

Sessions for Thursday, May 25

Thursday, 08:00 AM - 09:30 AM

Invited Session

464	Thursday, 08:00 AM - 09:30 AM, Celebration 2	Track: Energy and Natural Resource Management
	Invited Session: Data-driven Electricity Markets and Sustainability	
	Chair(s): Kai Pan	

115-0238 Data-driven Operations for a Smart Vehicle-grid System

Ziliang Jin, Student, The Hong Kong Polytechnic University, Hong Kong, China
Kai Pan, Associate Professor, The Hong Kong Polytechnic University, Hong Kong, China
Jianqiang Cheng, Associate Professor, University of Arizona, United States
Yulan Wang, Professor, Hong Kong Polytechnic Univ, Hong Kong, China
Max Shen, Professor, University of California Berkeley, United States

We consider a vehicle-grid integration system supported by vehicle-to-grid (V2G) technology. We aim to identify the potential of V2G in such synergy. To address this problem, we propose a two-stage robust mixed-integer linear programming (MILP) model which jointly optimizes the energy grid's planning and EV sharing company's operations under uncertainties.

115-0463 Subsidies/Taxes Induced by an Adoption Target or a Budget Limit

Lingling shi, Student, UT Dallas, United States
Metin Cakanyildirim, Professor, University of Texas Dallas, United States
Suresh Sethi, Professor, University of Texas Dallas, United States

A government, managing green product subsidies, may minimize the subsidy expenditure with an adoption target or maximize the adoption level with a subsidy budget. Equivalence of these two government problems is not straightforward and is investigated under a combination of subsidies/taxes in a Stackelberg game involving manufacturers and service providers.

115-1302 Optimal Operation of Virtual Power Plants for Primary Reserve Markets

Anil Kaya, Student, Karlsruhe Institute of Technology, Germany
Yashar Ghiassi-Farrokhfal, Associate Professor, Rotterdam School of Management, Netherlands
Steffen Rebennack, Professor, Karlsruhe Institute of Technology, Germany
Derek Bunn, Professor, London Business School, United Kingdom
Kai Pan, Associate Professor, The Hong Kong Polytechnic University, Hong Kong, China

Increasing renewables requires primary reserve resources. Conventional resources are insufficient and often polluting. As alternatives, virtual power plants (VPP), aggregating local renewables, and storage can help. However, their profitability and unreliability for primary reserve services are unclear. Our paper models and evaluates VPPs as primary reserve service providers.

115-2078 Data-driven Clustering and Feature-based Retail Electricity Pricing

N. Bora Keskin, Associate Professor, Duke University Durham, United States
Yuxing Li, Assistant Professor, Johns Hopkins University, United States
Nur Sunar, Associate Professor, Kenan-Flagler Business School, United States

We design a data-driven joint spectral clustering and feature-based pricing policy for an electric utility. This paper is the first to analyze such a policy with different types of feature heterogeneity. Our case study uses real-life smart meter data from Texas and illustrates the substantial value of our policy.

Invited Session

465	Thursday, 08:00 AM - 09:30 AM, Celebration 3	Track: Healthcare Operations Management
	Invited Session: Service and Coordination in Healthcare Operations	
	Chair(s): Tharanga Rajapakshe Xueze Song	

115-0121 Emergency Care Access vs. Quality: Uncovering Hidden Consequences of Fast-Track Routing Decisions

Shuai Hao, Student, University of Illinois Urbana-Champaign, United States
Zhankun Sun, Assistant Professor, City University of Hong Kong, Hong Kong, China
Yuqian Xu, Assistant Professor, UNC Chapel Hill, United States

This work aims to examine the impact of the emergency department (ED) fast-track (FT) routing decisions on patient outcomes and propose evidence-based routing policies to guide the FT routing decisions.

115-0738 Appointment Scheduling in Multi-Stage Outpatient Clinics under Patient Heterogeneity

Pelin Kesrit, Student, Texas A&M University, United States
Chelliah Sriskandarajah, Professor, Texas A&M University College Station, United States
Jon Stauffer, Assistant Professor, Mays Business School, Texas A&M University, United States

We design effective appointment templates, based on block scheduling, for two-stage outpatient clinics under patient heterogeneity having different mean service times. We present the effectiveness of our algorithm under both deterministic and stochastic service times assumption with an objective to minimize patient waiting time, healthcare providers' idle time and overtime.

115-0831 Analysis of Compensation Contracts for Providers in Clinical Studies

Thursday, 08:00 AM - 09:30 AM

Xueze Song, Student, University of Illinois at Urbana Champaign, United States
Mili Mehrotra, Associate Professor, University of Illinois, United States
Tharanga Rajapakshe, Associate Professor, University of Florida, United States

Participant retention is a significant challenge faced by clinical studies. In this work, we consider how the sponsor of a clinical study can motivate investigators and coordinators to improve participant retention for the study. We identify three different clinical study settings observed in practice and derive the optimal compensation contracts.

115-1313 Optimizing Return and Secure Disposal of Prescription Opioids to Reduce Diversion to Secondary Users

Md Mahmudul Hasan, Assistant Professor, University of Florida, United States
Tasnim Faiz, Post Doc/Researcher, University of Maryland, United States
Alicia Modestino, Associate Professor, Northeastern University, United States
Gary Young, Professor, Northeastern University, United States
Md Noor-E-Alam, Assistant Professor, Northeastern University, United States

Unused prescription opioids diversion to secondary users significantly increased risk of OUD and accidental opioid overdose. We aim to address this critical public health problem by designing a data-driven optimization framework to determine the optimal incentive disbursement plans and locations of easily accessible opioid disposal kiosks for opioid users.

Invited Session

466	Thursday, 08:00 AM - 09:30 AM, Celebration 4	Track: Healthcare Operations Management
	Invited Session: Topics in Health Equity	
	Chair(s): Anita Carson Ankita Shirahatti	

115-0389 How to Drive Health Equity through Rigorous Deployment of Digital Transformation in Healthcare Operations

Ann Bagchi, Associate Professor, Rutgers Business School, United States
Alok Baveja, Professor, Rutgers University, United States

Digital transformation (DT) involves the application of technology to promote changes in business models, processes, and structures. We examine how DT in the system of delivery of care for HIV can improve patients' experiences of care, enhance population health, and reduce healthcare costs.

115-0492 The Impact of Workload on Racial Disparities in Healthcare

Alison Murphy, Student, University of Minnesota, United States
Rachna Shah, Associate Professor, University of Minnesota, United States

There are stark racial disparities in maternal mortality in the US. We examine between- and within- hospital factors that contribute to these disparities. We show that significant racial disparities exist within hospitals and study how workload and patient race interact to contribute to disparities in severe morbidity and mortality.

115-0559 Optimal COVID-19 Vaccination Facility Location under Heterogeneous Demand

Jingyuan Hu, Student, University of California Los Angeles, United States
Fernanda Bravo, Assistant Professor, UCLA Anderson School of Management, United States
Elisa Long, Associate Professor, UCLA Anderson School of Management, United States

We empirically examine the how proximity to a vaccination site relates to uptake among different communities using cross-sectional data within California. Integrating the results into an optimization model, we show that by replacing 18% of the current locations with dollar stores can lead to 1.5 million additional vaccinations in California.

Invited Session

467	Thursday, 08:00 AM - 09:30 AM, Celebration 5	Track: Healthcare Analytics
	Invited Session: Policy and market impacts on healthcare operations	
	Chair(s): Jonathan Phares	

115-0280 The Impact of Opioid Legislation on the Supply Chain Stakeholders

Amirreza Sahebi, Student, North Carolina State University, United States
Amir Sadeghi, Student, North Carolina State University, United States
Robert Handfield, Professor, North Carolina State University, United States

Many states enacted legislation to quell the opioid pandemic in the United States. However, few policy reviews consider unintended consequences of such policies. To assess South Carolina's state-level drug policies for effectiveness in reducing prescription opioid misuse as well as for changes in patients' interactions with other stakeholders.

115-1034 Physician Practice Migration and Changes in Practice Style: An Empirical Analysis of Inappropriate Diagnostic Imaging

E. David Zepeda, Associate Professor, Boston University, United States

We exploit migration patterns of primary care physicians by tracking physician migrations to practice sites comprised of new peers who shared actual physical working space. We examined whether a patient's likelihood of receiving an inappropriate referral for diagnostic imaging was associated with a change in the work environment.

115-1225 Effect of Isolation Wards on Hospital Clinical Outcome: An Agent Based Modeling Perspective

Sukrit Pal, Assistant Professor, Iowa State University, United States

Thursday, 08:00 AM - 09:30 AM

Anand Nair, Professor, Michigan State University, United States

Hospitals implement different policies to better manage care capacity in environment of uncertain demand. In this study, we investigate one such policy - creation of access controlled COVID isolation ward - to understand how hospitals exploit such policy to manage their protective equipment inventory and patient care.

