Optic Project (CPFOP) in the light of Multi-Criteria Decision Making (MCDM)," traced out the pros and cons of CPFOP and performed risk assessment of CPFOP by using Fuzzy VIKOR technique. In their method, each failure mode was measured with three indexes, namely occurrence, severity and detection. The work prioritized a list of failure modes of fiber optic cable and can help in optimizing and safeguarding national interest in the wake of CPFOP.

Song et al., in the paper "Cross-border e-commerce commodity risk assessment using text mining and fuzzy rule-based reasoning," assessed the risk of Cross-Border E-Commerce (CBEC) caused by commodity regulation conflicts. In their work, first the commodity safety regulations were transformed into risk rules considering a fuzzy representation of violation consequence, then the features of CBEC commodities were extracted from the web and assessed with the corresponding risk factors. A comparison with the current risk assessment measure of the customs showed that the proposed method improved the efficiency and accuracy of CBEC commodity risk assessment.

Zhang et al., in the paper "Locating electric vehicle charging stations with service capacity using the improved whale optimization algorithm," established an electric vehicle charging station site selection model considering service risk including the risk of service capacity and user anxiety. They also introduced Gaussian mutation operator, differential evolution operator and crowding degree factor to the whale optimization algorithm framework to improve its efficacy. Computational results based on a large-scale problem instance suggested that both the model and the algorithm were effective and could help reduce social costs.

In summary, risk-aware supply chain intelligence mainly incorporate two types of research. The first type is related with optimization under uncertainty, where uncertainty is considered as risk and usually modeled using random variables. The other type is related with risk assessment, which involves the identification, measurement and quantification of risk factors. Both the two types of research can leverage on the development of artificial intelligence and other intelligent techniques to achieve better results. The theories and methodologies of risk-aware supply chain intelligence, presented in the special track, can help to improve the efficiency and efficacy of supply chain and logistics management, especially in the practical environment with various risks.

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