

**OPERATIONS MANAGEMENT &
UN SUSTAINABLE DEVELOPMENT GOALS**



**2023 POMS
INTERNATIONAL CONFERENCE**

PARIS, FRANCE



**RENNES
SCHOOL
OF BUSINESS**

UNFRAMED THINKING



Welcome

A very warm welcome to the 2023 POMS International Conference in Paris.

This year's theme is "Operations Management & United Nation's Sustainable Development Goals (UNSDGs)". Therefore, the main focus of the conference revolves around the role of Operations Management tools and concepts to transform our world and positively impact any of the 17 UNSDGs. We call on you as operations and supply chain scholars to use this conference as an opportunity to share knowledge and build lasting networks. We offer in return keynote speeches from leading scholars in our field including Sushil Gupta (Florida International University) and Christopher Tang (UCLA). You will also have the opportunity to join inspiring debates during our four special panels.

Finally, we would like to thank the Rennes School of Business as the host and organizer of this fantastic conference. Our special thanks go to Constantin Blome (Lancaster University Leipzig) and Guillaume Roels (INSEAD) for their support.

Best wishes,

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Keynote Speakers



Sushil K. Gupta

Distinguished University Professor in the College of Business
Florida International University

Dr. Sushil K. Gupta is a Distinguished University Professor in the College of Business, Florida International University (FIU), Miami, Florida, U.S.A. Dr. Gupta has also served FIU as Vice Provost, and Associate Dean of College of Engineering. Dr. Gupta is also a Distinguished Professor, at Dongbei University of Finance and Economics (DUFE), Dalian, China. His research interests include disaster management, healthcare, mathematical modeling, project management, supply chain management, and e-business. He has published in top-ranking professional journals. Dr. Gupta is one of the founding members of the Production and Operations Management Society (POMS) and has played a key role in its initiation, development, and growth. He was POMS Vice President for Member Activities (1994), POMS President (1996) and is currently serving as its Executive Director (since 1997). He is the Department Editor of the POM's Disaster Management department.



Christopher Tang

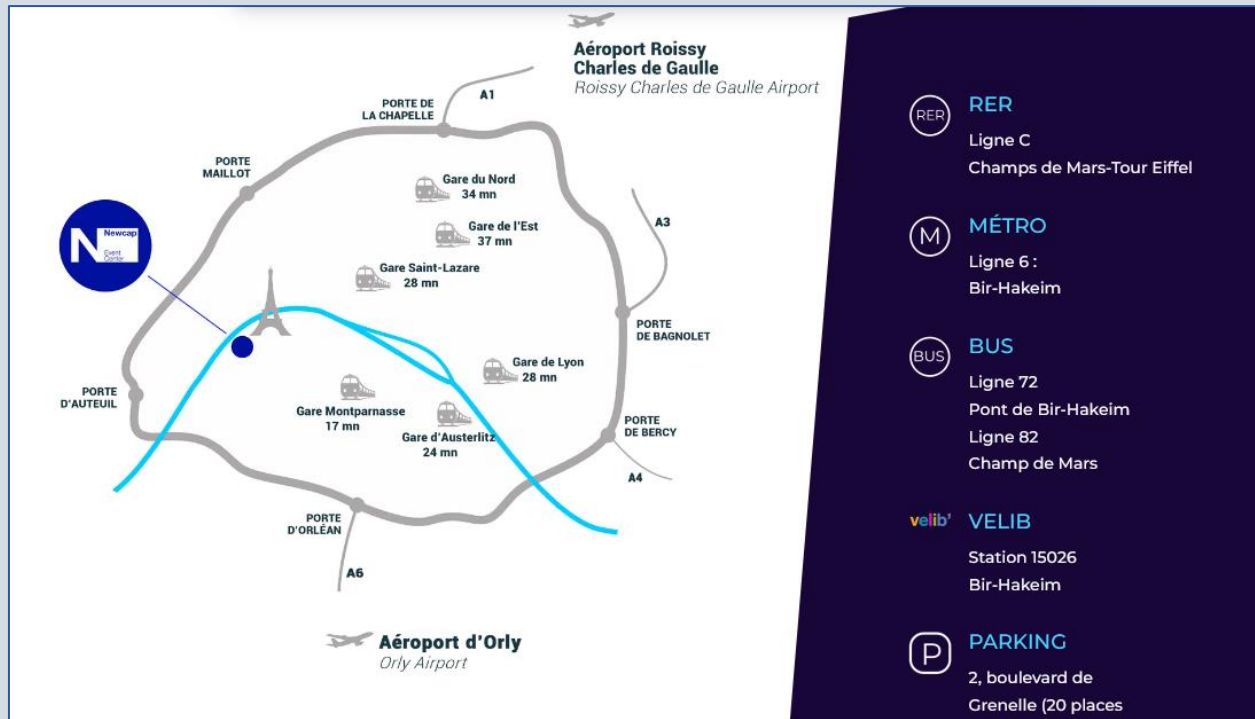
Distinguished Professor
UCLA

Dr. Christopher Tang is a University Distinguished Professor and the holder of the Edward W. Carter Chair in Business Administration at the UCLA Anderson School of Management. Currently, he also serves as the Senior Associate Dean of Global Initiatives and the faculty director of the Center for Global Management at UCLA. Known as a thought leader in global supply chain management, Chris consulted with numerous global companies including Amgen, Amazon, HP, IBM, Nestlé (USA), etc.; taught at Stanford University, UC Berkeley, Hong Kong University of Science and Technology, National University of Singapore, MIT (Zaragoza), and London Business School. Chris has published 7 books, 30 book chapters, and over 200 research articles in global supply chain management. He is a lifetime fellow of POMS, INFORMS, and MSOM society, a former president of POMS, a former editor-in-chief of M&SOM, a former Dean of the Business School at the National University of Singapore, and a former chairman of the UCLA Anderson School.

Conference Venue: The Newcap Event Center

(Address: 3 Quai de Grenelle, 75015 Paris)

Under the Eiffel Tower along the River Seine, the luxurious Newcap Event Center is the 2023 POMS International Conference venue.



Conference Gala Dinner Venue on Wednesday, July 19, at 19:00

(Address: Port de Javel Haut, 75015 Paris)

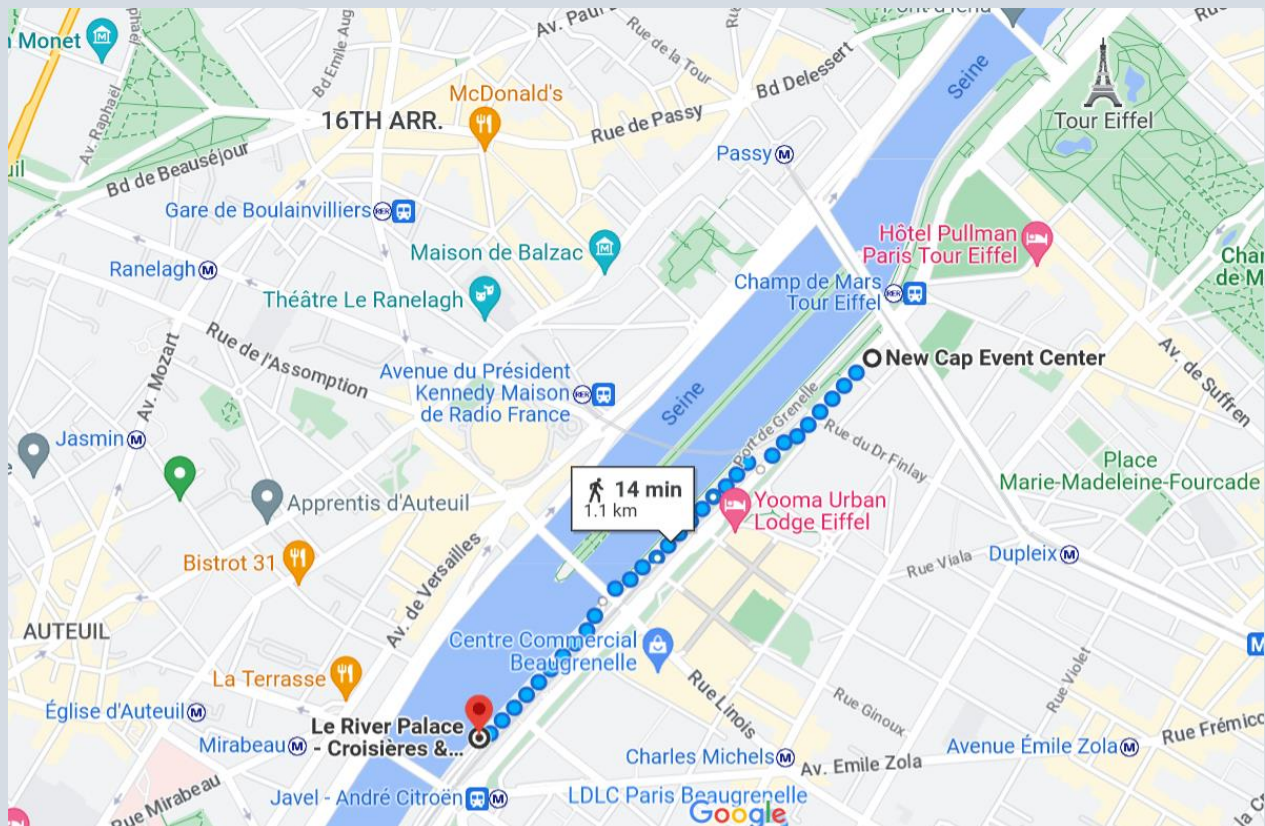
The "Le River Palace" cruise is a 15-minute walk along the Seine River from the conference venue, the "Newcap Event Center". A group will leave the Newcap Event Center at 18.40. Please meet at the entrance if you would like to join the group.

Alternatively, please make your own way to the venue. The venue is accessible by public transport through:

 "Javel" station

 "Javel - André Citroën" station

 The onboarding will start at 19:00. **Please note that the boat will leave the port at 19:30 and will no longer be accessible.** So, please make sure you arrive at the Gala Dinner venue before 19:30.



Programme Overview

2023 POMS International Conference - Paris, France

July 18 - 20, 2023

Newcap Event Center: 3 Quai de Grenelle, 75015 Paris

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Conference Timetable

Start Time	End Time	Event	Location
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Monday, July 17, 2023

6:00 PM	8:30 PM	Pre-conference Social Event @Rennes School of Business-Paris Campus: 9 Rue d'Athènes, 75009 Paris	
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Tuesday, July 18, 2023

7:30 AM	5:00 PM	Check-in & Reception	Newcap Event Center
8:00 AM	8:30 AM	Welcome Session	Room 2 - 8
8:30 AM	9:20 AM	Plenary (1): Professor Sushil K. Gupta, Florida International University	Room 2 - 8
9:20 AM	9:50 AM	Coffee Break	Ballroom Foyer
9:50 AM	11:20 AM	Breakout Sessions & Panel "Meet the Editors (I)"	Rooms 1 - 10
11:30 AM	1:00 PM	Breakout Sessions & Panel "Practice-based Research"	Rooms 1 - 10
1:00 PM	2:00 PM	Lunch (will be served in the foyer)	
2:00 PM	3:30 PM	Breakout Sessions	Rooms 1 - 10
3:30 PM	3:50 PM	Coffee Break	Ballroom Foyer
3:50 PM	5:20 PM	Breakout Sessions	Rooms 1 - 10

Wednesday, July 19, 2023

7:30 AM	4:00 PM	Check-in & Reception	Newcap Event Center
8:00 AM	8:50 AM	Plenary (2): Professor Christopher S. Tang, University of California - Los Angeles	Room 2 - 8
8:50 AM	9:20 AM	Coffee Break	Ballroom Foyer
9:20 AM	10:50 AM	Breakout Sessions & Panel "Meet the Editors (II)"	Rooms 1 - 10
11:00 AM	12:30 PM	Breakout Sessions & Panel "UN Sustainable Development Goals"	Rooms 1 - 10
12:30 PM	1:30 PM	Lunch (will be served in the foyer)	
1:30 PM	3:00 PM	Breakout Sessions	Rooms 1 - 10
3:00 PM	3:20 PM	Coffee Break	Ballroom Foyer
3:20 PM	4:50 PM	Breakout Sessions	Rooms 1 - 10
7:00 PM	11:30 PM	Gala Dinner @Le River Palace	Port de Javel Haut, 75015 Paris

Thursday, July 20, 2023

8:15 AM	10:00 AM	Check-in & Reception	Newcap Event Center
8:15 AM	9:45 AM	Breakout Sessions	Rooms 1 - 10
9:45 AM	10:05 AM	Coffee Break	Ballroom Foyer
10:05 AM	11:35 AM	Breakout Sessions	Rooms 1 - 10



Special Panels

Tuesday, July 18, 09:50 AM – 11:20 AM, Rooms 4-5-6

Meet The Editors (I)

- Production and Operations Management represented by Sushil Gupta
- Manufacturing & Service Operations Management represented by Feryal Erhun
- Int. Journal of Operations & Production Management represented by Constantin Blome
- International Journal of Production Economics represented by Stefan Minner
- Journal of Supply Chain Management represented by Andreas Wieland
- Transportation Research Part E represented by Reza Zanjirani Farahani

Tuesday, July 18, 11:30 AM – 13:00 PM, Rooms 4-5-6

Practice-Based Research

- Alexandre Dolgui, IMT Atlantique, France
- Andreas Dalluege, President at EuroBEN, Germany
- Nagesh Murthy, University of Oregon, USA
- Hela Atman, Co-founder & CEO at PALM, France
- Samir Dani, Keele Business School, UK

Wednesday, July 19, 09:20 AM – 10:50 AM, Rooms 4-5-6

Meet The Editors (II)

- European Journal of Operational Research represented by Ruud Teunter
- International Journal of Production Research represented by Alexandre Dolgui
- Operations Research represented by Ilia Tsetlin
- Decision Sciences represented by Xenophon Koufteros
- Service Science represented by Guillaume Roels
- Management Science represented by Vlad Babich

Wednesday, July 19, 11:00 AM – 12:30 PM, Rooms 4-5-6

UN Sustainable Development Goals

- Felix Papier, ESSEC, France
- Margrét Bjarnadóttir, University of Maryland, USA
- Manmohan Sodhi, City University of London, UK
- Charles Corbett, UCLA Anderson, USA
- Gemma Berenguer, University of Carlos III Madrid, Spain
- Prashant Yadav, INSEAD, France

Schedule of Breakout Sessions

Sessions for Tuesday, July 18

Tuesday, 09:50 AM – 11:20 AM

1	Tuesday, 09:50 AM – 11:20 AM, Room 1 Session: Agri-Food Supply Chain Chair: Liliana Rivera	Track: Supply Chain Management
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Resilient Agri-Food Supply Chains: Short vs Conventional

Pedram Bagheri* (Asper School of Business), Yuvraj Gajpal (Asper School of Business)

Supply chain resilience, a topic of interest among both researchers and practitioners, is the speed at which a supply network reacts to and recovers from disruptions caused by phenomena such as Covid-19, earthquakes, etc. With increased resilience sufficient and continuous delivery of products is assured especially in remote areas where food insecurity is severe. In this research through mathematical modeling and simulation, we compared different types of supply chains; namely conventional and short, based on their performance in regard to connectivity and availability, to propose a supply network that ensures food is delivered to people who need it most.

Adopting Circular Economy to the Agri-Food Sector: Selecting the Most Suitable Agri-Food

S. Ali Torabi* (University of Tehran), Mahsima Rasi (University of Tehran), Narges Hajloo (University of Tehran), Navid Sahebjamnia (Middlesex University)

According to FAO's reports, about one-third of food production is wasted worldwide. This wastage rings the bells for missing opportunities to ensure food security. Therefore, redesigning Agri-food Supply Chain Networks (AFSCNs) under circular economy is of utmost importance in order to move towards the Sustainable Development Goals (SDGs) in the agri-food sector. As the first step, in this research, we aim to develop a hybrid multi-attribute decision-making (MADM) method to select the most appropriate agri-food item for which designing a circular supply chain would be the next step. A case study is also provided to validate the proposed methodology.