115-1247 Testing policy assumptions in the U.S. pharmaceutical supply chain

Molly Hughes, Student, Logistics & Marketing Department, United States

Public policies (e.g. the GDUFA laws and the ACA) are built off the assumption that generic and brand drugs are interchangeable. We test this assumption through exploration of each product types' risk regarding logistic service quality and highlight how differences in supply chain and logistics practices are impactful to policy.

Invited Session

468	Thursday, 08:00 AM - 09:30 AM, Celebration 6	Track: Healthcare Analytics
	Invited Session: AI in Healthcare	
	Chair(s): Mehmet Ayvaci Ozgur Aksoy	

115-0246 Learning to be Proficient? A Structural Model of User Dynamic Engagement in E-Health Interventions

Tongxin Zhou, Assistant Professor, Arizona State University, United States

Yingfei Wang, Assistant Professor, University of Washington, United States

Lu (Lucy) Yan, Associate Professor, Indiana University Bloomington, United States

Yong Tan, Professor, University of Washington, United States

In this study, we examine individuals' dynamic engagement in eHealth interventions to shed light on efficiency of online healthcare delivery. Leveraging a structural-modeling approach, we characterize individuals' decision making and perception updates. Our estimation results reveal multiple implications regarding individuals' learning performance in online health-management settings and online intervention design.

115-0582 People Talking and AI Listening: How Does Stigmatizing Language in EHR Notes Affect AI Fairness

Yizhi Liu, Student, University of Maryland - College Park, United States

Weiguang Wang, Assistant Professor, University of Rochester, United States

Guodong Gao, Professor, University of Maryland, United States

Ritu Agarwal, Professor, University of Maryland, United States

EHRs enable various artificial intelligence (AI) applications in healthcare, but EHRs may contain Stigmatizing Language (SL) that reflects clinician bias. We find that removing SL improves AI performance and fairness. In addition, clinicians who work more closely with colleagues, measured by centrality, are more likely to write SL.

115-0996 What Drives Algorithm Use? An Empirical Analysis of Algorithm Use in Type 1 Diabetes Self-Management

Wilson Lin, Assistant Professor, Santa Clara University, United States

Song-Hee Kim, Associate Professor, Seoul National University, South Korea

Jordan Tong, Associate Professor, University of Wisconsin-Madison, United States

Using the bolus calculator (algorithm) use behavior from a field experiment on Type 1 Diabetes self-management, we contribute field analysis to identify drivers of algorithm use, such as previous algorithm use, previous performance feedback exposure to multiple, potentially conflicting measurements, the need for precision, and deviations from algorithm recommendations.

115-1654 When Systemic Biases Taint Algorithms: A Path to More Equitable Access in Healthcare

Ozgur Aksoy, Student, The University of Texas at Dallas, United States

Mehmet Ayvaci, Associate Professor, The University of Texas at Dallas, United States

Asunur Cezar, Professor, Bogazici University, Turkey

Srinivasan Raghunathan, Professor, The University of Texas at Dallas, United States

Algorithms using historical data can replicate and amplify existing flaws in social systems. For example, systemic disparities in access to healthcare can taint algorithmic predictions, leading to "social bias." We formulate a bias-aware algorithmic decision-making framework that factors the origins of social bias in healthcare while considering fairness outcomes.

115-1742 Effectiveness of Using a Multi-Task Learning-Based Predictive Model for Various Hospital Outcomes

Deepika Gopukumar, Assistant Professor, Saint Louis University - School of Medicine, United States

Abhijeet Ghoshal, Associate Professor, University of Illinois Urbana-Champaign - Gies College of Business, United States

Martin Schoen, Assistant Professor, Saint Louis University - School of Medicine, United States

Fred Buckhold, Associate Professor, SLUCare Physician Group; Saint Louis University-School of Medicine, United States

Hospital readmissions have been one of the major contributors to healthcare costs. Prior literature focuses mainly on predicting readmissions and not on costs. This study evaluates the effectiveness of using a multi-task learning-based predictive model for different types of readmission costs and the readmitted length of stay.

Contributed Session

469	Thursday, 08:00 AM - 09:30 AM, Celebration 7	Track: Sustainable Operations Management
	Contributed Session: Climate Change and Carbon Management Policies	
	Chair(s): Sinan Erzurumlu	

Thursday, 08:00 AM - 09:30 AM

115-0255 A mechanism test of carbon neutrality based on the synergy of China's carbon trade policy

Shiyuan Li, Student, Tongji University, China
Hongda Liu, Student, Tongji University, China
Xiaoxia Wang, Student, Shanghai University, China

This paper constructs a synergistic model of carbon trade policy and investigates its mechanism on carbon neutrality in China. We conclude the configurations in benefits of net-zero emission policy. Based on Chinese context, a research path for the synergy of carbon trade policy on carbon neutrality is proposed.

115-0381 Competitive Industry's Response to Environmental Tax Incentives for Green Technology Adoption

Dmitry Krass, Professor, University of Toronto, Canada
Anton Ovchinnikov, Professor, Queens University, Canada

We consider market and technological equilibria in Cournot competition with linear and isoelastic demand between firms heterogeneous in operational and environmental efficiency. We examine possibilities and limitations of incentivizing "green" technology choice with environmental/"carbon" taxes. The resultant equilibria and the impact of taxation may qualitatively differ with demand function.

115-0859 Accelerating the adoption of ESG at Entrepreneurial Franchise Systems

Sinan Erzurumlu, Professor, Babson College, United States
Phil Kim, Professor, Babson College, United States

Many corporations are facing a demand to create action-oriented Environmental, Social, and Governance (ESG) strategies. We focus on how the franchisor-franchisee relationships are effective at the ESG adoption and mitigation of climate change risk. The franchise system offers guidelines for a network structure embedded with ESG strategies.

115-1977 Safe production and operation of hydrogen as an alternative fuel in maritime transportation for future

Mir MD Ashfaque Sumon, Student, University of South-Eastern Norway, Norway

The present world is desperately looking for safe alternative fuel for global maritime transportation because of the zero-carbon emission policy regulated by IMO. This paper will delineate the risk assessment of hydrogen fuel by the STPA (Standard theoretic process analysis) method for safe production and operation

Contributed Session

470	Thursday, 08:00 AM - 09:30 AM, Celebration 8	Track: Sustainable Operations Management
	Contributed Session: Sustainable Manufacturing	
	Chair(s): Jacob Jensen	

115-0329 Data Supported Sustainable Operational Excellence in Manufacturing Industries

Jukka Hemilä, Senior Scientist, Vtt Technical Research Centre of Finland, Finland

Sustainability needs to be part of all operations in manufacturing industries. Study indicate how data can enable sustainability and can be utilized in sustainable operations. Findings are based on the multiple case studies in Finland.

115-0660 A resource dependence perspective on how inventory policy impacts the environment

Jacob Jensen, Student, Auburn University, United States
Dustin Cole, Assistant Professor, Auburn University, United States

This study evaluates the effect of inventory policy and uncertainty on firm environmental performance. We find that change in inventory levels can impact firm environmental performance. These results highlight the need for policy incorporating both environmental and financial performance targets in the face of uncertainty.

115-2036 Adoption of Industry 4.0 towards sustainable manufacturing

Kalinga Jagoda, Associate Professor, University of Guelph, Canada
Premaratne Samaranyake, Senior Lecturer, University of Guelph, Australia

Sustainable manufacturing practices are becoming significant and emerging areas of interest among industry practitioners and research investigators in recent times. This paper examines the impact of Industry 4.0 technologies on products, processes and system and the level of improvement of economic objectives, environmental conditions and social factors.

Invited Session

473	Thursday, 08:00 AM - 09:30 AM, Celebration 11	Track: Manufacturing Operations
	Invited Session: Sourcing and Operational Decisions for Manufacturing and Retailing	
	Chair(s): Dennis Yu	

115-0134 Sustainable Sourcing Considering Wholesale Price Discount

Yu Xia, Professor, College of William and Mary, United States
Gang Li, Associate Professor, Bentley University, United States

We study a sourcing plan that consists spontaneous decisions on supplier selection, order allocation, and sustainability investment on selected suppliers. Sourcing cost is complicated by the selected suppliers' price discount menus. Optimization model is developed, numerical tests are conducted to check the impact of suppliers' discount pricing strategy.

Thursday, 08:00 AM - 09:30 AM

115-0655 An Integrated Location, Allocation and Capacity Planning Model for Hyper-local Retailing

Ajinkya Tanksale, Assistant Professor, Clarkson University, United States

Santosh Mahapatra, Professor, Clarkson University, United States

Instant, door-delivery retailing that spurred during the pandemic through hyper-local, dark stores has been continuing to expand. The infant "fast and fresh" business model is complex and requires integrated location, allocation and capacity planning. We propose a mixed-integer programming model to address the relevant strategic, tactical and operational decision-making issues.

115-0763 The Impact of VMI on an Online Platform's Pricing and Sourcing Decisions

Dennis Yu, Associate Professor, Clarkson University, United States

We study an online platform's optimal pricing and sourcing decisions when the platform can purchase from a manufacturer who also provides VMI option to the platform while having its own OEM direct channel. We investigate the platform and the manufacturer's optimal pricing decisions under two scenarios of the dual-channel competition.

