Topic: Optimal Decision-Making in Complex Supply Chain Networks under the Make-to-Order Manufacturing Paradigm

Speaker

Prof. Zhibin Jiang

Advisory Board Member of *CES*
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Time:
June 14, 2023
08:00 PM (Beijing, UTC+8)
08:00 AM (Toronto, UTC-4)
01:00 PM (London, UTC+1)
09:00 PM (Seoul, UTC+9)

Zoom ID： 872 9067 2511

Prof. Zhibin Jiang is now a Distinguished Professor at the Department of Management Science, Antai College of Economics and Management and the Dean of Sino-US Global Logistics Institute, Shanghai Jiao Tong University. He obtained his Ph. D. degree in Manufacturing Engineering & Engineering Management from City University of Hong Kong in 1999. He is the Changjiang Scholar Program Chair Professor of MOE China and a Fellow of the Institute of Industrial & System Engineers (IISE). He is Vice President of the Chinese Industrial Engineering Society, Vice President of the Advisory Committee of IE Undergraduate Programs of MOE China, and the formal Regional VP of IISE for Asia (2019-2022). He has long been engaged in research on Discrete Dynamic Event System (DEDS) /Operations Research (OR)-based modeling and control theory/methodologies for complex production and operation management (P/OM). He finished or is undertaking 3 NSFC funded key projects, 8 NSFC funded projects, and over 20 other China national projects. He has authored 5 books and published more than 120 papers in peer-reviewed international journals such as IMFOMS Journal on Computing, Production and Operation Management, ISE Transactions, IEEE Transaction on Automatic Control, IEEE Transactions on Automation, etc. He holds eight Chinese patents and computer software copyrights.

Talk Abstract

Motivated by coping with the complexities of supply chain networks for implementing make-to-order production, this talk focuses on optimizing decision-making for integrated multi-plant collaborative production, inventory management, and hub-spoke delivery. We examine a comprehensive supply chain network that encompasses diverse plants, distribution centers, and customers. Our aim is to efficiently produce customized and splitable orders, which consist of multiple general-size multi-type jobs. These jobs are processed at plants with varying capabilities, production capacities, processing times, production and inventory costs, and locations. Once completed, the jobs are transported from plants to distribution centers. Subsequently, orders with all constituent jobs are delivered from distribution centers to customer sites. Our objective is to make integrated scheduling decisions for production, inventory, and delivery, with the primary goal of minimizing the total cost. This cost includes production costs, transportation costs, tardiness costs, and inventory costs.

To address this problem, we initially formulate it as a mixed-integer programming model. Additionally, we demonstrate its complexity by proving that the problem is NP-hard and that no approximation algorithms exist with a constant worst-case ratio. Subsequently, we reframe the problem as a binary integer linear programming model, aiming to select a feasible schedule for each job. We propose a combined column generation and two-layer column enumeration algorithm to effectively solve the model. Through extensive numerical experiments, we showcase the capabilities of our proposed algorithm in generating optimal or near-optimal solutions efficiently. Furthermore, our algorithm outperforms four benchmark approaches, leading to important insights for practitioners in the field.

In summary, our research focuses on optimizing decision-making in complex supply chain networks involving multi-plant collaborative production, inventory management, and hub-spoke delivery. We develop a comprehensive mathematical model, prove its complexity, and propose an efficient algorithm that outperforms existing approaches. Through our work, we provide valuable insights and practical solutions for industry professionals.

Host

Prof. Hamid Reza Karimi

Editor-in-Chief of *CES*
Department of Mechanical Engineering, Politecnico di Milano, Milan, Italy.

Program

Time (Beijing, UTC+8)	Speakers	Topics
20:00-20:10	Prof. Hamid Reza Karimi	Welcome Remarks
20:10-20:40	Prof. Zhibin Jiang	Optimal decision-making on complex supply chain network under make-to-order manufacturing paradihm
20:40-21:20		Discussion (Q&A)

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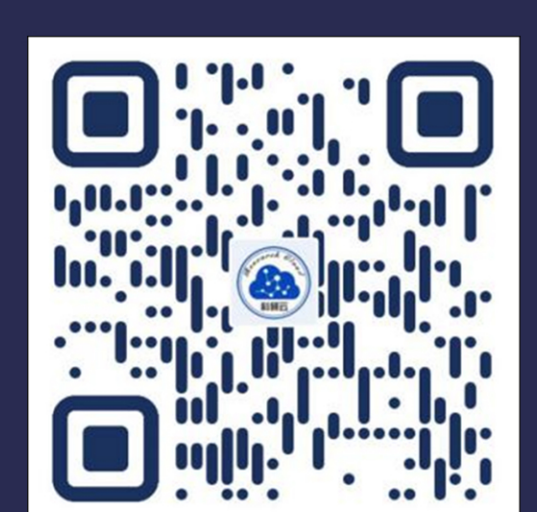
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