Sustainable Food Production in the Context of Decarbonisation

Jianhao Yang* (Cardiff University), Pauline Fount (Cardiff University), Jean-Paul Skeete (Cardiff University)

The research trend in this field is moving away from conventional greenhouses towards intelligently controlled environments. The objectives of the research are to obtain the total life cycle costs of different plant production methods through the use of life cycle assessment tools, to provide an evidence base for policies or barriers to vertical farming, and to explore ways to reduce the environmental impact of agriculture while supplying fruit and vegetables to meet demand. In the course of the research, successful examples of indoor farms from around the world, including China, will be reviewed to inform CEA practice in the UK.

Managing Agrologistics Operations for a Better Society

Liliana Rivera* (Universidad de Los Andes), Andrea Patrucco (FIU)

The agri-food supply chain is important for society, it ensures that agricultural products are grown, processed, and transported in a way that is safe, sustainable, and economically viable. Additionally, it helps reduce food waste and improve food security. Using a case study approach, we analyze the agri-food supply chain as a complex adaptive system that involves many interconnected actors and processes that change in response to their environment. Results show that managing risks in agrologistics involves encouraging diversity, adaptation, local knowledge, and building flexibility in the system to improve the resilience and adaptability of the agri-food supply chain.

Role of Industry 4.0 for a Sustainable Agri-Food Supply Chain

Rituraj Singh* (Indian Institute of Technology, Delhi), Gourav Dwivedi (Indian Institute of Technology, Delhi)

The Agri-Food supply chain has seen increased academic research in present years to meet the needs of the ever-increasing population and globalization. Two of the key goals of the United Nation's Sustainable Development Goals (UNSDGs) are to have zero hunger and responsible consumption and production. One way to achieve these goals is by reducing food wastage and promoting sustainability in the agri-food supply chain. The paper will explore how various Industry 4.0 technologies, such as AI, IoT, drones, blockchain, Digital twins, etc., can make our agri-food supply chain more sustainable and reduce food wastage.

2	Tuesday, 09:50 AM – 11:20 AM, Room 2 Track: Service Operations Management Session: Capacity Planning & Matching Supply and Demand Chair: Heikki Peura
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Capacity Planning for Resource Turnaround Operations

Buyun Li (Indiana University), Vincent Slauch* (Cornell University)

Many shared resources, such as hotel rooms or rental cars, require cleaning, charging, or some other operation to "turn around" the resources between successive customer uses. We study staffing decisions for the turnaround service capacity in order to minimize the total customer waiting and staffing costs. Using the discrete convexity framework of M-convexity, we provide analytical properties for the shift planning decision. These results allow us to propose a solution heuristic that efficiently finds the globally optimal solution. We illustrate the value of our model for a hotel.

Sales and Operations Planning Process: Insights from a Case Study

Zishi Wu* (Aalborg University)

Sales and operations planning (S&OP) is viewed as the set of business processes and technologies that enable an enterprise to respond effectively and efficiently to changes and align sales and production within organization and across the supply chain. Recently, most scholars characterized S&OP as a powerful tool that could deal with different challenges. In this study, we observed the limitation in S&OP for being flexible to different challenges through a case study.

Matching Supply and Demand in Platform Businesses through Surge Pricing

Harit Joshi* (S P Jain Institute of Management Research), Akansha Misra (S P Jain Institute of Management Research), Sudarshan Kumar (Indian Institute of Management Calcutta)

Ride-hailing platforms adopt surge pricing to achieve a better demand-supply match. Platforms have information about demand and supply levels across geographical zones and share this information in the form of dynamic fares with the drivers. This leads to the reallocation of drivers to these surge zones with higher fares. We evaluate the performance of surge pricing as a mechanism to match supply and demand better, using an analytical model and a numerical study. We model the platform's actions and the drivers' decision-making process. The results provide insights into the efficacy of dynamic pricing as a strategic choice in ride-hailing platforms.

Capacity Expansion in Service Platforms: Ownership, Commitment, and Flexibility

Heikki Peura* (Imperial College Business School), S. Alex Yang (London Business School)

Service platforms connect consumers to independent providers who typically deliver the service using their own assets (e.g., ride-hailing with suitable cars). Platforms expanding their services have trialled programs to attract providers who do not yet possess such assets. We develop a game-theoretical model to examine the relative performance of three common mechanisms: platform financing, employment, and rentals. With bank financing as a benchmark, we find that each mechanism can be profitable, but suffers from potential pitfalls. Comparing the mechanisms highlights a trade-off between the platform committing to a contract with the providers and exploiting their flexibility as independent service providers.

m	Tuesday, 09:50 AM – 11:20 AM, Room 3 Session: Agricultural & Food Supply Chain Chair: Mahdi Bashiri	Track: Supply Chain Management
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Indirect-Support Versus Subsidy: Value Creation in Presence of Environmentally-Conscious Farmers

Mohit Ray* (IIM Lucknow), Ajit Pratap Singh (IIM Lucknow), Suresh Jakhar (IIM Lucknow)

The paper investigates the role of subsidy and indirect-support in promoting the adoption of sustainable agricultural practices in developing economies. We develop a government-farmer game-theoretic model wherein the government first selects the intervening mechanism, followed by farmers' sowing decisions. Our analysis reveals that both policies positively impact the adoption of sustainable agricultural practices; however, in the scenario of higher environmental damage, subsidy outperforms indirect-support mechanism. On the contrary, for lower environmental damage, the choice of intervention depends on the proportion of environmentally-conscious farmers. Specifically, the government should extend indirect-support only if there exists a critical mass of environmentally-conscious farmers.

Competitive Sustainable Agricultural Supply Chain Network Model with Environmental and Social Sustainability Considerations

Deniz Besik* (University of Richmond), Sara Saberi (Worcester Polytechnic Institute), Pritha Dutta (Pace University), Rodrigo Mercado Fernandez (Tec de Monterrey)

This paper presents a competitive multiperiod and multicriteria agricultural supply chain network model that captures all three aspects of sustainability: financial, environmental, and social, which is the Triple Bottom Line. We analyze agri-food firms' strategic decisions on acquiring and maintaining farmlands, and labor hours for sustainable and conventional farming practices, and the amount of agricultural products that they sell at demand markets which directly affect their financial, environmental, and social sustainability. The competition between agri-food firms is studied through game theory, where the governing Generalized Nash equilibrium conditions correspond to a variational inequality problem. Further, we conduct a numerical study based on the avocado supply chains in Mexico and the impacts of climate change. Our numerical results and sensitivity analysis show that sustainable farming practices on farmlands can benefit all aspects of the Triple Bottom Line, especially considering the impacts of climate change and deforestation.

Crop Diversification: The Role of Subsidies and Contract Farming

Mohit Ray* (IIM Lucknow), Prashant Chintapalli (Ivey Business School), Suresh Jakhar (IIM Lucknow)

The paper examines the role of input cost subsidies and contract-farming in attaining the objective of crop diversification in agricultural supply chain of developing economies. We develop a game-theoretic model with government as a leader, and buyer and farmers as followers. Our analysis reveals that contract-farming and cost subsidy for two different crops can ensure the government's objective of crop diversification. However, the farmers' surplus need not always increase, though the net social welfare is always improving. Hence, a careful choice of input cost subsidy can not only lighten the financial burden on the government, but can also benefit farmers.

Social Sustainability Driven Operational Strategy in a Food Supply Chain

Niraj Kumar (Essex Business School), Debashree De (Essex Business School), Chang-Hun Lee* (Essex Business School)

The study aims to understand how the intention of a firm to improve its social sustainability performance affects its operational strategy. A case study approach has been adopted to understand the decisions made in a coffee supply chain to improve its sustainability performance. Data from several stakeholders in the supply chain (including farmers, coffee bean roasters, wholesalers and retailers) have been collected to understand the challenges involved in developing a socially sustainable supply chain and the changes made in its operational strategy. Findings of this study challenge current norms and pave the way to develop socially sustainable coffee supply chain.

Decarbonized Food Supply Chain with Technology Compatibility Perspective

Seyedmojtaba Sajadi* (Aston Business School), Mahdi Bashiri (Coventry University), Fatemeh Khezerlouye Aghdam (Alzahra University)

The purpose of this study is to develop a mathematical model for technology adoption in a sustainable supply chain. This is motivated by how technologies can be selected in the supply chain network with the aim of achieving net zero emissions to align with the global carbon neutrality targets. It is found that applying suitable technologies to a supply chain not only helps to achieve a net-zero supply chain network but also reduces overall costs. This study proves that using technology creates mutually beneficial opportunities for business owners and corporate environmental sustainability goals.

4	Tuesday, 09:50 AM – 11:20 AM, Room 7 Track: Disruptive Technology & Operations Management Session: Adoption and Implementation of Disruptive Technologies Chair: Rupak Rauniar
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Strategic Goals for Adopting Emerging Technologies: Metaverse and AI

Fatema El-Wakeel* (University of Cambridge), Veronica Martinez (University of Cambridge)

The metaverse is projected to become a multi-billion-dollar market by 2024. It is empowered by other technologies like digital twins and AI. The research methodology used was systematic literature reviews (>1,500 papers), microfoundational elements analysed and initial validation done against case studies. This research contributes to academic literature, particularly to develop future-fit organisation strategic goals, this is what we call “Data as a Strategy”. The second contribution shows how “Data as an Asset” allows the use of data in operations. This research also contributes to practice by illustrating the effect of an early phenomena as the metaverse on organisational performance.

Beyond the Adoption: Regulatory Perspective on Battery Lifecycle and Battery Management System

Nandan Kumar Singh* (Indian Institute of Management Visakhapatnam), Nishant Kumar Verma (Indian Institute of Management Bangalore), Milan Kumar (Indian Institute of Management Visakhapatnam)

Why battery lifecycle perspective is important in the adoption of Electric Vehicle and what is the role of Battery Management System (BMS) in improving sustainability? Considering the example of battery swapping, we present a game-theoretic model and derive equilibrium strategies for BMS subsidy design and show that subsidising the development of BMS can increase the environmental benefits of EVs, but only in countries where the end-of-life processes for batteries are sufficiently sustainable. In contrast, subsidising BMS development will not be effective in maximising the environmental benefits if the power sources used for charging battery during battery's lifespan are not sustainable.

Enhancing Circular Supply Chains through Digital Product Passports

Yingli Wang* (Cardiff University), Li Qian (Cardiff University), Martin Agyemang (Cardiff University), Andrei Hodorog (Cardiff University), Jon Gosling (Cardiff University), Yacine Rezgui (Cardiff University), Omer Rana (School School of Computer Science and Informatics)

The Digital Product Passport (DPP) is gaining traction among industries, driven by several EU regulations. A DPP is a dataset specific to a product that provides information on its origin, composition, and end-of-life possibilities through an electronic data carrier. However, its potential to support circular supply chains is not widely recognized. To address this gap, the authors conducted an extensive analysis of secondary data sources and primary interviews with companies, resulting in a conceptual framework for the core building blocks of a functioning DPP. This framework offers a valuable contribution to understanding how DPP drives behavioural change towards circular economy.

Impact of Reminders on Warehouse Driver Behavior: A VR Experiment

Mahsa Alirezaei* (Erasmus University), Jelle de Vries (Erasmus University), René de Koster (Erasmus University)

Balancing often-competing goals of productivity and safety is an ongoing challenge in warehouses. Despite the organizations' emphasis on safe and productive work, the combined impact of emphasis on speed, quality, and safety remains unclear. This study employs a laboratory experiment involving a VR simulator to examine the impact of audio reminders with different levels of specificity in terms of content and exposure time on the performance of warehouse vehicle drivers. We also measure individual differences between drivers, in terms of Regulatory Focus. Moreover, we also track head movements as a potential mechanism in the relationship between audio, head orientation, and drivers' performance.

Absorptive Capacity, Resource Commitment and New Technology Implementation Process

Rupak Rauniar* (University of Houston-Downtown), Greg Rawski (Marian University)

Lack of in-house technological knowledge and resource constraints can adversely affect the new technology adoption and implementation success. Based on a systematic literature review in new technology, innovation transfer, and diffusion, and from interviews with technology leaders, we identify and assess the enabling relationships of an organization's absorptive capacity and resource commitment during a new technology adoption and implementation process. Findings, based on a sample of 172 technology projects, suggest the partial mediation effect of these two enablers during the initiation, trial, evaluation, and implementation stages of new technology adoption and implementation.

5	Tuesday, 09:50 AM – 11:20 AM, Room 8 Session: Healthcare Operations Management Chair: Alex Kuiper	Track: Healthcare Operations
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Preventing Dengue Infections with Lethal Ovitrap: A Cost-Effectiveness Analysis

Huijun Yvonne Zhu (NUS Institute of Operations Research and Analytics), Joel Aik (Duke-NUS Medical School), Shuzhen Sim (National Environment Agency, Singapore), Joel Goh* (NUS Business School)

Approximately 3.9 billion people around the world are at risk of dengue infections annually. Lethal ovitraps – devices that trap and kill virus-carrying mosquitoes – have been recommended by the WHO as one way to combat the spread of this disease. This work represents the first study to assess the cost-effectiveness of such traps for dengue control. A principal innovation is the integration of operational factors in the cost analysis. Labour costs were estimated by modelling the workload needed for periodic maintenance of the units using a graph-theoretic framework, and other costs were estimated using a combination of public and proprietary data.

A Real-Time Optimization Approach to Managing Observation Unit Utilization

Vera Tilson* (Simon School, University of Rochester), Dessislava Pachamanova (Babson College), Keely DwyerMatzky (University of Rochester Medical Center)

Hospital observation units (OUs) are meant to host patients for relatively short periods of time, during which healthcare providers can assess the need for an inpatient admission. The initial placement of a patient in a unit (inpatient or the OU) can have quality of care and financial consequences for patients and for hospitals. We propose a practical real-time optimization algorithm balancing the initial patient placement with considerations for available capacity. We report on algorithm performance using simulation experiments calibrated with real hospital data.

Multi-Period Home Healthcare Routing and Scheduling Problem with Multiple Priorities and Preferences

Yagmur Selenay Selcuk* (Özyeğin University), Elvin Coban (Özyeğin University)

The growing ageing population has placed significant responsibility on healthcare systems. Improving the quality of management of health systems for the older patients in their homes emerges as an alternative solution to traditional hospitalization to deal with this issue. In our research, we analyze a home healthcare routing and scheduling problem over a multi-period planning horizon with the objective of minimizing the total routing and penalty costs in the presence of time windows, patient preferences, prior service restrictions, and lunch break requirements. We develop a mixed integer linear programming model and propose a heuristic algorithm.

Individualized Dynamic Patient Monitoring under Alarm Fatigue

Hossein Piri* (University of Calgary), Tim Huh (University of British Columbia), Steven Shechter (University of British Columbia), Darren Hudson (University of Alberta)

Hospitals are rife with alarms, many of which are false. This leads to alarm fatigue, in which clinicians become desensitized and may inadvertently ignore real threats. We develop a partially observable Markov decision process model for recommending dynamic, patient-specific alarms in which we incorporate a cry-wolf feedback loop of repeated false alarms. We develop structural results of the optimal policy and perform a numerical case study based on clinical data from an intensive care unit. We find that compared with current approaches of setting patients' alarms, our dynamic patient-centered model significantly reduces the risk of patient harm.

Convexity in Transient Queues and Implications on Dynamic Appointment Scheduling

Alex Kuiper* (University of Amsterdam), Christos Zacharias (University of Miami)

The inter-day (which day?) and intra-day (when?) appointment scheduling problems are often studied in isolation, whereas in reality, they are intertwined. Using the continuous intra-day scheduling paradigm, these problems are connected in a dynamic environment. Extending convexity properties of the appointment scheduling problem render the corresponding dynamic program amenable to building upon recent advances in literature. Since the optimal solution is not tractable, two intra-day scheduling paradigms are introduced: a theoretical approach (based on re-optimization) and a heuristic, which is based on schedules that exhibit sequential refinability. Together, they bound the performance gap, and show the potential of refinable schedules.