115-1891 Seeking Investment Operational and Timing Decisions by Manufacturing Startups

Xinxin Hu, Associate Professor, University of Houston - Downtown, United States

Xiangling Hu, Associate Professor, Grand Valley State University, United States

Ping Su, Associate Professor, Hofstra University, United States

We use dynamic programming to determine a start up's best timing to approach the investors with its optimal economic performance measured by profitability and market size. We establish a simple threshold policy to suggest whether to salvage, seek the investment, or continue the operation for future opportunities.

Contributed Session

474	Thursday, 08:00 AM - 09:30 AM, Celebration 12	Track: Humanitarian Operations and Crisis Management
	Contributed Session: Prepositioning & Allocation	
	Chair(s): Laura Heuser	

115-0452 Scenario-Probability Robust Model for Prepositioning Relief Supplies

Muer Yang, Associate Professor, University of St. Thomas, United States

Sameer Kumar, Professor, University of St. Thomas, United States

Xinfang Wang, Professor, Georgia Southern University, United States

Michael Fry, Professor, University of Cincinnati, United States

We develop a scenario-probability-robust optimization model to preposition relief supplies, and demonstrate its effectiveness using a realistic case of hurricane via simulation. Our model extends the robust optimization and applies to applications where a full empirical probability distribution of uncertain parameters can only be imprecisely estimated.

115-0837 Incorporating Preparedness in Equitable Disaster Relief Resource Allocation

Zhenlong Jiang, Student, George Mason University, United States

Ran Ji, Assistant Professor, George Mason University, United States

We propose a learn-then-optimize framework to design equitable relief resource allocation by incorporating the residents' preparedness. We first employ machine learning approaches to predict the preparedness level, which is later used in a two-stage multi-objective stochastic programming model seeking tradeoff among the effectiveness, equity, and efficiency.

115-0939 A method for building a prepositioning decision support tool and its application to epidemics

Laura Heuser, Student, ETH Zurich, Switzerland

Nathan Kunz, Associate Professor, University of North Florida, United States

Stephan Wagner, Professor, ETH Zurich, Switzerland

John Wasswa, Pharmacist, Management Sciences for Health, Uganda

Stock prepositioning is critical for an effective response to epidemic outbreaks. In this paper we present a method, decision support tool and process for such prepositioning decisions. This research in collaboration with the Ministry of Health of Uganda builds on the design science method and an empirical validation.

115-1072 Analyzing the dynamics of relief item priority and allocation using deprivation cost functions

Yu Fan, Post Doc/Researcher, University of Science and Technology of China, China

Tongxin Liu, Student, University of Science and Technology of China, China

Xihui Wang, Professor, School of Management, China

Luk Van Wassenhove, Professor, INSEAD, France

We conduct a field investigation in China and collect the Willingness-To-Pay (WTP) data to estimate the deprivation cost functions of some relief items, allowing us to solve a practical delivery and allocation problem, which provides an original appropriate approach to incorporate the dynamic priority of relief items delivery and allocation.

Contributed Session

475	Thursday, 08:00 AM - 09:30 AM, Celebration 13	Track: Humanitarian Operations and Crisis Management
	Contributed Session: Coordination	
	Chair(s): Diana C. Guzmán-Cortés	

Thursday, 08:00 AM - 09:30 AM

115-0943 Process modularity, supply chain responsiveness, and moderators
Félicia SAÏAH, Student, Hanken School of Economics, Finland
Diego Vega, Assistant Professor, HUMLOG Institute, Finland
Harwin De Vries, Assistant Professor, Rotterdam School of Management, Netherlands
JOAKIM KEMBRO, Associate Professor, Lund University, Sweden

This research describes how Doctors without Borders (MSF) employed process modularity to maintain supply chain responsiveness during the Covid-19 pandemic. Eight moderators that affect the impact of process modularity on supply chain responsiveness are presented and the applicability of process modularity in other humanitarian organizations is investigated.

115-1065 Improving the activation of government stakeholders during disaster response - a Brazilian perspective

Ana Nascimento, Student, Federal University of Rio De Janeiro, Brazil
Híngred Resende, Student, Federal University of Rio De Janeiro, Brazil
Tharcisio Fontainha, Professor, Federal University of Rio De Janeiro, Brazil

Disaster recurrence motivates the adoption of a process approach for more efficient operations. Therefore, this research identifies patterns and opportunities in government activation by comparing 13 disaster response processes involving Brazilian stakeholders. Results reveal different processes, bureaucratic activities, and coordination barriers surpassed through the proposition of a standardized process model.

115-2061 Collaborative decision support model for humanitarian logistics

Diana C. Guzmán-Cortés, Professor, Pontificia Universidad Javeriana, Colombia
William Guerrero, Associate Professor, Universidad De La Sabana, Colombia
Marie-Eve Rancourt, Associate Professor, HEC Montréal, Canada

We present a collaborative decision-support model that considers the planning of joint inventory and routing operations between local transportation providers (LTP) and humanitarian agencies (HA), evaluating different scenarios associated with different collaboration mechanisms where we include elements such as information sharing, resources sharing, centralized setting, and decentralized setting.

Contributed Session

476	Thursday, 08:00 AM - 09:30 AM, Celebration 14	Track: Service Operations
	Contributed Session: Service Quality and Queueing	
	Chair(s): Xinchang Wang	

115-0137 Service Rate Differentiation for Homogeneous Impatient Customers

Chenguang (Allen) Wu, Assistant Professor, Hong Kong University of Science and Technology, Hong Kong, China

We study the joint service rate and waiting time differentiation for homogeneous impatient customers in parallel server queueing systems. We propose an easy-to-implement policy that differentiates customers on both service rates and waiting times, and show that our policy can lead to significant improvements over policies without service rate differentiation.

115-0372 The Queue Behind the Curtain: Information Disclosure in Omnichannel Services

Abhishek Ghosh, Assistant Professor, Tulane University, United States
Achal Bassamboo, Professor, Northwestern University, United States
Martin Lariviere, Professor, Northwestern University, United States

Increasing number of firms are running multiple channels to serve customers. In this paper, we address the question of whether or not a firm should disclose congestion-related queue information to its customers in an omnichannel setting, focusing on the impact of this decision on customer channel choice behavior.

115-0830 In-queue Queueing: Gaining Utility through Ancillary Service while Waiting

Yang Li, Assistant Professor, Richard Ivey Business School, Canada
Baolong Liu, Assistant Professor, ShanghaiTech University, China
Rowan Wang, Associate Professor, Southern University of Science and Technology, China

We investigate a queueing system with the primary service provider also providing an ancillary service which attracts more demand but hurts the utility of the primary service customers. By comparing it to the primary queue and priority queue, we find the ancillary service improves profit and welfare under certain conditions.

115-1741 Optimal Pricing and Information Sharing in Queueing Systems

Xinchang Wang, Assistant Professor, Washington State University, United States
Sigrun Andradottir, Professor, Georgia Institute of Technology, United States
Hayriye Ayhan, Professor, Georgia Institute of Technology, United States

We study optimal pricing in a queueing system that can be observable or unobservable, depending on how customers receive information to estimate sojourn time. We show that if no (all) customers overestimate sojourn time in the observable system, the service provider is better off making the system observable (unobservable).

Contributed Session

478	Thursday, 08:00 AM - 09:30 AM, Coral Spring 1	Track: Emerging Topics in Operations Management
	Contributed Session: Blockchain and Technology	
	Chair(s): Christopher Zobel	

Thursday, 08:00 AM - 09:30 AM

115-0473 The Impact of Blockchain Technology on Competing Suppliers in E-commerce Platform

Rongyi Huang, Student, Renmin University of China, China

Jiahao Yu, Student, Renmin University of China, China

We utilize a game theory model to study blockchain adoption's impact on different supply chain players in an e-commerce platform. We construct a supply chain consisting of a high-class supplier, a low-class supplier and an e-commerce platform and find that the low-class supplier will free ride another supplier's blockchain adoption.

115-1002 A decision support framework for blockchain consensus algorithm selection

Behnam Malmir, Student, Virginia Tech, United States

Hamed Baziyad, Student, ., Iran (Islamic Republic of)

Christopher Zobel, Professor, Virginia Tech, United States

The performance of a blockchain depends on the consensus algorithm (CA) it uses. Finding the ideal CA to adapt in a system is crucial. Yet, it is a challenging task for the decision-makers as they must compromise between conflicting criteria. This paper presents a CA-selection framework modeled by DEA approach.

115-1011 Stakeholder engagement in blockchain development: The case of governing lithium-ion battery circular supply chain safety

Zhuowen Chen, Student, Worcester Polytechnic Institute, United States

Joseph Sarkis, Professor, Worcester Polytechnic Institute, United States

Yildizbasi Abdullah, Post Doc/Researcher, Worcester Polytechnic Institute, United States

Understanding blockchain (BC) development involvement of stakeholders is presented. A unique RACI matrix analysis with industry and academic expert input is used to identify stakeholder roles in BC development for governing lithium-ion battery safety issues in circular systems. Implications and research directions are presented.

