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Editorial

Preface to the Special Issue on "Mathematical Methods and Operation Research in Logistics, Project Planning, and Scheduling"

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In the last decade, the Industrial Revolution 4.0 brought flexible supply chains and flexible design projects to the fore. Nevertheless, the recent pandemic, the accompanying economic problems, and the resulting supply problems have further increased the role of logistics and supply chains. Therefore, planning and scheduling procedures that can respond flexibly to changed circumstances have become more valuable both in logistics and projects. The aim of this Special Issue was to gather novel, original publications that offer new methods and approaches in the field of planning and scheduling in logistics and project planning that are able to respond to the challenges of the changing environment. The response of the scientific community has been significant, with many papers being submitted for consideration, and, finally, twelve papers were accepted after going through a careful peer-review process based on quality and novelty criteria.

The paper by Abusaq et al. [1] suggests a decision support system for optimizing biomass-based wood pellet production supply chain network design (WPP-SCND). The WPP-SCND decision system minimizes the total supply chain (SC) cost of the system while also reducing carbon emissions associated with wood pellet SC activities. A fuzzy flexible robust possibilistic programming (fuzzy-FRPP) technique is developed for solving the suggested uncertain WPP-SCND model.

The paper authored by Zhanh et al. [2] proposes a mathematical formulation of the multi-trip time-dependent vehicle routing problem with split delivery (MTTDVRP-SD). It analyzes the pattern of the solution, including the delivery routing and delivery quantity. The paper develops an algorithm based on the simulation anneal (SA) framework. The proposed algorithm is compared with random–simulation anneal–CPLEX (R-SA-CPLEX), auction–genetic algorithm–CPLEX (A-GA-CPLEX), and auction–simulation anneal–CPLEX (A-SA) on 30 instances at three scales, and its effectiveness and efficiency are statistically verified.

In the paper by Kovács et al. [3], the authors identify different aggregation scenarios in risk assessment. They summarize the requirements of aggregation functions and characterize different aggregations according to these requirements. They critique the multiplication-based risk priority number (RPN) used in existing applications and propose using other functions in different aggregation scenarios. The behavior of certain aggregation functions in warning systems is also examined. The authors find that, depending on the aggregation location within the organization and the purpose of the aggregation, considerably more functions can be used to develop complex risk indicators.

The paper by Yan et al. [4] studies a single-machine problem with resource allocation and deteriorating effect. Under group technology and limited resource availability, the goal was to determine the schedules of groups and jobs within each group such that the total completion time was minimized.

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Citation: Kosztyán, Z.T.; Kovács, Z. Preface to the Special Issue on "Mathematical Methods and Operation Research in Logistics, Project Planning, and Scheduling". *Mathematics* **2023**, *11*, 232. https://doi.org/10.3390/math11010232

Received: 22 December 2022
Accepted: 26 December 2022
Published: 3 January 2023

In the paper by Radácsi et al. [5], a model and solution are shown for controlling the inventory of a logistics warehouse in which neither satellite positioning nor IoT solutions can be used. The proposed model involves three steps. In the first step, a traversal path definition provides an optimal solution, which is pre-processing. This is in line with the structure and capabilities of the warehouse. In the second step, the pre-processed path determines the real-time movement of the drone during processing, including camera movements and image capture. The third step is post-processing, i.e., the processing of images for QR code identification, the interpretation of the QR code, and the examination of matches and discrepancies for inventory control.

The paper by Nagy et al. [6] solves the Dynamic Capacitated Arc Routing Problem (DCARP) combinatorial optimization problem by the Artificial Bee Colony (ABC) algorithm. The problem requires identifying such route plans on a given graph to several vehicles that generate the least total cost, and it considers dynamic changes in the problem. The proposed algorithm excels in finding a relatively good quality solution in a short amount of time, which makes it a competitive solution.

The paper by Ogazón et al. [7] focuses on foodbank networks. Foodbank networks provide adequate infrastructure and perform logistics activities to supply food to people in need on a day-to-day basis. The paper proposes a mathematical formulation for the design of logistics processes, including collection, transshipment, and aid distribution, over a network of foodbanks inspired by the real case of Bancos de Alimentos de México (BAMX).

The paper authored by Alkahtani [8] formulates mathematical models and provides an optimization algorithm for process outsourcing, considering imperfect production with variable quantities for effective supply chain management. The numerical experiment was performed based on the data taken from the industry for the application of the proposed outsourcing-based SCM model.

The paper by Bognár and Hegedűs [9] proposes a new risk assessment method. The proposed PRISM (partial risk map) methodology is a risk assessment method developed as the combination of the failure mode and effect analysis and risk matrix from the risk assessment methods. Based on the new concept of partial risks, three different aggregation functions are presented for assessing incident risks.

The paper by Khan et al. [10] presents an inventory model that involves non-instantaneous deterioration, nonlinear stock-dependent demand, and partially backlogged shortages by considering the length of the waiting time under a hybrid prepayment and cash-on-delivery scheme. The corresponding inventory problem is formulated as a nonlinear constraint optimization problem.

In the paper by Ambrosino and Cerrone [11], a variation of the Rich Vehicle Routing Problem (RVRP) is solved in city logistic problems. The authors deal with a multi-period vehicle routing problem with a heterogeneous fleet of vehicles, with customers' requirements and company restrictions to satisfy, in which the fleet composition has to be defined daily. A mixed integer programming model was proposed, and an experimental campaign was presented to validate it.

The paper by Álvarez-Miranda and Pereira [12] proposes a hybrid method for designing delivery zones with an objective based on improving the quality of express delivery services. The proposed method combines a preprocess based on the grouping of demand in areas according to the structure of the territory, a heuristic that generates multiple candidates for the distribution zones, and a mathematical model that combines the different distribution zones generated to obtain a final territorial design.

As Guest Editors of this Special Issue, we are grateful to all authors who contributed their articles. We would also like to express our gratitude to all reviewers for their valuable comments on the improvement of the submitted papers. The goal of this Special Issue was to attract quality and novel papers in the field of "Mathematical Methods and Operation Research in Logistics, Project Planning, and Scheduling". It is hoped that these selected research papers will be found to be impactful by the international scientific community and

that these papers will motivate further operations research for solving complex problems in various disciplines and application fields.

Conflicts of Interest: The authors declare no conflict of interest.

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