6	Tuesday, 09:50 AM – 11:20 AM, Room 9 Session: Warehouse and Inventory Management Chair: Pietro De Giovanni	Track: Supply Chain Management
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Using Metaheuristics to Improve Anticipatory Order Picking Efficiency

Son Tran Thai* (Maastricht University), Christof Defryn (Maastricht University), Rui Jorge De Almeida e Santos Nogueira (Maastricht University)

E-commerce activities put warehouses under high pressure because of small order sizes and very short delivery lead times. To deal with such challenges, anticipatory order picking (AOP) incorporates forecast information to allow the picking of products before they are ordered. As such, products can be picked when their costs are low, resulting in a reduced total travel time compared to when products can only be picked once ordered. In this talk, we will elaborate on the performance of multiple local search based algorithms and the impacts of the supporting forecasting methods when solving the AOP problem.

Dynamic Management of Order Pickers in Urban Warehouses

Arsham Atashi Khoei* (University of Bath), Melih Çelik (University of Bath), Vaggelis Giannikas (University of Bath), Niccolo Corsini (LOGIDOT Company)

With the current trends towards faster response through e-commerce there has been increased pressure on efficient management of urban warehouses which operate in an environment with dynamic order patterns and stringent lead times. Thanks to the high-tech infrastructure of IOT platforms for tracking and managing the order pickers in real time, we consider a smart warehouse setting where all the pickers can be re-routed dynamically whenever needed. We propose a heuristic solution approach based on column generation that satisfies both solution quality and agile response requirements which deal with batching, picker assignment, and routing decisions.

Is It Wise to Increase the Number of Robots in Parts-To-Picker Warehouse?

Suryakant Kumar* (National Taiwan University), Tanmoy Kundu (Indian Institute of Technology Jodhpur), Jiu-Bing Sheu (National Taiwan University)

Motivated by the increasing adoption of the parts-to-picker order picking system in e-commerce warehouses, this study aims to investigate the planning issue concerning robot-human coordination. Therein, one such critical decision involves finding the optimal number of robots to work together with human pickers for order fulfillment in a warehouse. Our analyses interestingly suggest that deploying more robots in warehouses with a parts-to-picker system does not necessarily improves the order fulfillment rate; instead, a trade-off exists. More importantly, this work paves the way towards elaborately designing a human-centric work environment for parts-to-picker e-commerce warehouses.

Cost Allocation Mechanisms in a Capacitated Economic Lot-Sizing Game

Okan Örsan Özener* (Özyeğin University), Basak Altan (Özyeğin University), Ali Ekici (Özyeğin University)

We consider a capacitated lot-sizing problem where companies determine the optimal joint order plan to meet their demands. We prove that the core of the corresponding cost allocation game may be empty. We establish the necessary and sufficient conditions to have a non-empty core and we obtain a core allocation by solving a dual problem. We also establish the equivalency of the dual optimal solution and the core. Finally, we propose five different allocation mechanisms and show that pattern based allocation significantly outperforms the other mechanisms with respect to the fairness criteria.

Analyzing Inventory Flow of Subscription-Based Business Models

Behzad Maleki Vishkaei (SDA Bocconi School of Management), Pietro De Giovanni* (SDA Bocconi School of Management)

Nowadays, customers and businesses are becoming increasingly interested in subscription models because they offer a great balance of price and value while also aligning with sustainability goals. With product-as-a-service models, customers do not own the products, and the companies remain the owners, responsible for implementing circular economy practices to extend the product's lifetime and provide more convenient services to customers. This study analyzes the inventory flow of such businesses and helps them make decisions regarding the efficient subscription length, inventory level, and service capacity.

7	Tuesday, 09:50 AM – 11:20 AM, Room 10 Session: Disaster Recovery and Sustainability Chair: Mollie Bryde-Evens	Track: Risk & Disaster Management
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Analysis of the Ukrainian Nuclear Industry under Extreme Operating Conditions

Volodymyr Skalozubov (Odessa Polytechnic National University), Kochnieva Valeriia (Scientific Center for Energy and Ecology of the National Academy of Sciences of Ukraine), Ashraf Labib* (University of Portsmouth), Sara Hadleigh-Dunn (University of Portsmouth), Dylan Jones (University of Portsmouth)

Nuclear energy safety state in Ukraine under extreme conditions concerns the Zaporizhzhia Power Plant (ZNPP), the largest in Europe. Due to the plant location in a conflict zone, assessment of the ZNPP safety condition regarding the possibility of nuclear and radiation accidents is an urgent problem. We apply analytical tools to analyze the Japanese Fukushima Daiichi accident in order to generate a hypothetical scenario based on a deterministic model of flooding of the ZNPP site, due to the destruction of the dam of the Kakhovka reservoir. Results will be compared to the tsunami flooding of the Fukushima Daiichi NPP.

Risk-Averse Models for Earthquake Preparedness and Response

Komlanvi Parfait Ametana* (Institut de Mathématiques de Bordeaux), Mehdi Amiri-Aref (KEDGE Business School), Olga Battaia (KEDGE Business School), Francois Clautiaux (Institut de Mathématiques de Bordeaux), Boris Detienne (Institut de Mathématiques de Bor

We are interested in designing a blood supply chain for earthquake preparedness and response. With the aim of placing the risk to human lives at the heart of our study, we propose to address the blood supply chain design problem using three risk-averse optimization models. The first and the second are based on a set of discrete scenarios. While the third, a polyhedral uncertainty defined inside a model of finite adaptability. We perform a numerical comparison of these approaches, with the aim of evaluating their suitability for minimizing unmet demands, with a measure of risk aversion.

A Robust Facility Location Problem for Earthquake Preparedness with Aftershocks

Ivana Ljubic (ESSEC Business School), Laurent Alfandari (ESSEC Business School), Minakshi Punam Mandal* (ESSEC Business School)

Earthquakes are one of the deadliest natural disasters that can cause catastrophic damages, leading to loss of life and property and displacing thousands of people. Most earthquakes are followed by major and minor aftershocks, further increasing the damage caused. In this paper, we study an uncapacitated facility location problem for storing relief materials in the event of such a disaster. We adopt a two-stage budgeted-robustness approach. We consider a major earthquake in the first stage, followed by Gamma aftershocks in the second stage. We use Mixed-Integer Linear Programming techniques to formulate our problem and employ Branch-and-Cut methods to solve it.

An Ethical Approach to Sustainability and Recovery Operations in Hotels

Mollie Bryde-Evens* (Liverpool John Moores University), Claire Hannibal (Liverpool John Moores University), Scott Foster (Liverpool John Moores University), Kelsy Hejjas (Edinburgh Napier University)

The purpose of this research is to examine the interplays between sustainability, disaster recovery and ethics through a dual-theoretical lens comprising virtue ethics and stakeholder theory. A qualitative approach is applied and data is being collected through semi-structured interviews with varied stakeholders within a hospitality context. The expected theoretical contribution is to develop knowledge on the complex relationship between these concepts. In accordance with a number of SDGs including goal 8 and goal 12, the anticipated practical contribution is to understand how integrating disaster recovery with an ethically grounded sustainability framework can foster long-term sustainability and disaster recovery preparedness.

∞	Tuesday, 11:30 AM – 13:00 PM, Room 1 Track: Healthcare Operations Session: Innovation and Sustainability in Logistics and Transportation Services Chair: Gwang Kim
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Can Autonomous Ships Bring More Sustainability to Europe's Transportation System?

Seyed Parsa Parvasi* (Technical University of Denmark), Harilaos N. Psaraftis (Technical University of Denmark)

As demand for goods increases, delays are introduced into networks, causing congestion. Additionally, reducing emissions within the supply chain is becoming increasingly important. Roads are stretched to capacity, so how else can we increase throughput, reduce emissions, and lower the risk of delay by balancing green footprints? The AEGIS project has been established to answer the above questions. AEGIS is a concept for short-sea transportation in the future. Using automation, we aim to solve the challenges currently faced by the short-sea shipping sector. Therefore, we compared land and maritime transportation between the ports of Rotterdam and Ghent by cost-benefit analysis.

Understanding The Status Quo of Crowd Logistics System Robustness

Florian Cramer* (University of Bayreuth, Kühne Logistics University), Christian Fikar (University of Bayreuth)

Crowd logistics has gained increasing attention in the scientific literature over the past decade. Real-world implementations, however, are still scarce. To improve understanding and facilitate real-world implementations, we explore crowd logistics delivery systems' robustness and system behavior. To this end, we combine a literature review with a systems thinking approach. Our findings show several limits to success and other prevalent system archetype structures in these systems. The results highlight the importance of integrating a dedicated delivery fleet and platform support to maintain system momentum. Furthermore, the generated insights can help managers to understand how to incorporate crowd logistics successfully.

Smart Charging Electric Trucks with Advance Booking System

Lavanya Meherishi* (Erasmus University), Pieter L. van den Berg (Erasmus University)

This study develops a mathematical framework to investigate the use of an advance booking system to schedule the overnight charging of electric trucks. Based on each user's energy demand and route profile, the advance booking system offers an assortment of charging slots including charging station location, time-slot and power along with the price. The mathematical framework further determines the user's utility, predicts the choice for a particular offer from the assortment provided, and dynamically modifies the charging schedule of already accepted requests. This study demonstrates the optimization of electric grid resources while considering user requests and system constraints.

A Heuristic Method for Determining the UAM Skyport Locations

Gwang Kim* (Chosun University), Youngchul Shin (Ajou University), Yoonjea Jeong (Dong-a University)

One of the problems caused by rapid urbanization is traffic congestion. Urban air mobility (UAM), a disruptive innovation concept, has emerged to solve the problem. This study covers the skyport location problem, a necessary procedure to successfully introduce the UAM system. We analyzed the factors affecting the usage of UAM and calculated the probability of using this transportation mode based on a discrete choice model. A mathematical formulation of determining the locations is presented to optimize the initial operations of the UAM system along with a heuristic algorithm to obtain near-optimal solutions to the problem within an acceptable computation time.

5	Tuesday, 11:30 AM – 13:00 PM, Room 2 Track: Supply Chain Management Session: Sustainable Supply Network Design Chair: Erna Engebretsen
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Design Supply Chain Network to Achieve Sustainable Development Goals (SDGs)

Malek Masmoudi (University of Sharjah), Arij Lahmar* (Dubai Business School, University of Dubai)

SDG integration into the supply chain is crucial to achieving sustainability goals, especially as governments enact mandatory due diligence regulations. However, with a broad range of SDG goals and targets, prioritization is a challenge. This research addresses the issue of prioritizing SDGs for a global supply chain. The result of this step is then integrated into the optimization of the supply chain design. This approach helps supply chain organizations achieve sustainability objectives while being efficient, competitive, and compliant, ensuring a sustainable future.

Closed-Loop Supply Chain Network Optimization Model with Corporate Social Responsibility

Dong Li (Babson College), Jose Cruz* (University of Connecticut), Ke Ke (Central Washington University)

We developed a closed-loop supply chain network (CLSCN) optimization model with corporate social responsibility (CSR) on supply chain consisting of manufacturers, retailers, new product demand market, and retailer-refurbished product demand market. The manufacturers produce substitutable products using raw materials from two sources, new and recycled. The retailers face the demands of new products, retailer-refurbished products, and recycle from the new product demand market. We analyze the impacts of CSR, new materials and landfill costs, return rate, return cost, remanufacturing rate, and CLSCN competition. Results indicate consumer behaviors and environmental costs play an essential role in CSR and closing the loop.

Circular Catch and Bycatch Supply Chain Network Design

S. Ali Torabi* (University of Tehran), Amir Ghasemi (Amsterdam University of Applied Sciences), Amin Feizi (University of Tehran)

The implementation of Circular Supply Chain Networks (CSCNs) in the fishing industry is a crucial factor in promoting sustainability and reducing waste. The principles of circular supply chains aim to close the loop of material and resource utilization through different practices such as reusing, recycling, refurbishing, and recovery. The adoption of these practices results in decreased costs, increased efficiency, and a lower environmental impact for fishing organizations. Accordingly, our research focuses on designing a multi-objective circular supply chain network in the fishing industry which aims to enhance network efficiency, mitigate overfishing, conserve biodiversity, and encourage responsible fishing practices.

Optimizing Biomass Supply Chain Network With Environmental Consideration in Ireland

Maryam Roudneshin* (University College Dublin), Amanda Sosa (University College Dublin)

Rising concerns about climate change and energy security have increased the importance of finding alternative energy sources to fossil fuels. This paper proposes a bioenergy supply chain development approach that combines Geographic Information System (GIS) and a mathematical model. GIS is used to select candidate locations, while an optimization model determines the optimal design of the supply chain, including location, capacities, and flow between different supply chain echelons. The validity of the proposed approach was demonstrated through a case study in Ireland, which provides valuable insights for creating sustainable bioenergy supply chains that can help combat global warming challenges.

Optimal Network Design for Carbon Capture, Transportation and Storage

Erna Engebretsen* (BI Norwegian Business School), Mehdi Sharifyazdi (BI Norwegian Business School)

Carbon capture and storage (CCS) technology is important for reducing CO₂ emissions, especially for carbon intensive industrial sectors. We develop a mixed-integer optimization model for supply chain network design of CCS on a regional scale for the largest emission sources, represented by several industrial sectors in Norway, based on industrial data. We consider alternative carbon capture technologies and transportation modes for each emission source, as well as alternative offshore underwater locations along the seacoast, with the purpose of minimizing the total costs and maximizing the capture rate. We discuss model challenges, managerial implications and directions for future research.

10	Tuesday, 11:30 AM – 13:00 PM, Room 3 Session: Risk Management & Resilient Supply Chain (I) Chair: Yangyan Shi	Track: Risk & Disaster Management
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Supply Chain Resilience in Fast-Fashion: An AHP Perspective

Farah Abu-Qdais (Lidl, United Kingdom), Aniekan Essien (University of Bristol), Teslim Bukoye* (University of Bath)

Focusing on the UK fast-fashion industry, this study prioritises supply chain risks that emerged from the COVID-19 pandemic using AHP to prioritise decision criteria and recommend strategies to mitigate the impact of disruptions resulting from COVID-19. We interview industry experts in the UK fashion industry and find that logistics risks were the most impactful on the UK fast-fashion supply chain during COVID-19, recommending digital transformation, collaboration, and flexibility as risk mitigation strategies. The study addresses the critical issue of supply chain management and resilience, which is essential to achieving the UN SDGs 8, 9 and 12, providing insights into how the fast-fashion industry can build supply chain robustness and resilience in the face of similar (future) crises.

Assessing Supply Chain Resilience Using the ISM Approach

Maximilian Breitruck (University St.Gallen), Tim Auer* (University St.Gallen)

This paper aims to increase understanding and simplify the applicability of the concept of supply chain resilience by identifying the variables involved and their interrelationships using the Interpretive Structural Modeling (ISM) approach. A multiple case study approach is used to explore the theoretical foundation and practical application of resilience strategies in seven individual cases. The research provides an overview of companies' resilience practices and formulates hypotheses regarding influencing relationships within these strategies. The results offer insight into the application of the concept of supply chain resilience, providing practitioners with a clearer understanding of the factors involved and their composition.

Building Supply Chain Resilience Through the Transposition of Informal Networks

Camila Lee Park* (EDC Paris Business School), Mauro Fracarolli Nunes* (EDC Paris Business School), Sven Horak (John's University), Maral Muratbekova-Touron (ESCP Business School)

We explore how informal networks that stem from cultural backgrounds may help build supply chain resilience when people and organisations are located in a different cultural setting. More specifically, through semi-structured interviews with supply chain professionals who hold strong proximity to two distinct local practices, we examine if the presence of an informal network, formed in the basis of participants' culture of origin, can increase the chances of organisational survival in a competitive context. Preliminary analyses suggest that informal networks formed novel configurations other than its traditional pillars, yet still posing powerful resources especially by reinforcing information sharing routines.

A Look at Supply Chain Resilience through Coping Theory

Nezih Altay* (DePaul University), Raktim Pal (James Madison University)

The aim of this paper is to extend coping, a theory adapted from psychology to supply chain disruption management, to organizational resilience and compare it to a select set of plausible organizational theories identified from the literature. We aim to answer the following research question: How does coping explain organizational resilience? We first extend coping theory to resilience. Then we review relevant literature on disruption management and resilience focusing on organizational theories that have been used to shed light on these concepts in Operations Management. We identify elements of resilience from the literature, and look at coping theory through the lens of these elements of resilience.