Contributed Session

480	Thursday, 08:00 AM - 09:30 AM, Blue Spring 1	Track: Supply Chain Risk Management
	Contributed Session: Supplier Issues	
	Chair(s): Vishwakant Malladi	

115-0049 Supplier selection under consideration of risk and cost - A set covering model

Marcus Brandenburg, Professor, Flensburg University of Applied Sciences, Germany

The proposed study deals with the problem to select a set of suppliers that minimizes the cost and the risk of supply disruptions. A set covering problem formulation is chosen to model the supplier selection problem and heuristic approaches are applied to solve the formulated problem.

115-0911 The significance of frequency and duration of supplier disruptions on risk mitigation

Vishwakant Malladi, Assistant Professor, Indian School of Business, India

Diwakar Gupta, Professor, University of Texas Austin, United States

Kumar Muthuraman, Associate Professor, University of Texas Austin, United States

Frequency and duration of disruptions are distinct components of supplier disruption risk. Managers must tailor risk mitigation strategies to these two components. We model these components of independently using a continuous-time Markov chain and show that the frequency and duration of disruptions affect risk management differently.

115-1438 Compound Risks in Supply Chain Operations: Can Network Reconfiguration Save the Deal?

Naoum Tsolakis, Assistant Professor, International Hellenic University, Greece

Long-lasting and overlapping disruptions impact intertwined supply networks. This research investigates the interactions of such compound risks and their effect on supply chain performance. The developed System Dynamics model acts as a decision-making tool for scenario planning of resource allocation and supply network reconfiguration to respond to compound risks.

Invited Session

481	Thursday, 08:00 AM - 09:30 AM, Blue Spring 2	Track: Supply Chain Risk Management
	Invited Session: Empirical Supply Chain ESG Risk Management	
	Chair(s): WANG Ziang	

115-0636 More than demand variability: Financial bullwhip along supply chain

Chong Chen, Assistant Professor, Central University of Finance And Economics, China

Ziang Wang, Assistant Professor, PolyU, Hong Kong, China

Demand variability increasing along the production network, or the so-called bullwhip effect, has been well established in literature. We further identify a financial bullwhip, i.e., the trade credit variability is larger for more upstream firms along the supply chain. We further discuss the factors intensifying or mitigating the financial bullwhip.

115-0954 Does Carbon Emission Threat Supply Chain Relationship? International Evidence

Ziang Wang, Assistant Professor, PolyU, Hong Kong, China

Yong Jin, Associate Professor, Hong Kong Polytechnic Univ, Hong Kong, China

Duan Yang, Assistant Professor, Hong Kong Baptist University, Hong Kong, China

Hao Ying, Student, Chinese Univ of Hong Kong, Hong Kong, China

Thursday, 08:00 AM - 09:30 AM

The global supply chain relationships have been experienced the new threats and challenges to achieve the carbon neutrality. Drawing on the signaling theory and the transaction cost theory, carbon emissions can be the potential source of the disruption.

115-2045 The Endemic Population-Trust and Supply Chain Networks

Volodymyr Babich, Professor, Georgetown University, United States

Gilles Hilary, Professor, Georgetown University, United States

Ziang Wang, Assistant Professor, PolyU, Hong Kong, China

Jing Wu, Associate Professor, The Chinese University of Hong Kong, Hong Kong, China

The effect of the endemic population-trust on the formation and dissolution of supply chain links among firms is not fully understood. We apply the assortive matching theory to analyse the supply chain partnerships. Our empirical evidence is consistent with the complementarity of the endemic population trust of supply chain partners.

Contributed Session

483	Thursday, 08:00 AM - 09:30 AM, Rainbow Spring 2	Track: Operational Excellence
	Contributed Session: Miscellaneous Topics in Operational Excellence	
	Chair(s): Chenghuai Li	

115-1139 Using Permissible Delay in Payments to Coordinate a Two-Stage Supply Chain under Carbon Tax Regulation

Ming-Feng Yang, Professor, National Taiwan Ocean University, Taiwan

Jatinder Gupta, Professor, University of Alabama Huntsville, United States

Chieh Lee, Associate Professor, National Sun Yat-Sen University, Taiwan

The carbon tax influences the production, logistics, and all operations processes for the supply chains. We examine how supply chain financing strategies, in particular, permissible delay in payment options, can coordinate a two-level supply chain by purchasing policy and pricing strategy to reduce the financial impact of a carbon tax.

115-1182 Condition-Based Production for Stochastically Deteriorating Systems: Optimal Policies and Learning

Collin Drent, Assistant Professor, Eindhoven University of Technology, Netherlands

Melvin Drent, Assistant Professor, Eindhoven University of Technology, Netherlands

Joachim Arts, Professor, University of Luxembourg, Luxembourg

Production systems deteriorate due to usage and may eventually break down, resulting in high maintenance costs at scheduled maintenance moments. This deterioration behavior is affected by the system's production rate. While producing at a higher rate generates more revenue, the system may also deteriorate faster. We study this trade-off.

115-1662 The Blockchain Newsvendor: Value of Freshness Transparency and Smart Contracts

N. Bora Keskin, Associate Professor, Duke University Durham, United States

Chenghuai Li, Student, Duke University, United States

Jeannette Song, Professor, Duke University, United States

Motivated by blockchain applications in the fresh produce industry, we consider a problem where the retailer can have more transparency over the food supply chain by adopting blockchain. We quantify the value of blockchain-enabled freshness transparency and smart contracts by analyzing the retailer's expected profit growth and food waste reduction.

115-1744 The Impact of Cost Auditing on Supply Chain Social Responsibility

Haiying Yang, Assistant Professor, Missouri State University, United States

Zhengping Wu, Associate Professor, Syracuse University, United States

Audit is becoming an increasingly important tool to improve supply chain efficiency. We investigate potential negative social responsibility externalities of audit, and discuss corresponding managerial implications. We also analyze the impact of social responsibility change on supply chain profitability.

Invited Session

484	Thursday, 08:00 AM - 09:30 AM, Barrel Spring 1	Track: POM-Marketing Interface
	Invited Session: Digital platforms: Pricing and strategies	
	Chair(s): Anurag Garg Arunima Chhikara	

115-0666 The Art of Free Tokens: An Economic Analysis of Promotional Crypto Airdrops

Xinyu Zang, Student, University of Florida, United States

Xiang(Shawn) Wan, Assistant Professor, Santa Clara University, United States

Jian Li, Student, Xi'an Jiaotong University, China

Kenny Cheng, Professor, University of Florida, United States

Xi Zhao, Professor, Xi'an Jiaotong University, China

Many blockchain-based startups have now employed the strategy of "airdrop" to gain attention from new investors and get more investors trading in it when it lists during the Initial coin offerings (ICO). This study develops a two-period model incorporating the airdrop strategy. Our study has significant implications for various stakeholders.

115-1021 Study Of Health Outcomes In A Technology Enabled Virtual Setting

Max Terekhov, Student, University of Florida, United States

Thursday, 08:00 AM - 09:30 AM

This paper presents an empirical analysis of health insurance claims data to explore telemedicine outcomes. Specifically, I utilize causal forests and a retrospective matched case control study design to demonstrate statistically significant changes in costs, utilization, and medication adherence of telehealth users.

115-1038 Business Analytics: Emerging Practice And Research Issues In The Health Insurance Industry.

Max Terekhov, Student, University of Florida, United States

This paper summarizes emerging practice and research issues in the health insurance industry. We provide an industry overview, epitomize business analytics applications, and outline current and emerging problems of interest to key stakeholders and researchers in information systems, operations management, and healthcare management.

115-1586 Pricing Strategies of Digital Media Platforms

Anurag Garg, Assistant Professor, University of Kansas, United States

Vashkar Ghosh, Assistant Professor, University of North Carolina Greensboro, United States

Soohyun Cho, Assistant Professor, Rutgers University, United States

Subhajyoti Bandyopadhyay, Professor, University of Florida, United States

Arunava Banerjee, Associate Professor, University of Florida, United States

The media industry has seen a major shift in the past decade with the increase in digital platforms. These digital platforms have challenged traditional broadcasting channels on how the content and services are provided. In this research, we discuss how the business model has evolved and analyze different revenue models.

115-1614 Pricing Strategies for Multi-Channel Liquidation

Avinash Geda, Assistant Professor, University of North Carolina Wilmington, United States

Arunima Chhikara, Assistant Professor, University of Kansas, United States

Nazli Turken, Assistant Professor, Johns Hopkins University, United States

Janice Carrillo, Professor, University of Florida, United States

This work offers insights into pricing and channel strategy to a multi-channel firm facing bankruptcy and considering inventory-liquidation. We also analyze consumer surplus under each liquidation strategy. We conclude by considering the impact of a local competitor firm in the offline market on the liquidating policies of the bankrupt firm.