Building an Agile Automotive Supply Chain Ecosystem on Business Performance

Qi Zhang (China University of Geoscience), Li Zhu (China University of Geosciences), Yangyan Shi* (Macquarie University), Mengyu Tu (China University of Geosciences), V G Venkatesh (Normandie Business School), Cong Cao (Zhejiang University of Technology)

This study selects Dongfeng Motor Corporation (DFM), BYD Company Limited (BYD), and SAIC Motor Corporation Limited (SAIC) as the research objects, three listed auto firms with production plants in Wuhan, based on the theory of supply chain resilience, responsiveness, and restoration (3R capabilities). The collection, mining, and analysis of social media unstructured data from these three companies explore the impact of establishing an agile supply chain ecosystem (ASCE) under the effect of COVID-19 on their financial performance and customer performance. Data mining was conducted on 4,406 comments involving DFM, BYD, and SAIC from 190 Up-loaders in the stages of 'Early COVID-19' and 'Enhanced Preparedness and Vaccine Lunch Period.' The conceptual model of ASCE was tested by adopting structural equation modeling and was verified by DFM's case study. The study finds that the 3R capabilities of the supply chain have a positive effect on establishing an automotive agile supply chain ecosystem.

11	Tuesday, 11:30 AM – 13:00 PM, Room 7 Track: Disruptive Technology & Operations Management Session: Industry 4.0 Chair: Gokhan Egilmez
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Industry 4.0 Technologies to Achieve the 17 Sustainable Development Goals

Saoussane Srhir* (Kedge Business School - La Sabana University), Anicia Jaegler (Kedge Business School), Jairo R Montoya-Torres (La Sabana University)

This study aims to investigate the impact of integrating Industry 4.0 technologies into supply chain processes to achieve sustainability goals. The literature lacks empirical justification for frameworks that could potentially be implemented to drive practitioners, and academics towards practical solutions to achieve the 17 Sustainable Development Goals (SDGs) through supply chain operations. Therefore, our research aims to validate a conceptual framework with a Delphi analysis, to investigate the impact of Industry 4.0 technologies to leverage new capabilities in SCOR-based supply chain processes to improve sustainability initiatives and achieve the SDGs.

Modelling Facilitators of Workforce-4.0 for Industry-4.0 Transformation-Indian MSME Perspective

Sarma PRS* (Indian Institute of Management Visakhapatnam), Aalok Kumar (Indian Institute of Management Visakhapatnam)

The Industry-4.0 has brought multi-dimensional transformation in the arena of workforce. The transformation has opened gates for workforce with unique skillsets and varied competencies. The transforming organizations need to either recruit smart workforce or upskill the existing workforce to match the technological requirements. This study focuses on the facilitators for workforce-4.0 in Indian Micro, Small, and Medium Enterprises (MSMEs) perspective. DEMATEL is used to delineate the 'Casual relationships between several complex facilitators and a structural model'. Study proposed a structure for workforce-4.0 in Industry 4.0 is proposed and implications are presented.

Collaborative and Data Based Process for Industry 4.0 Maturity Assesment

Benoit Lardeux (ISEN), Sylvain Lefebvre* (ISEN), Jean-Marie Guyader (ISEN), Michael Lecointre (ACOME), Olivier Aubrun (ACOME), Birane Touré (ACOME), Maher Jridi (ISEN)

We deal in this study with an innovative approach to assess the maturity level of a manufacturing company willing to upgrade towards Industry 4.0. Implementing Industry 4.0 in a company supports the transformation towards more automated operations and improvement of decision making process. In addition to the analysis of the maturity level, we position the studied items which cover main company functions and operations according to the overall business strategy and the cost involved by moving towards upper grades of maturity. Data analysis performed by principal component analysis automates the ranking of items according to company objectives and feasibility.

An Integrated Analytical Approach to Assess Industry 4.0 Maturity

Gokhan Egilmez* (Lindenwood University), Ilaria Tutore (University of Naples)

A non-parametric assessment (PCA+DEA) approach is proposed to assess the OECD countries' preparedness for Industry 4.0 adoption from macro-economic perspective. It was found that PCA is a robust approach, which could be used to treat high multicollinearity in producing a composite index of Industry 4.0 maturity. PCA's outputs were used as the input data for DEA to derive the I4.0 maturity scores. Results indicated that USA, Sweden, and Finland were found to be the best 3 countries, and Mexico, Latvia, and Chile were found to be the worst 3 in terms of readiness for Industry 4.0 adoption.

12	Tuesday, 11:30 AM – 13:00 PM, Room 8 Session: Innovative Technologies and Techniques in Healthcare Operations Chair: Atanu Chaudhuri Track: Healthcare Operations
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Motivating Factors For Adoption Of Additive Manufacturing (AM) in Healthcare Sector

Jaya Priyadarshini (MDI, Gurgaon, India), Rajesh Kumar Singh* (MDI, Gurgaon, India)

AM is an Industry 4.0 technology with the potential to transform the healthcare sector. This study explores the factors that motivate firms and hospitals to adopt Additive Manufacturing (AM). First, the factors are identified through a literature review and categorised into three themes. These are supply chain disruption orientation, internal environment orientation and performance expectancy. Then, using the fuzzy Delphi method, these factors are finalised. Post that, the factors are ranked using the Best-Worst method. In the end, the authors validate the findings through experts opinion.

Drone Network Design for Early Infant Diagnosis of HIV

Alborz Hassanzadeh* (ESSEC Business School), Laurent Alfandari (ESSEC Business School)

Every hour, 13 infants succumb to HIV, with over 81% of these deaths occurring in Sub-Saharan Africa. Accurate and early diagnosis is the first step in addressing this global health crisis, but operational challenges persist. We developed an integrated allocation-queue decision model with drone fleet sizing to address such challenges. A selective overview of our findings from Mozambique shows that drones offer a promising solution: assigning just one drone to 4% of the clinics results in a 2% increase in treatment initiation for HIV+ infants. This translates to over 300 more infants starting HIV treatment every year.

Role of Community Health Workers in Technology enabled Healthcare Delivery

Atanu Chaudhuri* (Durham University Business School), Ujjal Mukherjee (GIES College of Business, University of Illinois), Tirumala Santra (Ikure Techsoft Pvt. Ltd.), Saheli Chakraborty (Ikure Techsoft Pvt. Ltd.)

Developing climate resilient health system is an urgent need to mitigate health risks, linked with climate changes. Community health workers (CHWs) play an important role in delivering healthcare to underserved communities, often mediated by telehealth platforms. In the context of Sundarbans Delta of India, which is subject to high climate risk, the study aims to understand the health impact of extreme weather events, the roles played by CHWs in building awareness of climate change related risk to health and in delivering health services in the region using a telehealth platform.

13	Tuesday, 11:30 AM – 13:00 PM, Room 9 Session: Waste Reduction in Food Supply Chain Chair: Marjolein Buisman	Track: Supply Chain Management
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Food Waste Reduction in Food Supply Chains Using a Novel Replenishment Policy

Atieh Jafarian* (Université de Rennes), Thi Le Vo Thi (Université de Rennes), Emmanuelle Fromont (Université de Rennes)

This paper develops an optimization model to design a perishable food supply chain network including manufacturers, distribution centers, and retailers. In this network, the retailers receive a demand from local customers and use a novel replenishment policy and discounting approach to reduce food waste. Also, a vehicle routing problem with pick-up and delivery is used to model the problem. The model simultaneously aims at minimizing the total cost and food waste. A hybrid metaheuristic approach is used to solve the problem. Results indicate that discounts of up to 30% and the replenishment policy can reduce food waste and total costs.

Can "Ugly Veg" Supply Chains Reduce Food Loss?

Behzad Hezarkhani* (Southampton Business School), Guven Demirel (Queen Mary University), Yann Bouchery (Kedge Business School), Manoj Dora (Angela Ruskin University)

The tradition of marketing only aesthetically agreeable produce by retailers contributes to a major source of food loss through "ugly veg", i.e., the produce that does not look "regular". In this talk, we examine the relations between different tiers of agri-food supply chains to study the impact of marketing ugly veg on different supply chain members and the food loss in the system. We demonstrate the conditions under which the supply chain can reduce overall food loss. We show that the grower is generally better off offering the ugly veg to an auxiliary retailer.

Impact of Consumer Picking on Food Waste: A Data-Driven Approach

Alexander Hübner* (TU Munich), Tobias Winkler (TU Munich), Fabian Schäfer (TU Munich), Kai Hoberg (KLU Hamburg)

The undesirable customer behavior of opportunistic picking for products with longer expiration dates is prone to be a major root cause for food waste at the retail stage. We develop an approach to classify waste bookings in the panel data set received from a major European retailer. In the second step, we investigate in store and product-related determinants of waste caused by consumer picking. We apply a hierarchical linear model and find that on average 20% of food waste in stores is caused by consumer picking.

Food Waste Mitigation in Pakistan Hotel Industry through Implementing Lean Supply Chain Practices

Sheikh Muhammad Zahid* (University of Roehampton London), Nasrin Asgari (Anglia Ruskin University), Wantao Yu (Roehampton University), Oznur Yurt (Open University)

Food waste is a global concern. In developing countries like Pakistan, most of the waste food created by hospitality industry. This research investigates how lean supply chain practices contributes to food waste mitigation in the hospitality industry. Based on the NRBV theory, we proposed a theoretical framework to envision the hotel food supply chain and identify the critical point to eliminate waste. This research uses structural equation modelling (SEM) to test the proposed hypothesis. We suggested that lean practices positively associated with operations, organisational performance and stimulate hospitality food waste mitigation practices.

Reducing the Environmental Impact at the Retailer

Marjolein Buisman* (WHU – Otto Beisheim School of Management), Sonja Rohmer (HEC Montréal)

Plastic packaging has a negative environmental effect and retailers therefore face consumer pressure to reduce the amount of packaging material. However, for fresh produce, plastic packaging can lead to shelf life extension, and thus reduce the environmental impact of food waste. This research investigates this trade-off between packaging material and food waste, together with other measures a retailer can take to reduce the overall impact. Our results show the clear economical benefit when packaging material is used. The environmental benefits are less clear, since the impact of packaging differs from the environmental impact of foods.

14	Tuesday, 11:30 AM – 13:00 PM, Room 10 Track: Humanitarian Operations & Crisis Management Session: Humanitarian Coordination and Decision-Making Chair: Reut Noham
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The Humanitarian Supply Conundrum: A Signalling Perspective on Ebola in West Africa

Adebayo Serge Koukpaki (Unithena Global Education Ltd - Universidad Catholica San Antonio de Murcia), Adegboyega Oyedijo* (University of Leicester School of Business), Chidozie Umeh (University of York), Juliet Ocheja (Jetoph Ltd, Nigeria)

Using signalling theory, this study investigates the challenges faced by HSC partners during the Ebola Virus Disease (EVD) outbreak in West Africa. A socio-constructivist methodology and a qualitative design were used in the study. Data was collected using semi-structured interviews with thirty HSC professionals, which were then thematically analysed. The findings identified issues that were classified as either endogenous (related to the affected countries) or exogenous (related to the signalling environment) (exogenous). This study contributes to our understanding of the complexities of managing multiple HSC partners in developing countries, as well as how to improve their performance in disaster response.

Forming a Humanitarian Coalition When Time Is Short

Iman Parsa* (INSEAD), Mahyar Eftekhari (Arizona State University), Scott Webster (Arizona State University), Luk Van Wassenhove (INSEAD)

Lack of effective coordinated response among humanitarian organizations remains a challenge. We thus propose a non-cooperative game theoretical model to analyze horizontal coordination among non-governmental organizations involved in relief operations aftermath of a sudden-onset disaster. Our model consists of drivers and barriers of coordination indicated to us by practitioners and confirmed by the literature. We analyze pooled and partitioned coordination models. Our analysis highlights that efficient coordination models need to be tailored to the response context for better response system performance. We also show that partitioned coordination models outperform pooled models, particularly when urgency matters.

A Disaster Relief Network Design for Search and Rescue Teams

Kamran Sarmadi* (University of Greenwich), Mehdi Amiri-Aref (Kedge Business School)

Natural disasters cause significant human and economic losses, highlighting the importance of efficient search and rescue (SAR) teams. A disaster relief network must be designed to address challenges such as the number and location of temporary-bases-of-operation (TBOs), allocation of affected sites to TBOs, and SAR team routing decisions. We propose a multi-period location-routing model to address this problem, using a mixed-integer programming approach. We also introduce a loss function to minimize the number of fatalities ensuring that un-served victims are kept to a minimum level. Our model is tested using realistic data, and managerial insights are derived through computational analyses.

Selection of Optimal Fundraising Organization during Disaster Response Phase

Nawazish Mohammed* (Indian Institute of Management Kozhikode), Sidhartha Padhi (Indian Institute of Management Kozhikode), Sarat Jena (Xavier Institute of Management)

Humanitarian organizations (HOs) solicit earmarked donations during the disaster response phase. Alongside, government authorities also solicit charitable donations during disasters. Given the efficiency and effectiveness of the relief programmes run by the HOs and Government bodies during the response phase, the individual donor's dilemma is deciding which relief organization, HO or Government, to support and contribute to. In this work, we attempt to resolve this donor's conundrum by modelling a Stackelberg game between the stakeholders, i.e., Donor, HO, and Government. We obtained a closed-form solution and generated some exciting results that will assist donors in making an informed decision.

The Humanitarian Transshipment Problem

Reut Noham* (Tel-Aviv University), Ohad Eisenhandler (Afeka College of Engineering)

Lateral transshipments allow facilities that are at the same echelon in the supply chain to share inventory. They have been extensively studied in the context of commercial supply chains and provide an effective way to enhance responsiveness. We study inventory pre-positioning decisions in humanitarian supply chains that consider the possibility of performing transshipments at the post-disaster phase. We discuss the modelling challenges associated with the unique characteristics of humanitarian operations and suggest different modelling alternatives aimed at balancing effectiveness, efficiency and equity. We demonstrate how transshipments may affect pre-disaster inventory decisions and make disaster response more effective and equitable.

15	Tuesday, 02:00 PM – 03:30 PM, Room 1 Track: Humanitarian Operations & Crisis Management Session: Equitable and Human Working Conditions in Supply Chains Chair: Felix Papier
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Eliminating Forced Labor and Coercion in the Labor Supply Chain

Christopher Tang (UCLA Anderson School), Felix Papier* (ESSEC Business School), Javaiz Mohamed Parappathodi (ESSEC Business School)

Motivated by the prevalence of labor contractors, we develop a game between a buyer and (several) labor contractor(s) that we calibrate with H2A visa data. We analyze conditions under which the buyer outsources labor recruitment and contractors employ forced labor. We derive the optimal coercion-free supply chain contract, and design a mechanism for the case of information asymmetry between buyer and agent.

Cryptocurrencies in Philanthropic Giving

Milad Keshvari Fard* (University of Bath), Jingshu Liu (Cranfield University)

Since the introduction of Bitcoin in 2009, cryptocurrencies have found applications in different areas. However, despite unique features and potential capabilities of cryptocurrencies for NGOs, the majority of NGOs have not adopted cryptocurrencies in their operations. In this study, we investigate the unique advantages and opportunities of cryptocurrencies in humanitarian operations, as well as the barriers and challenges with this fundraising method. We then investigate a number of hypotheses using donation data that we collected from public blockchains to obtain a deeper understanding of factors that can improve the effectiveness and efficiency of crypto-fundraising.

Understandings of Effective Supply Chain Governance against Modern Slavery

Alexander Trautrimis* (University of Nottingham), Stefan Gold (Universität Kassel), Oana Burcu (University of Nottingham), Faiza Zafar (University of Nottingham)

Businesses are increasingly held accountable for human rights and labour rights violations in their supply chains, even where suppliers are based in jurisdictions overseas. However, even committed businesses struggle with limited upstream visibility and challenges in engaging their suppliers and their supply chains in meaningful action. Our study utilised data from the Workforce Disclosure Initiative survey, focus groups with business practitioners from the UK's Utilities&Industrials sector and modern slavery experts, and a workshop with survivors of modern slavery, to assess and cross-examine supply chain governance effectiveness

The State of Supplier Diversity Initiatives for Large Corporations

Gemma Berenguer* (Universidad Carlos III de Madrid), Natalia Costas Lorenzo (Management Solutions), Anna Saez de Tejada Cuenca (IESE Business)

We describe the state of supplier diversity for large corporations worldwide. Using data from the Global Fortune 500 companies, we first analyze systematically their definitions of supplier diversity. We then study what company characteristics are related with supplier diversity efforts. Such initiatives are not yet widespread, but companies in the US and in the services sector are more likely to have them, as well as companies that report on their internal diversity or have supplier sustainability initiatives. We draw similarities between supplier diversity and supply chain sustainability initiatives, which are currently widely established. Finally, we suggest directions for future research.