Invited Session

485	Thursday, 08:00 AM - 09:30 AM, Barrel Spring 2	Track: Procurement and Supplier Management
	Invited Session: Procurement and supply management of pharmaceuticals	
	Chair(s): Kostas Selviaridis Harwin De Vries	

115-0405 Optimizing Policies for National Medicine Stockpiles

Harwin De Vries, Assistant Professor, Rotterdam School of Management, Netherlands

Stef Lemmens, Assistant Professor, Erasmus University Rotterdam, Netherlands

Europe and the US face a worsening problem of medicine shortages. In response, countries are designing policies that oblige manufacturers or wholesalers to stockpile X months of demand for essential medicines. We study the question how to design such policy, trading off cost, complexity, and impact (on medicine shortages).

115-0409 Contracting for resilience in medicine supply chains

Kostas Selviaridis, Associate Professor, Lancaster University, United Kingdom

Nonhlanhla Dube, Lecturer, Lancaster University, United Kingdom

Medicine shortages are a pressing problem internationally with negative effects on patient treatment outcomes and costs of care. The pandemic exacerbated these challenges, creating a sense of urgency to reform medicine procurement systems. We explore how changing tendering and contracting practices can help build resilient medicine supply chains.

115-0412 A global review of medicine shortages reporting systems (MSRS): analysing access and sustainability

Liz Breen, Professor, University of Bradford, United Kingdom

Emilia Vann Yaroson, Lecturer, University of Huddersfield, United Kingdom

Gemma Quinn, Associate Professor, University of Bradford, United Kingdom

The supply of medicine is a common challenge among healthcare systems globally. One way of addressing this issue is to implement a reporting system. It requires stakeholders to report issues with medicine supply and provide early signals. This study explored how these MSRS can enhance medicine access and ensure sustainability.

Contributed Session

487	Thursday, 08:00 AM - 09:30 AM, Regency Ballroom Q	Track: Revenue Management and Pricing
	Contributed Session: New Methods and Applications in Revenue Management	
	Chair(s): Mengzhenyu Zhang Farbod Ekbatani	

115-0457 Attribute-based Pricing: A Novel Formulation and Convergent Algorithms

Mengzhenyu Zhang, Assistant Professor, UCL School of Management, United Kingdom

Chris Ryan, Associate Professor, University of British Columbia, Canada

Thursday, 08:00 AM - 09:30 AM

Wei Sun, Research Staff Member, IBM Research, United States
Shiva Subramanian, Research Staff Member, IBM Research, United States
Markus Ettl, Manager, IBM Research, United States

Attribute-based pricing---giving a price to potential product attributes individually and allowing customers to choose the attributes that form the final product---has been shown to improve customer satisfaction. We consider the problem of finding optimal attribute prices to maximize the expected revenue of a monopolist seller.

115-1547 Simultaneous or Delayed: Optimal Strategy for Movie Release on OTT

Megha Sharma, Associate Professor, Indian Institute of Management Calcutta, India
Raunak Joshi, Student, Indian Institute of Management Calcutta, India
Sumanta Basu, Professor, Indian Institute of Management Calcutta, India
Soumyakanti Chakraborty, Associate Professor, Indian Institute of Management Calcutta, India
Indranil Bose, Professor, Indian Institute of Management Ahmedabad, India

We determine the optimal time to release movies in theaters and Over-the-top platforms. An early OTT release cannibalises the theater revenue while a late release reduces the movie's attractiveness. The tradeoff has become more important in recent times when many production houses have launched their OTTs.

115-1772 Operational Data Analytics: A Framework for Consumer Choice Modeling

Qi Feng, Professor, Purdue University, United States
George Shanthikumar, Professor, Purdue University, United States
Mengying Xue, Associate Professor, University of Science and Technology of China, China

An operational data analytics (ODA) framework is presented to estimate the general consumer choice model using data. This framework, generalizing the existing estimation methods for specific structural models, strikes a delicate balance between the (likely imprecise) structural knowledge and the data.

115-2075 Online Resource Allocation with Buyback: Optimal Algorithms via Primal-Dual

Farbod Ekbatani, Student, University of Chicago, United States
Yiding Feng, Post Doc/Researcher, Microsoft Research, United States
Rad Niazadeh, Assistant Professor, University of Chicago, United States

We study two-sided fractional online allocations with buyback, in which pre-allocated resources can be recalled at a cost proportional to the weight at which they were allocated at the first place. We characterize the optimal competitive ratio for this problem in all parameter regimes by designing primal-dual algorithms.

Contributed Session

489	Thursday, 08:00 AM - 09:30 AM, Regency Ballroom P	Track: Disruptive Technologies and Operations Management
	Contributed Session: Miscellaneous Topics in OM	
	Chair(s): Charles Wang	

115-0016 Are Bike-Sharing Platforms Complementing or Substituting Public Transit? An Empirical Investigation in the United States

Ecem Basak, Assistant Professor, Baruch College, United States
İlçığatay Iris, Assistant Professor, University of Liverpool, United Kingdom

A priori relationship between the entry of bike-sharing platforms and public transit demand is not straightforward and open to debate. In this study, we empirically examine the complementary and substitution effects of bike-sharing platforms on public transit. We also examine the factors that might amplify the strength of the effect.

115-0621 Mitigating upstream disruptions: Effects of extended inventories and power structures in buyer-supplier-sub-supplier triads

Christian Durach, Professor, ESCP EUROPE, Germany
Yuri Peers, Assistant Professor, Vrije Universiteit Amsterdam, Netherlands
Yimin Wang, Associate Professor, Arizona State University Tempe, United States

We studied the relevance of inventories and dependencies in buyer-supplier-sub-supplier triads after an upstream disruption event. Data was analyzed from triads that were affected at their upper end by the 2011 Japanese earthquake. Results show: triad inventories matter to buyers, joint orchestration is needed, and power is an important moderator.

115-1226 Do investments in business intelligence technologies improve firm performance?

Khadija Ajmal, Student, University at Buffalo, SUNY, United States
Charles Wang, Associate Professor, Suny At Buffalo, United States
Nallan Suresh, Professor, Suny At Buffalo, United States
Aditya Vedantam, Assistant Professor, University of Buffalo, United States

Using an event study methodology, this research empirically tests the influence of firms' investments in big data, machine learning, artificial intelligence, and cloud computing on their long-term operational and financial performance. Results show a significant positive effect of business intelligence investments on ROA, ROE, and Tobin Q of sample firms.

115-1400 Digital Transformation And Operational Performance: The Roles Of Transformation Management Capabilities

Peter Darko, Student, Kwame Nkrumah University of Science and Technology, Ghana
Francis Baidoo, Associate Professor, University of Texas Rio Grande Valley, United States
David Asamoah, Associate Professor, Kwame Nkrumah University of Science and Technology, Ghana

Thursday, 08:00 AM - 09:30 AM

Kwame Kwateng, Associate Professor, Kwame Nkrumah University of Science and Technology, Ghana

John Marfo, Lecturer, Kwame Nkrumah University of Science and Technology, Ghana

Digital transformation has resulted in favorable business transformations and new opportunities. However, huge difficulties have surfaced as businesses attempt to ignite DT throughout their organizations. This study seeks to examine the relationship between DT and Operational performance and the mediating effect of the Transformation management capabilities on this relationship.

Thursday, 09:45 AM - 11:15 AM

Contributed Session

497	Thursday, 09:45 AM - 11:15 AM, Celebration 2	Track: Energy and Natural Resource Management
	Contributed Session: Environmental Governance and Policy	
	Chair(s): Zana Cranmer	

115-0104 A Decision Support Tool for Local Climate Action

Zana Cranmer, Assistant Professor, Bentley University, United States

This work presents an open-source scenario modeling tool intended to provide local governments and community groups with a rigorous and easy to use tool for prioritizing local climate initiatives according to multiple criteria. Local governments play a crucial role climate action; however, few limited tools are available to support them.

115-1579 What criteria are considered in decision-making in biogas production projects from organic waste?

Daniela Yamaji, Student, Londrina State University, Brazil
Saulo Amâncio-Vieira, Professor, Londrina State University, Brazil
Claudia Luengo, Student, Londrina State University, Brazil
Eduardo Contani, Professor, Londrina State University, Brazil
Reginaldo Fidelis, Professor, UTFPR-Campus Londrina, Brazil

The main objective is to find the criteria considered in decision-making in biogas projects from organic waste. First, we carry out an integrative review of the literature on this topic, then we identify the decision criteria in these projects. Thus, we hope to build a multicriteria decision model for biogas.

Invited Session

498	Thursday, 09:45 AM - 11:15 AM, Celebration 3	Track: Healthcare Operations Management
	Invited Session: Pharmaceutical operations and supply chain	
	Chair(s): Rachna Shah Hanu Tyagi	

115-0095 Impact of FDA policy on Drug Shortages

Parshuram Hotkar, Assistant Professor, Indian School of Business, India
Diwakar Gupta, Professor, University of Texas Austin, United States

Frequent drug shortage have impacted healthcare and economy for past few years. We study the role of information sharing through the FDASIA act on the shortages. We find that information availability substitutes the capacity investment for certain drugs leading to severe drug shortage, while improving shortage duration for other drugs.