16	Tuesday, 02:00 PM – 03:30 PM, Room 2 Session: Healthcare Problems Motivated by the Covid-19 Pandemic Chair: Zeynep Akşin Karaesmen
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Track: Healthcare Operations

Optimal Sharing of a Resuable Medical Resource During a Pandemic

Daniel Adelman (University of Chicago Booth School of Business), Canan Uckun* (University of Illinois at Chicago)

Motivated by ventilator sharing between states in the US during the recent COVID-19 pandemic, we develop an optimal control model that maximizes lives saved by transferring ventilators across geographic regions to take advantage of intertemporal differences in peak times. Our model captures the patient holding times of ventilators, which in practice was on the order of weeks, and show that ignoring them results in significant error in the number of ventilators needed to save a fixed number of lives, and vice versa. More generally, our framework could be used in the next pandemic to optimize the flow of any reusable medical resource to save lives.

When Should Fractional-Dose Vaccines Be Used?

Francis de Véricourt (ESMT Berlin), Jérémie Gallien (London Business School), Naireet Ghosh* (London Business School)

Fractional-dose vaccines constitute an important potential intervention when available vaccine stockpiles are limited during an epidemic. While fractional-dose vaccines help expand coverage, they are less efficacious and hence lead to a slower buildup of population immunity when the speed of vaccine administration is constrained. We use an optimal control model to analyze this tradeoff and derive a simple and easily implementable vaccination policy relying on a combination of full and fractional-dose vaccines. We perform extensive numerical experiments to investigate the population health benefits and risks associated with this policy relative to simpler alternatives.

NHS Advice & Guidance: A Game Theoretical Consideration

Zidong Liu (Judge Business School, University of Cambridge), Feryal Erhun (Judge Business School, University of Cambridge), Houyuan Jiang* (Judge Business School, University of Cambridge)

In the UK, general practitioners (GPs) act as the first contact for patients for treatment. Other than in an emergency, specialist consultations require a referral by GPs. However, the system experiences diagnostic and referral errors and inefficiencies. Advice & Guidance (A&G) service is introduced as an additional and optional gatekeeper before referrals to outpatient appointments. We study different contractual designs to ensure that the A&G service reaches its potential in eliminating inefficiencies. We evaluate a referral system's performance under different contractual arrangements between commissioners and hospitals. We find that performance-based contracts provide the best care for patients. In contrast, some existing A&G contracts (e.g., fee-for-service) do not provide appropriate incentives for GPs and hospitals to reduce inefficiencies significantly.

Capacity Allocation and Pricing for Telemedicine with Contagion Aware Patients

Elif Karul* (Koç University), Zeynep Akşin (Koç University), Erhun Özkan (Koç University)

Driven by the fear of contagion, patient demand for the telemedicine service has increased significantly during the Covid-19 pandemic. We include the contagion-awareness factor into a healthcare center's decisions. We show that if the patients are contagion aware, as the number of patients increases, the number of patients choosing in-person appointments increases much slower than the number of patients choosing telemedicine appointments does. Therefore, telemedicine appointments are a major source of revenue when there is fear of contagion and the capacity allocation and pricing decisions should be done by considering the contagion-awareness of the patients.

17	Tuesday, 02:00 PM – 03:30 PM, Room 3 Session: Risk Management & Resilient Supply Chain (II) Chair: Guang Shi	Track: Risk & Disaster Management
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Supply Chain Resilience and Sustainability: Paradox or Synergy?

Judith Paulus* (Zurich University of Applied Science)

Supply chain resilience and sustainability are main topics of current managerial and scientific discussions. Yet, the interrelations between resilience and sustainability are rarely addressed. The purpose of this paper is to understand the paradoxes and synergies of both topics. A structured literature review was conducted between 2002 and 2022 to address the research objective. Based on the literature review, certain paradoxes and synergies are identified in the following areas : Concepts, objectives, and applied practices. In addition, an initial supply chain resilience and sustainability framework is discussed to address paradoxes and to exploit synergies at the same time.

Performance Evaluation of Concurrent Supply Chain Resilience Strategies

Reza Alikhani* (Montpellier Business School), Amirhossein Ranjbar (University of Tehran), S. Ali Torabi (University of Tehran), Christopher W. Zobel (Virginia Tech)

In this paper, we propose an extended slack-based super-efficiency data envelopment analysis (DEA) model to evaluate the performance of supply chain resilience strategies when they might be utilized concurrently. Resilience strategies can produce positive or negative synergistic effects when implemented together. Four resilience metrics, namely, resilience cost as the input of the DEA approach, along with service level, recovery time, and disruption cost as output metrics, are considered to assess the performance of each candidate set of resilience strategies while considering their synergistic effects. Our results provide useful theoretical and managerial implications for both academics and supply chain stakeholders.

Supply Chain Structural Complexity of a UK-Based Net Zero Cluster

Christopher Haynes (AMRC, University of Sheffield), Marco Franchino (AMRC, University of Sheffield), Guang Shi* (AMRC, University of Sheffield), Cansu Kandemir (AMRC, University of Sheffield), Ben Morgan (AMRC, University of Sheffield), Tom Robinson (AMRC, University of Sheffield), Diego Ruiz-Hernandez (Management School, University of Sheffield)

We applied the Structural Complexity Theory to measure the resiliency of the potential UK-based net zero industrial cluster supplier network. Structural complexity is defined as the complexity that originates from the firm's business strategy. From an upstream view of the supply chain, it stems from strategic decisions about the bill of materials and its suppliers. When out of control, structural complexity erodes profits. In a positive vein, it can be interpreted as a measure of the independence and resilience of the supply chain. Our resiliency investigation has proved to be useful information in building a better supply network to achieve the net zero industrial cluster's vision.

Investigating External Stakeholder in Oil and Gas Sustainability Risk Management

Ashem Egila* (Coventry University), Muhammed Kamal (Coventry University), Benny Tjahjono (Coventry University)

Sustainability risk management in the oil and gas supply chain is a complex issue that involves a range of external stakeholders, including governments and non-governmental organisations. These stakeholders have a unique perspective on the industry, and their perceptions can have a significant impact on the supply chain. In developing countries, where environmental regulations may be less stringent and enforcement weaker, these risks can be particularly acute. The findings show that sustainability risk is a comparative analysis of external stakeholder groups. In general, the results reveal minimal variances across stakeholders and between groups of stakeholders.

A Multi-Stage Focus Group Study on Supply Chain Viability Enablers

Tim Auer (University St.Gallen), Daniel Langner* (University St.Gallen)

Supply chains today are facing multiple challenges, and they need to constantly adapt in order to succeed in a rapidly changing and unpredictable environment. To enable supply chain resilience while maintaining efficiency, and simultaneously achieving sustainability goals, these aspects need to be considered in an integrated manner. This paper examines the relevance and current implementation level of six enabler categories from three different stakeholder perspectives for what is known as Supply Chain Viability (SCV). Furthermore, concrete actions for stakeholders to achieve SCV are presented. To this end, we conducted multistage focus group interviews with senior experts in the respective subfields.

18	Tuesday, 02:00 PM – 03:30 PM, Room 4 Session: Behavioral Project Management Chair: Teslim Bukoye	Track: Behavioral Operations
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Nudges in Managing Projects: A Systematic Literature Review

Oyegoke Teslim Bukoye* (University of Bath), Mahnoor Fatima (University of Bath), Cliff Pagani (University of Bath), Mabel Philip (University of Bath)

Although the concept of nudges is found predominantly in behavioral economics and public policy, but adapted across a variety of areas and project management in particular. This study explores extant project and nudges-related studies with the aim to review, analyse and synthesize them. After filtering, we analysed 76 papers from Scopus, Web of Science and Science Direct to draw key publication themes, concepts within self-management, organisations and narrowed down to projects. Finally, we highlighted important theoretical and practical outcomes. In so doing, we uncover areas that are currently under-studied and draw out fruitful future research avenues.

Sustainable Intentions, Norms, Attitudes and Behaviours: A Construction Sector Perspective

Nida Chairman* (University of Westminster), Afolabi Dania (University of Westminster)

The application of sustainability in construction requires change. Despite extensive development of codes, policies, technologies and materials, literature indicates that sustainability remains a significant problem on projects. The change required has been studied extensively at the organisation level, yet these problems persist. This research-in-progress explores the perspectives of professionals at the operational level. This paper presents an extensive literature review on the current state of the sustainability paradigm, the critical role of construction professionals and important theoretical determinants for behavioural change interventions. It is argued that understanding industry norms, individual intentions and attitudes towards sustainability will shape the necessary behavioural changes.

Cognitive Effects of Asset Physicality on Project Requirement Change Decisions

Shobhit Mathur (Indian Institute of Academy), Tarikere Niranjana* (Technology Bombay), Kristian Rotaru (Monash University)

In fixed asset development projects, a specific asset (e.g., a building or enterprise software) is developed for long-term use in an organization's operations. Extensive requirement changes in such projects can negatively affect their success. We extrapolate the concepts of psychological ownership and waste aversion to theorize the cognitive effects of an asset attribute, i.e., asset physicality, on a project owner's propensity to accept requirement changes. Based on an integrative review of cross-disciplinary literature, our propositions predict the role of hidden individual cognition factors, such as the perception of asset malleability and the nature of change, on requirement change decisions.

Integrating Lean Social Practices with Digital Capabilities: A Socio-Cognitive Perspective

Mohsin Malik* (Swinburne University Australia), Amir Andargoli (Swinburne University Australia), Imran Ali (Central Queensland University Australia)

Drawing on the social cognitive theory, we conceptualise psychological safety as the mechanism that affects both employees' and organisational outcomes. The employees' outcomes in a lean-digital context is lean employee involvement which is an outcome of the climate of psychological safety provided to the employees by an organisation. The organisational outcomes are the development of digital capabilities and operational productivity. Empirical data collected from Australian healthcare sector and analysed in SPSS Process macro supports the theorisation that lean employee involvement and digital capability acts as individual and serial mediators for the relationship between psychological safety and operational productivity.

Multitasking in Project Management: Revisiting some Old Assumptions (Experimental Approach)

Yen-Tsang Chen* (NEOMA Business School), Ronaldo Dutra-de-Lima (Mackenzie Presbyterian University)

Companies implement diverse strategies through projects looking for competitive advantages. Currently, a vast set of best practices, project management tools, and methods support project managers to succeed. However, they are still challenged with considerable failure rates. Through a controlled experiment, this study investigated some frequent assumptions about resource allocation and task planning. We observed the harmful effect of task alternating, known as multitasking, in project management. To extend the existing research, we also demonstrated the impact of the real multitasking effect (performing two tasks simultaneously) and its detrimental consequences in operation performance.

19	Tuesday, 02:00 PM – 03:30 PM, Room 5 Session: Strategic Planning and Decision-Making in Non-Profit Operations Chair: Iva Rashkova Track: Nonprofit Operations
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Adoption Platform Design to Improve Outcomes for Children with Disabilities

Ludwig Dierks (Kyushu University), Vincent Slauch* (Cornell University), M. Utku Unver (Boston College)

Children with disabilities age out of the child welfare system at disproportionately high rates. Matching platforms struggle to identify high-capability families and match them with these children. Moreover, families without the necessary skills and resources for children with disabilities might express an eagerness to adopt any child, failing to recognize their own limitations. We analytically derive the platform-optimal envy-free mechanism for preference elicitation and matching. The platform's success largely depends on the ratio of the number of low-needs children to low-capability families. We also discuss managerial insights about the platform's efforts to recruit and coach families.

Survival and Success in Non-for-Profit Sector: A Dynamic Capability Perspective

Sarah Hajmohammad* (University of Ottawa)

Not-for-profit firms (NFPs) are constantly under pressure by their various stakeholders to enhance their services while improving their cost-efficiency despite the limited resources available to them. Drawing on the theory of dynamic capabilities, this study suggests service innovation to be the strategic weapon in addressing NFPs' idiosyncratic challenges, improving their performance, and enhancing their chances of long-term survival. In addition, environmental intelligence and external partnership capabilities are identified as the main drivers of service innovation in the NFP context. The proposed conceptual model is then examined using the survey data collected from North American orchestras.

Donor Influence on Humanitarian NGOs and their Supply Providers

Jihee Kim* (Anglia Ruskin University), Stephen Pettit (Cardiff University), Anthony Beresford (Cardiff University)

This study examines the relationships between an international humanitarian NGO and its aid supply providers, and the influence of donors on these relationships. Using a single case study design, data was collected through interviews and document analysis. The findings suggest that the NGO's working procedures vary based on its counterparts in the supply network. Donor pressure was analyzed using institutional theory. This study highlights the importance of understanding the interplay between institutional pressures and supply network adaption structures in the humanitarian context.

Nurturing Agricultural Growth: The Optimal Government Intervention Strategies to Guide Farmers in Long-term Production Decisions

Junlin Chen* (Central University of Finance and Economics), Xinwei He (Central University of Finance and Economics), Shi Chen (University of Washington)

The fluctuation of the market price of agricultural products is an important cause of the poverty for farmers. The government usually provides assistance to farmers through price guidance or cost assistance. We developed a long-term model to examine planting decision-making by farmers with heterogeneous production costs under three government assistance measures. Given the limitations of government cost assistance in reducing price fluctuations and the substantial cost of providing price guidance, we further consider three assistance measures that the government works with social organizations. The applicability of all assistance measures to improve the social welfare of farmers and to stabilize market prices was discussed.

Budget Allocation Decisions for Drug Procurement in Developing Countries

Iva Rashkova* (Washington University in St Louis)

Global health financing to both public and private providers has been under scrutiny in recent years. We consider the financing channels and operational levers available to a financial donor whose objective is to maximize drug consumption in a population. While the public provider is affordable, it often lacks procurement and distribution efficiency. The private provider, on the other hand, offers better drug availability at a profit-maximizing price. We optimize the donor's budget allocation decision across channels and provide conditions for dual-channel financing to be optimal. We use data from five countries in Africa to make model-based budget allocation recommendations.

20	Tuesday, 02:00 PM – 03:30 PM, Room 6 Track: Disruptive Technology & Operations Management Session: Disruptive Technologies and Innovation on Social Sustainability of Supply Chain Chair: Serkan Akturk
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Assessing the Impact of Brand-Level ESG Violations on Sales

Yao Chen (Clemson University), M. Serkan Akturk* (Clemson University), Rakesh Mallipeddi (Clemson University)

Employing a proprietary transaction data from a major U.S. retailer and firm-level environmental, social, and governance (ESG) information, our research investigates the impact of firms' ESG violations on their operational performance. To address our research questions, we use a series of quasi experiments and panel data econometric models and show that ESG violations lead to decreased sales for brands. However, as the intensity of media reach increases for violations, sales for brands increase. Furthermore, we break total ESG violations into four major categories such as social, cross-cutting, environmental, and governance issues and explore their marginal impact on firms' operational performance.

Competing with Cause Marketing: Transactional vs. Non-Transactional Campaigns

Arian Aflaki* (University of Pittsburgh), Esther Gal-Or (University of Pittsburgh), Mike Gordon (Pamplin College of Business, Virginia Tech), Jennifer Shang (University of Pittsburgh)

In Cause Marketing (CM), firms donate to a cause to attract prosocial customers. We study two different CM types: Transactional CM (T-CM), where firms donate a fraction of their revenue from each unit sold to a cause, and Non-Transactional CM (N-CM), where firms contribute to a cause independent of customer purchases. We show that CM-type choice under competition has significant implications for various stakeholders, including firms, consumers, nonprofits, and society.