115-0698 Balancing Speed-Safety Tradeoffs in the Drug Approval Process

Hanu Tyagi, Student, University of Minnesota, United States
Rachna Shah, Associate Professor, University of Minnesota, United States

Getting new products to market fast is advantageous. However, increased speed could negatively impact product safety. We study the speed-safety tradeoff in the context of the US pharmaceutical industry. We compile a unique dataset of drugs approved by the FDA and find that speed negatively impacts safety.

115-1162 Time to Recover Market Share: Lasting Effects of Supply Chain Disruptions on Firm Performance

Minje Park, Post Doc/Researcher, Columbia University, United States
Anita Carson, Professor, Boston University, United States
Rena Conti, Professor, Boston University, United States

As supply chain disruptions frequently occur in today's globalized supply chains, understanding their impact is important. We study the long-term effects of supply chain disruptions on firms' market share. We focus on the generic drug industry where supply chain disruptions have been recurrent in the last decade.

Invited Session

500	Thursday, 09:45 AM - 11:15 AM, Celebration 5	Track: Healthcare Analytics
	Invited Session: Healthcare Decision Making	
	Chair(s): Kimia Ghobadi	

115-0262 Opioid Epidemic: Evidence-Based Management of Pain Treatments Using Longitudinal Machine Learning

Bolori Alireza, Assistant Professor, University of Washington, Tacoma, United States
Soroush Saghafian, Assistant Professor, Harvard University, United States
Stephen Traub, Department of Emergency Medicine, Brown University, United States

Medical guidelines have urged healthcare providers to lessen opioid prescriptions. This, however, could negatively affect patients who suffer from pain symptoms. Utilizing claims data, we analyze the trade-off between the side effects and benefits of using pain treatments, and provide an analytical framework that helps physicians in prescribing these treatments. Opioid

115-0727 Data-Driven Approach for Operating Room-to-Downstream Elective Surgery Planning Under Uncertainty

Karmel Shehadeh, Assistant Professor, Lehigh University, United States

Thursday, 09:45 AM - 11:15 AM

Man Yiu Tsang, Student, Lehigh University, United States
Rema Padman, Professor, Carnegie Mellon University, United States
Arman Kilic, Associate professor of surgery, Medical University of South Carolina, United States

We propose a new elective surgery assignment, sequencing, and scheduling problem (ESASSP), involving multiple ORs and downstream recovery units (ICU and ward) and methodologies for solving the ESASSP. Numerical experiments based on real surgery data are used to compare the proposed methodologies and illustrate the potential for impact in practice.

115-1618 Data-driven Dynamic Coordination of Exams in a Radiology Practice
Saharnaz Mehrani, Assistant Professor, Florida Atlantic University, United States
Miao Bai, Assistant Professor, University of Connecticut, United States
Carlos Cardonha, Assistant Professor, University of Connecticut, School of Bus, United States
David Bergman, Associate Professor, University of Connecticut, United States

We study dynamic coordination of exams in a radiology practice with multiple classes of patients with the goal to minimize patients waiting cost. We adopt a reinforcement learning method to develop data-driven policies for this problem. We show the performance of our proposed policies on real-world data.

115-2110 Would a better healthcare access reduce Covid-19 mortality measures?
Fardin Ganjkanloo, Student, Johns Hopkins University, United States
Farzin Ahmadi, Student, Civil and Systems Engineering, United States
Kimia Ghobadi, Assistant Professor, Johns Hopkins University, United States

We examine COVID-19 mortality measures in US counties and particularly focus on the pandemic progression, societal response, vaccination uptake, and vaccine efficacy for variants. Our analyses indicate correlations between mortality measures and various factors, including access to acute resources, which can be improved through optimal resource allocation.

Invited Session

501	Thursday, 09:45 AM - 11:15 AM, Celebration 6	Track: Healthcare Analytics
	Invited Session: Operational and Behavioral Decisions in Healthcare	
	Chair(s): Sriram Venkataraman	

115-0175 Repeated Principal-Agent Games with Unobserved Rewards of Imperfect-Knowledge Agents
Ilgin Dogan, Student, University of California, Berkeley, United States
Anil Aswani, Associate Professor, University of California Berkeley, United States
Max Shen, Professor, University of California Berkeley, United States

We explore a challenging scenario of repeated games which is applicable to personalized medical adherence incentives. We design a consistent estimator and data-driven policies for two strategic players: a self-interested agent tackling a multi-armed bandit with non-parametric rewards, and a principal training a parallel algorithm by solely observing agent's actions.

115-0209 Physician Discretion and Patient Pick-up: How Familiarity Encourages Multitasking in the Emergency Department
Robert Niewoehner, Assistant Professor, Kelley School of Business, United States
Bradley Staats, Professor, University of North Carolina Chapel Hill, United States
Diwas KC, Professor, Emory University, United States

Recent operations research acknowledges that agents in our operational systems have discretion to make decisions. Modeling this behavior requires assumptions, but these assumptions may induce gaps between models and real-world observations. Deliberate system design can transform problematic deviance into productive discretion.

115-0386 Chronic disease management under different payment systems and the promise of mHealth
Balaraman Rajan, Associate Professor, California State University East Bay, United States
Arvind Sainathan, Associate Professor, NEOMA Business School, France
Saligrama Agnihotri, Professor, Binghamton University, United States
Leon Cui, Assistant Professor, Binghamton University, United States

Mobile health (mHealth) technology is promising to provide efficient, effective, and patient-centred healthcare to manage chronic conditions. However, the economics associated with mHealth is not well understood. In a chronic care clinical practice setting, we investigate fee-for-service and capitation payment schemes, and explore their performance under office-visit and mHealth modes.

115-1549 Certificate of Need and case complexity in hospital operations: Examining cost and quality tradeoffs
Jonathan Phares, Assistant Professor, Iowa State University, United States
David Dobrzykowski, Associate Professor, University of Arkansas - Fayetteville, United States
Brian Fugate, Associate Professor, University of Arkansas - Fayetteville, United States

Certificate of Need (CON) laws have produced a considerable practical and academic debate regarding its effects on hospital operations. Using hybrid econometric models with data from multiple sources accounting for 3,458 acute-care hospitals, we examine the effects of CON and case mix index on hospital cost and quality performance.

115-1668 Scheduling Smarter: Staffing Decision Impact on Nurse-Aide Turnover
Kevin Mayo, Assistant Professor, Washington State University, United States
Eric Webb, Assistant Professor, University of Cincinnati, United States
George Ball, Associate Professor, Indiana University Bloomington, United States

Thursday, 09:45 AM - 11:15 AM

Kurt Bretthauer, Professor, Indiana University, United States

High turnover rates exacerbates the existing shortage of caregivers. We examine both how much and with whom to schedule part-time Certified Nursing Assistants (CNAs) in long-term nursing facilities. Using novel data we identify two scheduling levers, reducing coworker variability and optimal hours, managers can use to reduce turnover.

Contributed Session

503	Thursday, 09:45 AM - 11:15 AM, Celebration 8	Track: Sustainable Operations Management
	Contributed Session: Use of Technologies in Sustainable Operations	
	Chair(s): Sara Behdad	

115-0983 Impact of Blockchain-driven Sustainable Supply Chain Transparency on Supplier Selection: Insights from Choice-based Conjoint Experiment

Sukrit Vinayavekhin, Student, Bayes Business School, United Kingdom
Aneesh Banerjee, Reader, City University of London, United Kingdom
Feng Li, Professor, City, University of London, United Kingdom

Building on concepts in inter-organisational trust and information economics, this research examines how buyers assess the importance of various attributes of information voluntarily disclosed by suppliers. It also incorporates the factors associated with blockchain technology. The choice-based conjoint experiment was sent to collect quantitative and qualitative responses from actual buyers.

115-1005 An Artificial Intelligence-based Framework to Assess Product Repairability

Haoyu Liao, Student, University of Florida, United States
Sara Behdad, Associate Professor, University of Florida, United States

Product repairability is essential for extending product lifespan towards the circular economy. This work proposes an Artificial Intelligence-based framework for evaluating product repairability using unsupervised learning and transfer learning. The proposed framework has been applied to a dataset of smartphone teardown images from different brands.

115-1887 Green is not an option: Foodservice 4.0 for Green Supply Chain Resilience

Zenon Michaelides, Reader, Manchester Metropolitan University (MMU), United Kingdom
Roula Michaelides, Reader, Manchester Metropolitan University, United Kingdom
Santosh Maruti Salunkhe, Post Doc/Researcher, Manchester Metropolitan University (MMU), United Kingdom

Overcoming the ripple effects of the pandemic foodservice SMEs, primarily dependent on logistics, are now facing rising fuel-costs and unachievable environmental targets. This paper will explore foodservice 4.0 technologies to mitigate trade-offs and promote resilience in sustainable growth.