By-Product Valorisation for Socially Conscious Supply Chain Configuration Design

Lisa Rossi* (IfM, University of Cambridge), Jagjit Srari (IfM, University of Cambridge)

The use of local production by-products as feedstock offers enhanced local value-add and waste reduction benefits. Drawing on circularity, partnership, and network configuration literature we develop theory using the case of straw stubble agri-waste. We address the current straw-burning practice responsible for excessive air pollution by considering local resource availability, product-production process technology options, partnering arrangements and network governance. This paper develops by-product supply network configuration design approaches and related partnering models that leverage disruptive valorisation technologies and the proximity of non-traditional suppliers to local resources. Such configurations increase livelihood by offering marginalized farmers alternative sources of income.

The Value of Curated Box Retailing: Evidence from an Online Omnichannel Fashion Retailer

Yiwei Wang* (Zhejiang University), Lauren Xiaoyuan Lu (Dartmouth College)

Curated box retailing is to send retailer-selected products to customers at regular intervals with the option to purchase or return. We implemented curated box retailing through a longitudinal field test, and then used difference-in-differences method to examine the causal effect of curated box retailing on omnichannel consumer behavior.

21	Tuesday, 02:00 PM – 03:30 PM, Room 7 Track: Disruptive Technology & Operations Management Session: Combating Counterfeit Chair: Jason Junsong Bian
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Blockchain-based Traceability Solution to Combat Counterfeits: Implications for e-Commerce Platforms

Kushal Saha* (XLRI - Xavier School of Management), Subir Bhattacharya (Indian Institute of Management Calcutta)

The pervasiveness of counterfeit products has been a severe problem facing the e-commerce platforms. Counterfeits not only result in financial loss for the customers but can cause significant reputational loss for both the manufacturer and retailer (the e-commerce platform here). This paper focuses on determining when a blockchain-based traceability solution can be adopted by a manufacturer offering its products on an e-commerce platform to signal product authenticity to potential customers. The paper also aims to identify the optimal reward mechanisms that the e-commerce platform can design to incentivize blockchain adoption among the retailers.

Countering the Counterfeit Using Disruptive Technology for the Uninformed Consumers

Shipra Shukla* (Indian Institute of Management Kashipur), Abhishek Srivastava (Indian Institute of Management Kashipur), Nagesh Murthy (University of Oregon)

The availability of variety of products from different sellers in the presence of online marketplace has increased the number of counterfeits specially in the secondary market. Often Third-Party Firm's counterfeit products are so similar to those of the brand that an uninformed consumer cannot identify the difference at the time of purchase. This paper studies how implementing disruptive technologies in the secondary market can help improve the brand image of the brand by educating uninformed myopic consumers about the counterfeit products therefore, decision of purchase of counterfeit product does not tarnish the brand image.

Online Luxury Retailing with Authentication: Honesty, Distinguishability and Misauthentication

Baolong Liu* (ShanghaiTech University), Yanlu Zhao (Duhram University)

We examine an emerging type of online platform that provides authentication services and order fulfillment for luxury products. While helping consumers avoid counterfeits and building seller-consumer trust, authentication is costly, time-consuming, and sometimes misidentifies items. We develop queueing models to characterize seller-authenticator collaboration and its impacts on consumer welfare. We derive market belief thresholds for consumer welfare improvement and authenticator's refusals to collaborate, considering consumers' restricted distinguishability and misauthentication. The analysis shows a collaboration, which increases both the authenticator's and the seller's profit, may hurt consumer welfare. Moreover, authenticators are recommended to implement seller management systems.

Combating Luxury Counterfeits with Blockchain Solution

Umang Varshney* (IIM Indore), Tanmoy Kundu (IIT Jodhpur), Amit Karamchandani (IMI Delhi), Rohit Kapoor (IIM Indore)

The counterfeits' use of the second-hand market has eroded luxury brand exclusivity and consumer trust. While reselling platforms have invested heavily in product authentication, their efforts have had only a limited impact on the problem. However, the collaboration between brands and reselling platforms, focusing on knowledge sharing and using blockchain technology for product authentication and certification transfer, could be an effective solution. This study uses game theory to examine the options available to brands, including running their reselling platforms or partnering with independent ones, and the potential for collaboration to combat counterfeits.

Deceptive Counterfeits and Anti-Counterfeiting: A Strategic Analysis

Jason Junsong Bian (Rennes School of Business), Yong Liu (University of Arizona), Xuan Zhao (Wilfrid Laurier University)

This paper develops an analytical game theoretical model to examine the strategic interactions between an authentic producer and a deceptive counterfeiter. The authentic product firm could benefit from more counterfeiting when the current counterfeit penetration and the cost of counterfeiting are both low. This is due to the impact of counterfeiting on product quality. When the counterfeiter implements a close imitation of the authentic product, it results in higher average product quality in the market, which benefits the authentic product firm. The authentic product firm can be worse off with a heavier penalty on counterfeiting or more efficient anti-counterfeiting.

22	Tuesday, 02:00 PM – 03:30 PM, Room 8 Session: Data-driven Decision Making in Healthcare Chair: Hamid Noori	Track: Healthcare Operations
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Fall Detection for Elderly People: A Data Driven Approach

Antra * (Indian Institute of Management), U Dinesh Kumar (Indian Institute of Management)

The World Health Organization reports that falls are the second leading cause of unintentional injury deaths among elderly people. Falls that are not treated in time can lead to functional impairment in older adults, as well as a significant reduction in mobility. This study aims to predict falls of elderly living alone and reduce the number of false alarms generated in a fall detection system by detecting the genuine fall. In order to study this problem, we have used a decision fusion method. At decision fusion level, ensembles of heterogeneous classifiers gives better prediction than homogeneous classifiers.

Critical Medical Resource Rationing in a Public Health Emergency: A Data-Driven Modelling Study

Li Ding* (Durham University), Dong Li (Loughborough University), Richard Wood (NHS Bristol, Clinical Commissioning Group), Navid Izady (City Univeristy of London), Christos Vasilakis (University of Bath)

The Covid-19 Pandemic created “extraordinary and sustained” pressures on health systems and in some cases demands for rationing critical resource including intensive care (ICU) beds, medical equipment and health professionals. Advanced systems modelling and simulation approaches can help. To address the limitations of existing triage policies, we developed an empirically informed algorithmic model that assigns patient priority based on ICU operational data from one NHS trust. The performance of our prioritisation policies is evaluated against existing triage benchmarks in a comprehensive computer simulation study.

Understanding the Patterns of Fatigue with AI and ML

Veronica Martinez* (University of Cambridge), Stephen Green (Univeristy of Cambridge), Rosalind Adam (University of Aberdeen), Katherine Bradbury (University of Southampton), Jonathan Cooper (University of Glasgow), Derek Hill (University College London), Yojana Lotankar (University of Aberdeen), Corina Sas (University of Lancaster), Daniel Powell (University of Aberdeen)

Fatigue is a prevalent symptom across different health conditions such as cancer and heart failure. Unfortunately, it is poorly understood. Our objective is to explore signature patterns of fatigue that lead to critical health conditions. We set up a longitudinal Artificial Intelligence (AI) study. Four groups with 10 participants each across three health conditions – heart failure, cancer and long-COVID– and a healthy control group. Participants’ vital levels –e.g. sleep, heart-rate– were collected through smart-watch sensors. Participant’ speed and movements were collected through Environment-Beacon sensors. iPad interoceptive/thoughts/behaviours activities complemented the study. Expected Machine learning (ML) analyses provide distinctive patterns fatigue.

Mobile Clinic Routing for Covid-19 Vaccination: A Casestudy in Kenya

Mayukh Ghosh* (University of Amsterdam), Chintan Amrit (University of Amsterdam), Joaquim Gromicho (University of Amsterdam)

Mobile Clinics (MCs) are essential in providing medical assistance to the section of the population without access to healthcare, particularly in developing countries. Such facilities, in the context of Covid-19, can help protect underserved and difficult-to-reach communities by increasing vaccine accessibility. In this study, we partner with Amref Health Africa, to prescribe the routes of the clinic for maximizing the vaccination coverage for COVID-19 vaccines in Kenya. A two-stage framework is proposed, where the sub-counties to be served in the planning horizon are first selected with a set covering problem followed by a prize collecting TSP to generate the routes.

Data Sharing as a Contributor to Sustainable Healthcare

Hamid Noori* (Lazaridis Business School)

In many ways, Canada’s current landscape of health data sharing and organization can be classified as a supply chain pipeline. In this system, patient’s health data is vertically moved and retrieved, with no horizontal access for physicians, care providers, or patients. While some limited progress has been made in enabling information sharing across the health system, there is recognition that there are demands for access to integrated patient records by health delivery partners that today’s healthcare system cannot realize. We will discuss our proposed integrated framework resulted from a case study of the healthcare system in the Province of Ontario.

23	Tuesday, 02:00 PM – 03:30 PM, Room 9 Session: Supplier & Partner Management Chair: Hossein Rikhtehgar Berenji	Track: Supply Chain Management
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Outsourcing Decision in the Presence of Supplier Copycatting: A Two-period Approach

Shobeir Amirnequiee* (Ivey Business School), Hubert Pun (Ivey Business School), Joe Naoum-Sawaya (Ivey Business School)

Supplier copycatting occurs when the supplier (S) to a manufacturer (M) copies M's product and sells a copycat product to the customers. M can change its suppliers; and S runs the risk of facing repercussions (e.g., losing M's business in the future) if it decides to copy. We propose a two-period game-theoretic approach to supplier copycatting. We investigate a setting with M, copycatting S, and non-copycatting S, and examine how the equilibrium is influenced by the presence of future outsourcing opportunities to M and future repercussions facing S.

Supplier Selection under Consideration of Risk and Cost

Marcus Brandenburg* (Flensburg University of Applied Sciences)

Supplier selection is a complex and decisive task of strategic supply chain management in which conflictive criteria of supplier disruption risk and supplier management cost need to be taken into account. A resilient and efficient supply network could be obtained by resolving the tradeoff between risk and cost. The proposed study deals with the problem to select a set of suppliers that minimizes the cost and the risk of supply disruptions while covering the whole set of required supplies. A set covering problem formulation models the supplier selection problem which is solved and numerically analyzed by a metaheuristic approach.

Supply Chain Partner on the Board and Firm Environmental Performance

Saurabh Ambulkar* (University of Texas at Arlington), Sridhar Ramaswami (Iowa State University)

Amid growing calls for firms to be environmentally responsible, firms are employing multiple strategies like sustainable sourcing and manufacturing to improve their environmental performance. This study, drawing from social network theory of stakeholder influence, examines the relationship between having supply chain partners on board of directors and firms' environmental performance. To examine this relationship, the study looks at 1907 environmental violations conducted by 149 B2B firms listed on S&P 900 index between the years 2007-2015.

Using Auditing and Commitment for Engaging the Supplier for Supply Chain Sustainability

Hossein Rikhtehgar Berenji* (Pacific University, OR), Nagesh Murthy (University of Oregon, OR), Zhibin (Ben) Yang (University of Oregon, OR)

We model a supply chain in which the buyer audits the supplier's compliance with the code of conduct. We investigate the effect of the buyer's upfront commitment to price and quantity on supplier's compliance. We also analyze the implications of raising the standard of code of conduct on sustainability and financial performance.

24	Tuesday, 03:50 PM – 05:20 PM, Room 1 Track: Service Operations Management Session: Managing R&D, NPD, and Service Development Initiatives Chair: Mohsen Jafari Songhori
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Impact of Formal/Informal Networks on NPD: An Empirically Grounded Computational Approach

Mohsen Jafari Songhori* (Queen's University Belfast)

Scholars argue that a small extent of misalignment between the communication (informal) and formal networks can have critical consequences for an organization to achieve its New Product Development (NPD) goals. To further analyze this argumentation, this paper examines association between social network features of the formal/informal structures and the performance of NPD projects. In particular, using a couple of empirically published NPD networks, this work elaborates an empirically grounded computational model of NPD projects. Next, analysis of the results provides insights on how & which features of formal/informal networks can have significant effects on the performance of NPD projects.

Learn From Competitors via Shared R&D Partner

Lu Yu (Zhejiang University), Shivam Gupta* (NEOMA Business School), Xiaobo Wu (Zhejiang University), Subodha Kumar (Fox School of Business, Temple University)

Yet prior literature has not considered how indirect ties to competitors via shared R&D partners affect innovation. This study proposes firms can learn from their competitors via their shared partner, as indirect competition ties provide information to generate new knowledge, and counter vicarious learning. By using a 20-year dataset of US firms from electronics industry, we find that the number of indirect competition ties is positively associate with firm's innovation performance, and the effect is moderated by collaboration inertia and relative knowledge base. Our findings suggest that indirect competition ties could be considered as intangible strategic resource for firms.

Circular Business Models: Product Design and Consumer Participation

Stefan Buehler (University of St. Gallen), Rachel Chen* (University of California at Davis), Daniel Halbheer (HEC Paris)

This paper studies how firms should design a product by choosing its recyclability and price in markets where consumers care for the environment and make disposal decisions when the product reaches end-of-life. Under a circular business model, the firm generates revenue from both sales and recycling, and determines recyclability by balancing the marginal changes in the product's expected end-of-life utility and the unit production cost. We show that stronger consumer concerns about recyclability and a higher market value of the recovered resources increase recyclability, but have an ambiguous impact on price, profit, and the waste footprint of the firm.

How Does Probation Affect the Delivery of a Project?

Ş. Nuray Akın (Özyeğin University), Başak Altan* (Özyeğin University)

We study an agency problem with hidden actions in a dynamic setting. The principal has a project that consists of two consecutive tasks. The second task cannot start until the first one is complete. Agent needs to complete each task before a pre-set deadline, otherwise he will be put on probation with additional time to complete the task which might come at the expense of a reduction in payment. We solve for the optimal contract and characterize the effect of the probation phase on the payoffs as well as on the duration of project completion. of two consecutive tasks. The second task cannot start until the first one is complete. Agent needs to complete each task before a pre-set deadline, otherwise he will be put on probation with additional time to complete the task which might come at the expense of a reduction in payment. If the task is still not finished by the end of the probation period, principal fires the agent and hires a new one. We solve for the optimal contract and characterize the effect of the probation phase on the payoffs as well as on the duration of project completion. We compute welfare under the contract with probation and show that it is higher than in the case without probation, mainly due to shorter time-to-complete.

Selective Revealing of R&D Knowledge and Its Implications for Firms

Mohsen Jafari Songhori* (Queen's University Belfast), Fabian Sting (University of Cologne - Erasmus University)

Firms that selectively reveal their R&D outcomes to other (competing or cooperating) firms are observable across industries. However, our knowledge of when firms should follow such a strategy, and how they should design it, is limited. To fill this gap, we develop a computational landscape model on which firms search in a co-evolutionary way, and may reveal found solutions to one another. Our simulation results provide insights on how (1) the type of the R&D outcomes, (2) the role of industry contingencies (e.g., clock-speed) affect a firm's effective selective revealing of R&D knowledge.

25	Tuesday, 03:50 PM – 05:20 PM, Room 2 Session: Routing Problem Chair: Diego Ruiz-Hernandez	Track: Supply Chain Management
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Optimization of Routing Plan for Migratory Beekeeping Problem

Xintong Qui (Asper School of Business, University of Manitoba), Yuvraj Gajpal* (Asper School of Business, University of Manitoba), S.S. Appaddo (Asper School of Business, University of Manitoba)

Apiculture involves flowering plants, honeybees which can get nectar, the sugar substance from blossoms, on plants and beekeepers. Apiculture has played a vital role in the world in recent years due to its economic contribution and reduce the poverty in developing country. In this paper, a migratory beekeeping routing problem (MBRP) is studied to optimize the total profit of beekeepers, comprehensively considering several constraints. A variable neighbourhood search (VNS) algorithm is proposed to solve the MBRP. The effectiveness of the proposed algorithm is tested. Finally some analysis is performed to make the responsible honey production preserving the environment.

Electric Vehicle Routing Problem with an On-Demand Mobile Charging System

Ihsan Sadati* (Sabanci University), Bülent Çatay (Sabanci University)

Raising concerns about climate change has accelerated the shift towards zero-emission vehicles, electric vehicles (EVs) in particular. We investigate the use of mobile charging stations that supply energy to the EVs at points of need and introduce the Electric Vehicle Routing Problem with Time Windows and Mobile Chargers (EVRPTW-MC). In this problem, EVs serve the customers within their time windows and MCs are used to recharge their batteries en-route at selected customer locations. We first present the mathematical model and next, we propose a matheuristic approach. We perform an extensive numerical study to validate the performance of the proposed method.