115-2040 Supporting Supply Chain Sustainability through Digital Technologies in Transport SMEs

Wolfgang Kersten, Professor, Hamburg University of Technology, Germany
Lasse Ladewig, Student, Hamburg University of Technology, Germany
Hannah-Deborah Harbich, Student, Hamburg University of Technology, Germany
Beverly Lege (geb. Grafe), Student, Hamburg University of Technology, Germany

Supply chains have a major impact on the sustainability performance of companies. Our research focuses on how digital technologies can contribute to supply chain sustainability in certain areas and what issues arise and need to be addressed. The analysis is based on different research projects involving small and medium-sized enterprises.

Invited Session

506	Thursday, 09:45 AM - 11:15 AM, Celebration 11	Track: Manufacturing Operations
	Invited Session: Manufacturing Operations	
	Chair(s): Mehdi Farahani	

115-1079 Asymptotic Optimality of Open-Loop Policies for Lost-Sales Inventory Models

Xingyu Bai, Student, University of Illinois Urbana-Champaign, United States

We consider lost-sales inventory models with stochastic lead times. In the model with divisible products, we show that constant-order policies are asymptotically optimal as the lead time increases. In the model with indivisible products, we show that bracket policies are asymptotically optimal as the lead time increases.

115-1498 Equity-Based Critical Infrastructure Investments

Milad Baghersad, Assistant Professor, Florida Atlantic University, United States
Christopher Zobel, Professor, Virginia Tech, United States
Ravi Behara, Professor, Florida Atlantic University, United States

In many countries, like the U.S., critical infrastructures face the problem of aging and require significant improvements to continue their services for the next decades. In this study, we develop different deterministic models to address the inequity problem in prioritizing stormwater improvement projects.

115-1566 Taking advantage of a supplier's political instability?

Jafar Namdar, Post Doc/Researcher, Massachusetts Institute of Technology, United States
Milad Baghersad, Assistant Professor, Florida Atlantic University, United States
Sachin Modi, Professor, Villanova University, United States

Thursday, 09:45 AM - 11:15 AM

This paper investigates how sourcing from suppliers in politically unstable countries impacts focal firms' performance. We show that political instability has a slight, curvilinear relationship with firms' performance. Moreover, this nonlinear relationship gets pronounced and reversed for firms operating in durable goods industries.

Contributed Session

507	Thursday, 09:45 AM - 11:15 AM, Celebration 12	Track: Humanitarian Operations and Crisis Management
	Contributed Session: Pandemic-Vaccine Research	
	Chair(s): Mike Veatch	

115-0078 Covid-19 Policy Failure and Success: A configurational Perspective

Jomon Paul, Professor, Kennesaw State University, United States
Aniruddha Bagchi, Professor, Kennesaw State University, United States
Xinfang Wang, Professor, Georgia Southern University, United States

We adopt a configurational perspective to analyze the complexity of Covid-19 policies, which must balance public health outcomes and economic ones. Through a fuzzy-set qualitative comparative analysis (fsQCA), we reveal multiple, nonlinear combinations of the policies leading to failure and success of health and economic outcomes, providing a multiple-policy strategy.

115-0099 Optimizing Vaccine Distribution in Developing Countries under Natural Disaster Risk

Bonn Kleiford Seranilla, Student, University of Luxembourg, Luxembourg
Nils Löhndorf, Associate Professor, University of Luxembourg, Luxembourg

We propose a multistage stochastic facility location model that allows policy-makers to choose COVID-19 vaccination facilities while accounting for possible facility failure due to natural disasters. Recommendations based on this model were implemented following a collaboration with a flood-prone city in the Philippines posting highest vaccination rate in the region.

115-1611 Humanitarian Operations Standards for Epidemics: A Case in Japan

Yoshiki MATSUI, Professor, The Open University of Japan, Japan
Minh Nguyen, Lecturer, University of Economics, Ho Chi Minh City, Vietnam

This study aims to investigate the current standards for humanitarian operations in Japan to respond to disasters, specifically focusing on the case of COVID-19. The case of Japan will be compared with humanitarian operations in other countries to provide insights into strengths and weakness of humanitarian operations in different countries.

115-1959 International Vaccine Allocation: An Optimization Framework

Mike Veatch, Professor, Gordon College, United States
Abraham Holleran, Student, Gordon College, United States
Susan Martonosi, Professor, Harvey Mudd College, United States

Several vaccine donation arguments were given regarding COVID-19: altruism, reducing transmission across borders, and reducing the emergence of variants. A multi-area SEIR optimization model, with variants delayed by vaccination, identifies scenarios where donation does or does not improve donor country outcomes. Variants emerge from unvaccinated cases in low-income countries.

Invited Session

508	Thursday, 09:45 AM - 11:15 AM, Celebration 13	Track: Humanitarian Operations and Crisis Management
	Invited Session: Humanitarian Operations & SDGs	
	Chair(s): Adriana Leiras	

115-0822 Mapping the interlinkages between Humanitarian Operations and SDGs

Maria Angélica Gomes da Silva, Student, Pontifical Catholic University of Rio de Janeiro, Brazil
Luiza Cunha, Post Doc/Researcher, Universidade de São Paulo, Brazil
Adriana Leiras, Professor, Pontifícia Universidade Católica do Rio de Janeiro - PUC-Rio, Brazil

Humanitarian Operations (HO) aimed at minimizing the impact of disasters present synergies and tradeoffs with the Sustainable Development Goals (SDGs), focused on achieving a sustainable future for all. This research aims to analyze the interlinkages between the HO and the SDGs by representing relations through a system dynamics model.

115-1527 Forming a humanitarian coalition when time is short

Iman Parsa, Post Doc/Researcher, INSEAD, France
Mahyar Eftekhari, Associate Professor, Arizona State University Tempe, United States
Scott Webster, Professor, Arizona State University Tempe, United States

More coordination is emphasized in the UN sustainable development goals. Yet, in humanitarian operations, a lack of coordinated response remains a problem. We develop a non-cooperative game theoretical model to analyze horizontal coordination among humanitarian organizations, highlighting the structural barriers to higher levels of coordination.

Thursday, 09:45 AM - 11:15 AM

Contributed Session

509

Thursday, 09:45 AM - 11:15 AM, Celebration 14

Track: Service Operations

Contributed Session: Service Economics

Chair(s): Iman Dayarian

115-0914 Unifying model of conjoint analysis and MCDM : Focused on Music Streaming Services

Sangwon Eum, Student, Korea University, South Korea
Hosun Rhim, Professor, Korea University, South Korea
Jeunghyun Kim, Assistant Professor, Korea University, South Korea
EunSu Lee, Assistant Professor, New Jersey City University, United States
Zili Xu, Student, Korea University, South Korea

We develop a unifying model of conjoint analysis and MCDM models. The conjoint analysis model is divided into multiple subproblems to reduce the number of attributes. Attributes for conjoint analysis are identified by text mining tools. The subproblems are integrated into the original problems using MCDM.

115-1130 Equitable Workload Allocation in Vehicle Routing Problem with Heterogeneous Drivers

Iman Dayarian, Assistant Professor, University of Alabama, United States
Vahid Mahmoodian, Student, University of South Florida, United States
Hadi Charkhgard, Assistant Professor, University of South Florida, United States

Fairness considerations in the private logistics-service sector are growing for an equitable workload allocation among service providers. This is more crucial when employing crowdsourced workforce considering their inherent heterogeneity. This research aims at creating a decision-support tool to strike a balance between efficiency and equitable workload allocation in crowdshipping settings.

115-1174 A study on the profitability of proactive services: The event study method

Chongwoo Park, Student, Korea University, South Korea
Hosun Rhim, Professor, Korea University, South Korea
Youngmi Han, Lecturer, Korea University, South Korea

We introduce the concept of proactive services which includes three different concepts: service guarantee, preventive service, and condition-based predictive service. We examine the profitability of proactive services against traditional services by conducting the event study.

115-1455 Production and Inventory Strategies under Centralized Auction Scheme

Guohua Wan, Professor, Shanghai Jiao Tong University, China
Tong Wang, Associate Professor, Shanghai Jiao Tong University, China
Nani Zhou, Student, Shanghai Jiao Tong University, China

We study three different production and inventory strategies of pharmaceutical manufacturers under centralized auction scheme. We characterize and analyze optimal strategies under centralized auction scheme. We then conduct numerical experiments to compute the loss of social welfare under different strategies, shedding lights on design of the pharmacy auction scheme.

Invited Session

511

Thursday, 09:45 AM - 11:15 AM, Coral Spring 1

Track: Emerging Topics in Operations Management

Invited Session: Empirical Research in Social and Sustainable Operations

Chair(s): Amrita Kundu

115-0456 Racial and Gender Biases in Customer Satisfaction Surveys: Evidence from the Restaurant Industry

Masoud Kamalahmadi, Assistant Professor, Miami Herbert Business School, United States
Qiuping Yu, Associate Professor, Georgetown University, United States
Yong-Pin Zhou, Professor, University of Washington, United States

We explore racial and gender biases in customer ratings of restaurant servers using 260,000 customer satisfaction surveys and 1.5 million transactions at a U.S. national casual dining restaurant chain. We find strong evidence consistent with customer biases against female and racial minority servers. We discuss the mechanisms of the biases.

115-1779 Closing the Gender Gap in Performance of Small Firms by Building Resilience: Evidence from Uganda

Amrita Kundu, Assistant Professor, Georgetown University, United States
Kamalini Ramdas, Professor, London Business School, United Kingdom

Gender gap in performance of small firms is well documented in the literature, but the reasons are not well understood. We investigate the role of firm-specific disruptions in explaining the gender gap in performance and whether this gender gap can be reduced by building firm resilience.

115-1826 Economics of Grid-Scale Energy Storage in Wholesale Electricity Markets

Omer Karaduman, Assistant Professor, Stanford University, United States

I investigate private incentives for operating and investing in grid-scale energy storage and the need for policies that complement investments in renewables with encouraging energy storage. I build a new dynamic structural equilibrium framework to quantify the effects of grid-scale energy storage and apply it to study South Australian Market.

Thursday, 09:45 AM - 11:15 AM

Invited Session

513	Thursday, 09:45 AM - 11:15 AM, Blue Spring 1	Track: Supply Chain Risk Management
	Invited Session: Cross-functional Approaches to Supply Chain Risks: Operations & Finance	
	Chair(s): Ye Liu	

115-0800 Facilitating upstream supply chain resilience with buyer intermediation in supplier financing

Sairam Sriraman, Student, TUM School of Management, Germany
David Wuttke, Assistant Professor, Technische Universität München, Germany
Andreas Gernert, Assistant Professor, Kühne Logistics University, Germany
Volodymyr Babich, Professor, Georgetown University, United States

Buyers can increase supply chain resilience by supporting their suppliers with supply chain finance. To that end, we use a game theoretical model to examine how buyer intermediation in supplier finance affects the supplier's resilience investment. We examine the impact of decentralized decision making and market imperfections.

115-1337 Shareholder Scrutiny, Capacity Investment, and Inventory Level

Karca Aral, Assistant Professor, Syracuse University, United States
Erasmus Giambona, Professor, Syracuse University, United States
Luk Van Wassenhove, Professor, INSEAD, France

We study the effect of shareholder scrutiny and managerial time-horizon on two key intertwined operations decisions: capacity investment and inventory levels in a quasi-natural experimental setup. Our results suggest that capacity and inventory levels may be suppressed due to managerial risks involved.

115-1511 Utilizing Machine Learning to Manage a Hog Farm's Operational Decisions

Panos Kouvelis, Professor, Washington University in St. Louis, United States
Danko Turcic, Associate Professor, Anderson School of Management, United States
Ye Liu, Student, Washington University in St. Louis, United States

We study a data-driven model of a hog farm. Based on the prevailing market prices and inventory availability, a risk-averse farmer must periodically decide what hogs to sell and what hedges to implement while having to fulfill a contract with a meatpacker. Our optimal policy is derived through machine learning.

Invited Session

517	Thursday, 09:45 AM - 11:15 AM, Barrel Spring 1	Track: POM-Marketing Interface
	Invited Session: Ad load, consumer privacy, and product subscriptions	
	Chair(s): Xiaoyu Wang	

115-0821 Estimating Treatment Effects of Ad Load on Long-Term Outcome

Yueyang Zhong, Student, Booth School of Business, United States

We estimate the causal effect of short-term user engagement on the long-term ad revenue using a causal reinforcement learning framework where we use A/B testing as instrumental variables. We test our algorithm that dynamically controls the ad load in our partner firm's auction simulator, which is shown to perform well.

115-0898 The Effects of Diversity in Algorithmic Recommendations on Digital Content Consumption: A Field Experiment

Guangying Chen, Student, Washington University in St. Louis, United States
Tat Chan, Professor, Washington University in St. Louis, United States
Dennis Zhang, Associate Professor, Washington University in St. Louis, United States
Senmao Liu, Data Scientist, NetEase Cloud Music, Inc., China
Yuxiang Wu, Data Scientist, NetEase Cloud Music, Inc., China

We conducted a field experiment on a music streaming platform to study the effects of content diversity in personalized recommendations. Overall, recommendations with higher topic diversity did not affect users' consumption diversity but lowered their consumption level. However, higher recommendation diversity boosted active users' consumption diversity without hurting consumption level.

115-0994 Consumer Privacy in Online Retail Supply Chains

Xiaoyu Wang, Student, Washington University in St. Louis, United States
Fasheng Xu, Assistant Professor, Syracuse University, United States
Fuqiang Zhang, Professor, Washington University St Louis, United States

This paper studies the implications of newly adopted privacy policies such as the GDPR for online retail supply chains consisting of a retailer and a supplier. We find that, although the GDPR is designed to protect consumer privacy, it may actually hurt consumer surplus while benefiting the retailer.

115-1015 Product Subscriptions, Price Versus Non-Price Messages and Customer Churn: Evidence from a Field Experiment

Kirthi Kalyanam, Professor, Santa Clara University, United States
Raphael Thomadsen, Professor, Washington University in St. Louis, United States
Nan Zhao, Student, Washington University in St. Louis, United States

Thursday, 09:45 AM - 11:15 AM

We examine the relative performance of price versus non-price messaging in attracting and retaining customers for a product subscription service. Our results from a randomized email campaign show that nonprice messages have superior performance in retention. We also explore HTE of creatives to provide a better match and reduce churn.

115-1020 Consumer Response to Puffery: Empirical Evidence From A Cellular Network Upgrade Advertising

Yi Zhu, Student, University of Minnesota, United States

Jason Chan, Associate Professor, University of Minnesota, United States

Xuan Bi, Assistant Professor, University of Minnesota, United States

Yue Guo, Associate Professor, Southern University of Science and Technology, China

Jun Wu, Associate Professor, Beijing University of Posts and Telecommunications, China

We empirically study consumer response to advertising puffery. We find consumers respond negatively to puffery, and the responses vary across product attributes and consumer characteristics. Our findings inform companies of adverse outcomes of using puffery and highlight the importance of adequate product and service capacity to avoiding negative consumer response.

Invited Session

518	Thursday, 09:45 AM - 11:15 AM, Barrel Spring 2	Track: Procurement and Supplier Management
	Invited Session: Human Behavior in Supplier Management	
	Chair(s): Jan Fransoo	

115-0877 Supplying Cash-Constrained Retailers: Understanding Shopkeeper Behavior at the Bottom of the Pyramid

Sebastian Villa, Assistant Professor, University of New Mexico, United States

Rafael Escamilla, Student, Tilburg University, Netherlands

Jan Fransoo, Professor, Tilburg University, Netherlands

Nanostores are the source of income for millions of shopkeepers in developing countries. We conduct an empirical and a behavioral study to explain how and when suppliers' visit frequency, product margins, and shopkeepers' cash constraints influence shopkeepers' orders. We provide managerial recommendations for supplying cash-constrained shopkeepers.

115-0934 How to Account for Behavioral Newsvendors: The Robust Buyback Contract with Response Uncertainty

Christina Imdahl, Assistant Professor, Eindhoven University of Technology, Netherlands

Kai Hoberg, Professor, Kuehne Logistics University, Germany

Michael Becker-Peth, Assistant Professor, Rotterdam School of Management, Netherlands

Normative (expected profit maximizing) theory assumes any decision-maker to be fully rational while in fact, decision-makers deviate from the theoretical optimal response. We propose robust optimization to obtain contract parameters that are robust to deviations from normative behavior. The approach works without any assumptions on the distribution of the response.

115-1220 Understanding the Impact of Sales Visit Inconsistency on the Ordering Behavior of Nanostores

Simone Balvers, Student, Tilburg University, Netherlands

Eirini Spiliotopoulou, Assistant Professor, Tilburg University, Netherlands

Jan Fransoo, Professor, Tilburg University, Netherlands

Sangho Chae, Assistant Professor, Tilburg University, Netherlands

Nanostores, or mom-and-pop stores, rely on sales agents to replenish their inventory. When sales agents visit stores inconsistently, uncertainty arises about the time period for which to order. We define this uncertainty as review period uncertainty. Using an experimental design, we analyze the impact of this uncertainty on ordering behavior.

115-1688 Managing Risk Tradeoffs: Sustainability and Diversification Strategies of Procurement Managers

Brent Moritz, Associate Professor, Penn State University University Park, United States

Behnam Fahimnia, Professor, The University of Sydney, Australia

Andrew Collins, Senior Lecturer, University of Sydney, Australia

We investigate how practicing managers evaluate environmental and social sustainability relative to cost and supply diversification. Using a discrete choice experiment, managers resisted selecting new suppliers that had poorer sustainability profiles. They wanted increased country diversification, and were willing to incur a slight cost increase for better sustainability.