New Estimation Models for TSP Instance with Arbitrary Node Distributions

Taha Varol* (Özyeğin University), Okan Örsan Özener (Özyeğin University), Erinc Albey (Özyeğin University)

We propose a novel approach to improve the efficiency of solving complex routing problems by exploiting optimal tour length estimators. Our method utilizes neural network-based TSP tour length estimators that combine artificial neural networks and theoretical knowledge to achieve accurate predictions with less than 0.7 percent deviation from optimality. We design new instances mimicking real-life logistics networks, and devise a new way of finding lower bounds and partial solutions to TSP as predictors. Our computational study shows that our method outperforms state-of-the-art solver in terms of solution time and quality, demonstrating its potential for solving massive-scale routing problems efficiently.

A Multi-Vehicle Collection Problem with Online Route Optimisation

Diego Ruiz-Hernandez* (Sheffield University Management School), Mehdi Amiri-Aref (Kedge Business School)

We address the problem of collecting residuals from different collection points by a fleet of trucks. Demand is uncertain and partial collection is allowed. The problem consists of identifying the nodes to be visited by each truck, and finding the profit maximising routes. The problem is formulated as a two-stage stochastic multi-vehicle routing problem. We propose a heuristic approach based on a p-Median formulation that assigns the nodes to be visited by each truck and then solve TSP problems to find the associated route. We further propose an on-line improvement heuristic allowing the driver to modify the route as required.

26	Tuesday, 03:50 PM – 05:20 PM, Room 3 Session: Safety, Equity, and Sustainable Operations Chair: Charles Corbett	Track: Sustainable Operations
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Does Safety Violation Propagate through Supply Chain?

Shuhan Wang* (The Hong Kong Polytechnic University), Di Fan (The Hong Kong Polytechnic University), Chris K. Y. Lo (The Hong Kong Polytechnic University)

Literature has investigated propagation effects among supply chain partners in terms of information flow, financial risk, etc. It is unclear whether socially irresponsible behaviors can propagate. Sampling U.S. listed firms and their tier 1 and 2 suppliers, we developed a dataset of 367,850 triads and conducted a regression analysis with the safety violation data collected from OSHA. Results show that the firm's irresponsible behavior (measured as safety violations and the penalties) positively associates with their suppliers' irresponsible behaviors. This propagation effect is also found from suppliers to the firms. We discussed implications for supply chain management and sustainable operations.

The Price of Imposing Vertical Equity Through Asymmetric Outcome Constraints

Thomas Breugem* (Tilburg University), Luk Van Wassenhove (INSEAD)

Vertical equity or fairness is an important aspect in many settings. For example, donors might require a family planning organization to focus on high-impact' subgroups, e.g., young and poor clients. We provide an analytical upper bound on the price (loss of overall utility) of vertical equity considerations in resource allocation. We assume these concerns are expressed via outcome constraints, specifying a minimum percentage of the total utility for each player. We apply our results to health delivery, and confirm outcome constraints can entail a substantial price and analyze the factors driving this price close to the worst-case bound.

Intersecting Sustainabilities: Protecting both People and Planet in Supply Chains

Michael Rogerson* (University of Surrey), Johanne Grosvold (University of Bath), Kyle Alves (University of the West of England)

Efforts to manage the climate impact of, and labour standards in, supply chains have often been conducted in isolation. Organizations which negotiate and manage framework agreements for public sector buyers, the scope of which includes sustainability management (Rogerson et al., 2020), are well placed to incorporate efforts to address both of these two issues concurrently, especially given their purchasing volume and overall spend. However, we know little of the impact of attempts to manage these risks simultaneously. Our paper therefore investigates supply chain management by a consortium which manages climate and modern slavery risks for members.

Role of Authentic Leadership in Sustainable Service Operations

Qing Cao (University of Houston-Downtown), Rupak Rauniar* (University of Houston-Downtown)

Vulnerability and derailment of a sustainability program in the ever-present uncertain and volatile business environment of a service operation can be reduced in the presence of an authentic leader who can provide support and influence the continuity of sustainable program in the organization, while contributing to the overall competitive performance goals of the organization. This empirical study explores the role of the authentic leaders in the structural equation model of 102 responses (response rate of 20%) indicate a positive relationship between authentic leaders, strategic agile operations, and business performance.

The Operations of Well-Being: Happiness, Equity, and Sustainability

Charles Corbett* (UCLA Anderson School of Management)

Pursuing well-being is preferable to focusing on economic metrics alone. Well-being includes, among others, the happiness of individuals; diversity, equity and inclusion of groups; and the sustainability of society. Operations management has many impacts on well-being at each of these levels, some more obvious than others. The objective of this article is to offer a wide-ranging exploration of linkages between operations and well-being. It organizes "operations" into five broad areas: pace and productivity, predictability and probability, process and prevention, performance and payment, and pollution and protection; it explores links with individual, group and societal well-being for each.

27	Tuesday, 03:50 PM – 05:20 PM, Room 4 Session: Emerging Trends in Behavioral Operations Chair: Jose-Benedicto Duhaylongsod	Track: Behavioral Operations
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Exploiting Uncertainty about the Number of Competitors in Procurement Auctions

Nicolas Fugger* (University of Cologne), Elena Katok (UT Dallas), Achim Wambach (ZEW Mannheim)

We investigate theoretically and experimentally if the buyer can exploit her private information about the number of suppliers in procurement auctions or if she benefits from committing to a first-price auction independent of the number of suppliers. While standard economic theory with risk-neutral suppliers implies that commitment does not affect the buyer's profit, the buyer benefits from commitment if suppliers are risk averse. In contrast, the buyer can exploit her private information if suppliers fail to understand the correlation between the actual number of suppliers and the buyer's format choice. Such an inability is, e.g., implied by cursed equilibrium reasoning.

Using Process Data to Detect Lies in Supply Chain E-Business

Fadong Chen (Zhejiang University), Zhi Zhu (Zhejiang University), Yingshuai Zhao* (University of Cologne)

Supply chain collaboration often involves lies, particularly in the digital era where the cost of lying is low. Researchers have proposed several approaches to this problem but they cannot detect lies before transactions. We employ process data associated with decisions to detect lies. Using laboratory experiments, we show that both response times and mouse trajectories differ between partial liars and truth-tellers, but full liars exhibit similar patterns to truth-tellers. The agents' performances are well predicted by the quantal response equilibrium under lying aversion. Given the abundance of process data available in online interactions, our findings are particularly relevant to e-business.

Exclusive or not? An experimental Analysis of Parallel Innovation Contests

Ramazan Kizilyildirim (University College London), C. Gizem Korpeoglu* (Eindhoven University of Technology), Ersin Korpeoglu (University College London), Mirko Kremer (Frankfurt School of Finance and Management)

We study parallel innovation contests where organizers elicit innovative solutions from solvers with limited (financial, time, cognitive) resources. The quality of a solution improves with the solver's effort, yet it is also subject to uncertainty. Prior theoretical work shows that organizers should discourage solvers from participating in parallel contests when uncertainty is low. In this case, organizers should benefit from solvers focusing their efforts on one "exclusive" contest rather than splitting them across multiple "non-exclusive" contests. We test this prediction with controlled laboratory experiments, and show that non-exclusive contests are better even when theory favors exclusive contests (under low uncertainty).

Training Intensity and Supply Chain Learning: A Moderated Mediation Model

Jose Benedicto Duhaylongsod* (IÉSEG School of Management), Sheldon Carvalho (Universidad de los Andes), Irene de Pater (Edith Cowan University)

Managerial insights from operations management studies and practice often suggest the crucial role of training and competencies in improving supply chain learning. However, few research has substantiated these claims theoretically and empirically from an individual-level perspective. This study investigates how individuals' perceptions of training intensity improve supply chain learning through individual supply chain management competencies and how individuals' motivation to learn enhances the relationship. Building on operations and human resource management literature, we develop a model under the framework of the Ability-Motivation-Opportunity model. We test our hypotheses by collecting survey data over three waves from leaders in the operations/manufacturing/production functions.

28	Tuesday, 03:50 PM – 05:20 PM, Room 5 Session: Design and Optimization of Nonprofit Supply Chains Chair: Jyotirmoy Dalal Track: Nonprofit Operations
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Integrated Food Bank Network Design: A Case in India

Jyotirmoy Dalal* (Sheffield University Management School), Ajinkya Tanksale (Clarkson University), Nistha Dubey (Pixxelspace India Pvt Ltd.)

Although many foodbanks operate in India to serve particular localities, the shortfall on efficiency, effectiveness, and equity underline the need for a strategic integration of different entities in a food bank ecosystem. We propose an integrated three-tier network comprising large institutional to small individual donors, large and small-scale food banks, and food-insecure beneficiaries with varied priorities. Our integrated model - while strategically locating food banks with appropriate storage, transport, and manpower capacities - makes operational decisions on food purchase, packaging, and distribution by jointly considering the nutritional values of donated food and the needs of the age and gender-based categorized beneficiaries.

The Logistics of Food Redistribution: Challenges and Solutions

Michael Bourlakis (Cranfield School of Management), Emmanuel Sawyerr* (Cranfield School of Management), Andrew Dicker (UK Harvest)

There are increasing numbers of people reliant on alternative supply chains for their food provisioning. In this paper, we argue that efficient, sustainable and resilient logistics and supply chain operations in these supply chains are fundamentally critical in the pursuit of the United Nations Sustainable Development Goals 2 and 12. We interview 32 senior managers and experts from both the commercial and food aid supply chains and analyse the collected data abductively to map the supply chain that serves disadvantaged groups and to identify both the challenges and solutions to reduce waste and improve redistribution of surplus food.

Improving Vaccine Forecasts to Increase Coverage: A Hierarchical Forecasting and Inventory Control Approach

Bahman Rostami-Tabar* (Cardiff Business School), Mohamed-Zied Babai (Kedge Business School), Oussema Omri (University of Bordeaux)

500,000 children die annually in developing countries due to lack of vaccine access. Inaccurate forecasts, stock-outs and missed opportunities are main contributors, among other factors, to this issue. The standard approach to produce the vaccine forecasts is limited to the national level and annually, which is not suitable to inform operational decisions. These shortcomings are exacerbated during resupply efforts for vaccine distribution. Therefore, Immunisation programs are exploring alternatives to improving the forecast accuracy using data driven technologies. This paper explores how hierarchical time series forecasting approaches and their integration with inventory control could contribute to efforts in improving the vaccine coverage.

Channel Strategies for Terrain-Constrained Public Distribution Systems

Sushmita Narayana Aghalaya* (National Institute of Industrial Engineering)

Public distribution of welfare goods (healthcare, food items, vaccines, etc.) is an important function of government bodies. Nevertheless, when there are constant terrain / weather challenges, the distribution is difficult and result in costs to the government and other entities within the system. This paper aims to review the literature in the domain of public distribution and the impact of terrain / weather-related conditions (e.g. mountainous regions, flood-zones, etc.) on it. Further, it explores the means to achieving distribution of goods that can provide better facilities to the beneficiaries by identifying predominant channel strategies of collaboration within entities, outsourcing, network design, etc.

Consolidating Rural School Network: An Optimization Model and a Case In India

Jyotirmoy Dalal* (Sheffield University Management School), Jai Kamal (Indian Institute of Management Jammu)

We present a problem of school network consolidation in rural India, motivated by the policymakers' emphasis on closing underperforming schools and meeting their demands by upgrading the capacities of some neighboring well-performing schools. Considering the minimization of costs of closure, upgrading, transportation, and disruption due to school change for the pupils, our mixed-integer programming model prescribes the optimal school network by deciding on capacity extension, consolidation, or maintaining the status quo. Our GIS-based case study on a rural district, significantly backward in child education, highlights trade-offs among cost, unmet demand, and capacity utilization, that can elicit insights for the decision-makers.

29	Tuesday, 03:50 PM – 05:20 PM, Room 6 Track: Disruptive Technology & Operations Management Session: Blockchain and AI for Supply Chain Network Design & Resiliency Chair: Giovanni Lugaresi
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Multi-Period Long-Haul Connected and Automated Transportation Network Design

Ebrahim Mohammadi* (Erasmus University), Marie Schmidt (University of Würzburg), Rob Zuidwijk (Erasmus University)

Providing required services and infrastructures for connected and automated transportation(CAT) is crucial to realize the potential benefits of CAT, such as transportation cost savings. In this paper, we propose a new mixed integer mathematical model to locate various service stations and enablers required for the long-haul autonomous transportation over a planning horizon. This model integrates the location decisions of multiple enablers with different operational characteristics such as refuelling stations, emergency maintenance stations, transfer hubs etc. The model is numerically implemented for a number of benchmarks, and sensitivity analysis is provided for key parameters.

Building a Tech-Based Supply Chain Resilience Framework for Indian FMCG

Devnaad Singh* (Thapar Institute of Engineering and Technology), Anupam Sharma (Thapar Institute of Engineering and Technology), Rohit Singh (International Management Institute, Kolkata), Prashant Singh Rana (Thapar Institute of Engineering and Technology)

The unpredictable nature of supply networks requires careful planning for risk mitigation. Advanced technologies like BDA, AI, and ML can improve Supply Chain Resilience by developing a firm's continuity capabilities. The authors developed the Total Interpretive Structural Model (TISM) from semi-structured interviews with 24 professionals in India's FMCG supply chain, and a quantitative questionnaire with 230 responses was used to further test the model. Empirical studies also confirm that analytics help with demand forecasting and inventory management to increase efficiency. Thus, BDA, AI, and ML are vital for achieving supply chain resilience.

Application of Machine Learning for Railway Infrastructure Resilience

Mahdieh Sedghi* (Luleå University of Technology)

Railway infrastructure is critical for sustainable transportation and contributes significantly to UN's sustainable development goals. Accurately predicting railway infrastructure failures is critical, as it can prevent service interruptions, improve safety, and enhance maintenance efficiency. This paper delves into the use of cutting-edge machine learning models, including Support Vector Regression, Random Forest, Linear Regression, and Artificial Neural Networks, for precise track failure prediction to create sustainable and resilient infrastructure with unwavering reliability. Through a case study in Northern Sweden, this paper offers insights into the performance, computational efficiency, and maintenance effectiveness impact of each machine learning model.

Connecting Agility Drivers and Sustainability Metrics for Smart Supply Chains

Giovanni Lugaresi* (CentraleSupélec), Zied Jemai (CentraleSupélec), Evren Sahin (CentraleSupélec)

The Industry 4.0 revolution prompted an increase of the digitization of supply chains, and significant interest has been dedicated to smart decision-support tools. Particularly, recent research has focused on the agility of supply chains by identifying levers that can steer the value networks toward optimized conditions while minimizing risks. However, the impact of these actions on sustainability is often neglected within the decisional frameworks. This work analyses the link between agility drivers and sustainability metrics (e.g., emissions, waste reduction) in a practice-oriented way. Significant use cases are identified to demonstrate the applicability of the analysis and stimulate further research.

30	Tuesday, 03:50 PM – 05:20 PM, Room 7 Track: Supply Chain Management Session: Logistics & Transportation Service Optimization Chair: Mahdi Bashiri
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Longhaul and Multimodal Shipment Planning: From Theory to a Startup

Özgür Özpeynirci* (Izmir University of Economics), Sinem Tokcaer (Izmir University of Economics)

We present our path from describing a theoretical problem in a PhD thesis, enhancing it with real life requirements and finally converting the results into a startup company with multiple clients. Shipment consolidation and dispatching problem is faced by long haul freight forwarder companies (FFCs). An FFC receives orders from several clients to be delivered to multiple countries. The FFC consolidates the orders into carrying units and assigns a transportation mode while considering physical, geographical and temporal properties of orders and logistics regulations. We develop a web-based decision support system that is serving multiple large companies in the logistics sector.

Longhaul and Multimodal Shipment Planning: Tactical Tools for a DSS

Sinem Tokcaer* (Izmir University of Economics), Özgür Özpeynirci (Izmir University of Economics)

In this study, we present tactical tools developed for a decision support system serving international LTL transportation companies to increase the value of the product by providing insights for customers in their operational and tactical decisions. First tool considers temporal consolidation of orders and suggest early departures for the vehicles. Second tool suggests companies to find new solution partners abroad by using historical data. Third tool reveals target customer types by considering size and destination of cargoes, and also suggests target price for new incoming orders. All tools are developed by using machine learning algorithms and tested on real-life instances.

Leader Driver-Based Diffusion Optimization Model in Transportation Service Procurement

Aghdas Badiiee* (Heriot-Watt University), Hamed Kalantari (Iran University of Science and Technology), Chefi Triki (University of Kent), Adam Gripton (Heriot-Watt University)

The paper proposes a solution for allocating shipping orders to drivers in transportation systems that focuses on maximizing profits while minimizing time. The authors use a weighted drivers' collaboration network to model driver-to-driver interactions and develop a community detection algorithm to extract communities and their leaders based on their shipping order diffusion power and also introduce a profit maximization model that utilizes diffusion power of community leaders. Results show that the model can allocate orders to the most suitable drivers based on their risk level and reputation. A numerical example and case study are provided to demonstrate the algorithm's effectiveness.

Transportation Service Optimization Using a Matheuristic Algorithm Including Machine Learning

Faraz Panjehaein (Bistoun power plant, Kermanshah), Mahdi Bashiri* (Coventry University)

In this research staff transportation service with three objectives is considered to be designed. The total walking distance of staff, the total cost of transportation and the longest vehicle travel time are minimized. During a developed Matheuristic algorithm, an initial solution is determined first and then the solution is improved through several operators. As operators are being implemented, the algorithm specifies and learns the recrudescence patterns and uses them to improve solutions. Solutions are evaluated by Hypervolume measure in comparison to the real pareto frontier. Numerical studies confirm the efficiency the proposed algorithm in both computational time and solution quality.

31	Tuesday, 03:50 PM – 05:20 PM, Room 8 Session: Supply Chain and Resource Management in Healthcare Chair: Babak Abbasi	Track: Healthcare Operations
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A Platelet SC Model Considering Blood Groups and Extraction Methods

Mahsa Nazifi (Najafabad Branch, Islamic Azad University), Omid Boyer (Najafabad Branch, Islamic Azad University), Milad Asadpour* (Queen Mary University of London)

There are several methods for extracting platelets from blood. Regardless of their advantages and disadvantages, the chosen extraction method directly affects the two factors of platelet production time and its quality. Accordingly, focusing on blood groups and different platelet extraction methods, a multi-objective Blood Supply Chain model has been developed, whose functions are minimizing the total cost, minimizing the total platelet extraction time, and maximizing the quality of the extracted platelets. After validation using random problems, the developed model has been solved for a real problem in Iran employing the ϵ -constraint method. Moreover, a sensitivity analysis has also been deployed.

Efficient 2-Competitive Online Algorithm Saves Time Updating MSF Logistics Kits

Mickael Gaury* (Université de Bordeaux), Mehdi Amiri-Aref (Kedge Business School), Boris Detienne (Université de Bordeaux), Gautier Stauffer (HEC Lausanne)

MSF Logistics operates in emergency situations worldwide. They are committed to providing fast and efficient support to their beneficiaries, including MSF and other NGOs. To meet their obligations, they produce and stock ready-to-use kits that can be dispatched to the field within 48 hours. However, some kits contain perishable products that require periodic updates to maintain their validity, which can be a labor-intensive and time-consuming process. We propose an innovative solution based on opportunistic replacement. Our fast and 2-competitive online algorithm saves 40% of the time and effort needed to update the kits, and we are currently implementing it.

Operating Rooms and Resources Maintenance Scheduling

Seyyed Kian Farajkhah* (Ozyegin University), Elvin Coban Gokturk (Ozyegin University)

Hospital expenditures keep growing and operating rooms are one of the major causes for these expenditures. To reduce the costs, efficient operating room scheduling should be targeted. However, operating room problems are complex as they also include scheduling of several resources. In this work, we study an integrated scheduling problem of operating rooms and resources while considering maintenance via a mixed integer linear programming model. However, the proposed model's size may increase a lot preventing to compute a solution. Thus, heuristics and a rule-of-thumb are proposed to overcome this computational problem.

The Impact of Bundled Payments on Healthcare Operations

Anand Bhatia* (IE Business School), Jayashankar Swaminathan (University of North Carolina)

Strategies that increase quality while reducing costs are extremely relevant in today's environment of increasing healthcare expenditures. Bundled payment initiatives alter reimbursement structure in an effort to align financial incentives with increased care coordination. We examine how variation in payment structure influence hospital outcomes. While existing literature has studied relationship between payout structure and hospital outcomes, no paper has investigated how these outcomes are realized. Changing payment on its own does not directly change outcomes. We investigate three operation levels – service time, staffing, and service delivery – to see how operation strategies are influenced by payment changes.

Blood Inventory Management Based on Flexible Donor Allocation Design

Yu Shi (Yale University), Saed Alizamir (Yale University), Babak Abbasi* (RMIT University), Zahra Hosseinfard (University of Melbourne)

Blood is a perishable and scarce resource in supporting vital activities. The volatility in blood inventory could result in unnecessary shortage and waste. Recent studies also suggest the correlation between the transfused blood age and the risk of adverse outcomes. Ensuring a sustainable blood supply with minimal shortage and waste, while keeping fresh blood, requires smart design of donor allocations. To study the problem, we conduct analysis using national-level blood inventory data in Australia from 2015 to 2019. We design an incentivization algorithm to avoid shortage while maintaining blood freshness. By targeting the repeated donors as the incentivized group, we experiment two different re-allocation strategies. We achieve both an improvement in blood freshness and a decrease in inventory volatility through re-allocating flexible blood donors.

32	Tuesday, 03:50 PM – 05:20 PM, Room 9 Session: Supply Chain Sustainability Chair: Marcus Brandenburg	Track: Supply Chain Management
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Diffusion of SDG in Supply Networks: Effects on Buyer Performance

Jesus Diego-Castillo (Universidad Carlos III), Maria J Montes-Sancho* (Universidad Carlos III), Zhaohui Wu (Oregon State University)

Drawing on social network and faultlines theories, we explore how SDG adoption at the focal buyer and SDG diffusion into different tiers of the supply network affect buyer performance. In line with extant research on adoption and diffusion processes, our results indicate that buyer SDG adoption increases its financial performance. However, SDG diffusion in terms of adoption levels and differences among first-tier and critical second-tier suppliers exercised significant but mixed effects on buyer financial performance. Our findings contribute to the sustainable supply chain management literature and offer managerial implications for developing and implementing business models with sustainability at the core.

Analyzing the Impact of Social Capital on Supply Chains

Vinay Ramani (Indian Institute of Technology), Debabrata Ghosh* (University of Essex)

In this paper, we consider the strategic decisions of firms which have undertaken steps to develop value chains through a bottom-up approach while creating shared social, environmental and economic value in emerging markets. Motivated by the initiatives of such firms, we analyze a two-period vertical chain where the manufacturer and retailer sell product variants in each period, such that the manufacturer's efforts in period one have a positive spillover in period two. We analyze two scenarios: firstly, where profit maximization objectives are fulfilled and secondly, where objectives of the firm include both profit and social considerations.

Sustainability Is Real Only When Shared! The Role of Third-Parties

Valentina Bianchini* (University of Rome)

The study investigates how public and private organizations benefit from the collaboration with third-parties. A case-oriented research design is applied to explore the role of a EU based auditing firm and the partnership established with global firms and public buyers to foster sustainability in their global supply chains. By adopting the Social Exchange Theory lenses, the findings show that public and private organizations benefit from partnership with auditing firms in different ways: while both achieve strategic, reputational and legitimacy gains, the former also face challenges in terms of costs and public support. Strategies to mitigate these side-effects are discussed.

Improving Supply Chain Sustainability by the German Due Diligence Act

Marcus Brandenburg* (Flensburg University of Applied Sciences)

Germany's act for due diligence in supply chains (SCs) represents a strong governmental intervention into global operations and SC management. This act aims at maintaining and improving SC sustainability across the whole multi-tier supplier network. It turns the theoretical concept of chain liability of focal firms into practice and, thus, is worth being studied empirically. Expert interviews with managers reveal risk factors and opportunities as well as performance impacts and implementation issues. A conceptual framework is developed that models the performance implications of risks, opportunities and implementation issues. Moreover, different pathways and avenues for future research are outlined.

33	Tuesday, 03:50 PM – 05:20 PM, Room 10 Track: Sustainable Operations Session: Operations and Decision Models for Electric Vehicles Chair: Erica Ballantyne
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Decision Model for Electric Freight Mobility in Cities

Aalok Kumar* (Indian Institute of Management Visakhapatnam), Sarma PRS (Indian Institute of Management Visakhapatnam)

The urban logistics activities in cities are growing more complicated and expensive because of the growth of e-commerce, rising customer expectations, and derive to improve delivery performance while keeping delivery costs lower. Scholars have also evaluated the transition of urban logistics from conventional vehicles to electric vehicles (EVs) from the multitudinous perspective. To develop a comprehensive decision-making framework for identifying major roadblocks of the electric freight vehicles in cities and cause & effect relationship of identified roadblocks. Strategic roadmap is presented to improve the EFVs transport infrastructure and improving roadblocks for sustainable freight mobility in cities.

Optimal Vehicle Replacement with Budget Constraints and CO2 Emissions Minimization

Giulia Caselli* (University of Modena and Reggio Emilia), Joseph Hartman (University of Massachusetts Lowell), Manuel Iori (University of Modena and Reggio Emilia), Carlo Alberto Magni (University of Modena and Reggio Emilia), Giorgio Zucchi (Coopservice Soc.coop.p.A.)

We consider a vehicle replacement problem in which a keep-or-replace decision must be made for every asset of the fleet in every time period while meeting budget constraints. Multiple options for replacement are given for every family of assets (e.g., electrification of the fleet). The aim is to minimize the total discounted costs and CO2 emissions. The problem is inspired by a real-world industrial application in Italy and, because of its generality, can be used to model a large variety of further applications. We provide integer programming formulations and a promising dynamic programming model to solve the problem in practice.

Is Sharing Greener? An Evidence from EV Market

Huihui Chi* (emlyon), Yacine Rekik (ESCP Business School), Wei Zhou (ESCP Business School)

With the development of electric vehicles market, we investigate whether the existence of car-sharing companies is desirable for the government and manufacturers, and whether it can contribute to the adoption of electric vehicles. Therefore, we propose a two-period model to study the games between collaborative consumption and traditional trading platforms. We differentiate the electric car from the fuel car with Hotelling's law and consider the effect of the government's policy, such as tax and subsidy. We identify the conditions which the sharing market has a higher adoption rate of EV and discuss the effect of different policies on market equilibrium.

A Bilevel Optimization Approach to Electric Bus Operation for Sustainable Public Transportation

Utkarsh Shivam* (IIM Lucknow), Suresh K Jakhar (IIM Lucknow)

A challenging issue in Electric-bus public transportation is due to interactions between multiple stakeholders. In practice, private transporters operate the bus under the supervision of governments. Government goal is to increase social welfare, whereas the goal of private operator is to make profits. Considering these contradicting objectives, we apply a Bi-level optimization model to identify best trade-off of decisions for multiple stakeholders. At the upper level (leader), the government decides the subsidiary schemes to maximize the social welfare and service level of E-bus system. At the lower level (follower), the private operator decides the operation strategies to minimize the cost.

The Feasibility of Replacing Conventional Urban Motorbikes with Electric Alternatives

Tudor Stinescu (The University of Sheffield), Erica Ballantyne* (The University of Sheffield), David Stone (The University of Sheffield)

Two-wheel vehicles, such as scooters and motorbikes, make up on average over 10% of urban traffic worldwide, up to a maximum of 74% in some areas of the world. Adoption of scooters and lightweight motorcycles has been accelerated by their low cost, and the burgeoning gig-based economy, such as point-to-point food and last-mile deliveries. Along with the rise in the number road-registered of these vehicles, the related carbon footprint has also increased. This study focuses on understanding the energy requirements and the potential reduction in GHG emissions by replacing this ICE based two-wheel vehicle fleet with a fully electric alternative.

Sessions for Wednesday, July 19

Wednesday, 09:20 AM – 10:50 AM

34	Wednesday, 09:20 AM – 10:50 AM, Room 1 Session: Topics on Economics and Operations Management Chair: Lijue Lu Track: POM-Economics Interface
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The Effect of Interest Rate Fluctuations on the Economy

Donghun Yoon* (Kyonggi University)

In this paper, we present the effect of interest rate fluctuations on the economy. This study focuses on the analysis of interest rate fluctuations in South Korea. We conduct research on the impact of interest rate fluctuations on the economy through analysis results for interest rate fluctuations. This paper discusses the economic policy and future prospects for interest rate fluctuations.

Content Monitoring over Digital Platforms

Tarun Jain* (IIM Bangalore), Jishnu Hazra (IIM Bangalore), T.C.E. Cheng (The Hong Kong Polytechnic University)

Illegal content uploads on social platforms have grown rapidly in recent years. This paper presents an analytical model setup where we study content developer's and platform's efforts toward monitoring illegal content over digital platforms. We find content monitoring strategies that may generate higher payoffs for digital platforms and content providers. We find that, under certain conditions, it is beneficial for the platform firm to exert a higher monitoring effort than the content developer. We also provide some insights about the implications of the monitoring strategies on social welfare.

Fair Profit Distribution

Ranojoy Basu* (Indian Institute of Management Udaipur), Conan Mukherjee (Indian Institute of Management Calcutta)

We present a cooperative game theoretic approach to fair division of profit generated by overlapping teams of workers. We argue that unlike the standard notion of efficiency, individual shares must exhaust the sum of worths of all coalitions in this setting. We show that using Shapley value through a suitably constructed characteristic function to account for this feature is likely not to be practically acceptable. Instead, we directly use this no-wastage condition (we call it 'extended efficiency') to completely characterize two solutions of the fair division problem that satisfy monotonicity and symmetry.

Product Variety under Cost Uncertainty and Information Asymmetry

Lijue Lu* (NEOMA Business School), Mozart B.C. Menezes (NEOMA Business School)

Most of the existing bonus contracts for managers are based on revenues, which are visible and available in real-time. However, such contracts might incentivize managers to under-report operational costs - private information to the manager that is usually accounted for at the end of the financial year. In this study, we use principal-agent theory to examine how asymmetric information would affect assortment decisions. We aim to analyze the roles of asymmetric information and uncertainty in product proliferation and to design an incentive contract that can achieve the same outcome as complete information.

35	Wednesday, 09:20 AM – 10:50 AM, Room 2 Session: Pricing Policies in Supply Chain Chair: Zichun Liu Track: Supply Chain Management
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Multiproduct Price Competition on a Retail Platform

Lusheng Shao* (University of Melbourne)

Online retail platforms such as Amazon and eBay have played a significant role in online shopping over the past years. These platforms increasingly act as both a reseller and a marketplace. In this paper we study multiproduct price competition on a retail platform in which the platform competes with a brand manufacturer for selling their products to online consumers. We characterize the equilibrium for the Nash game and examine how the pricing decisions are influenced by evolving market conditions.

Optimal Sustainability Efforts and Pricing Policies in a Supply Chain

Pouneh Arbabiun (Nottingham University Business School), Anshuman Chutani* (Nottingham University Business School), Anne Touboulic (Nottingham University Business School)

We consider a supply-chain consisting of a manufacturer and a retailer where retailer is the dominant firm. Both firms determine their optimal prices and efforts to reduce their respective carbon emissions. The consumer demand depends on retail price and on overall supply-chain emission levels. We model the problem as a retailer led Stackelberg game. We also solve the problem of a centralized decision maker which serves as a benchmark solution. We obtain optimal policies and obtain useful managerial insights including the sensitivity of optimal decisions w.r.t. various model parameters. We also consider collaboration between firms to reduce overall emission levels.

Price Competition between Manufacturers Facing Carbon Emission Constraints

Manish Kumar* (IIM Indore)

The world is suffering from an excess carbon emission problem, further causing climate change problems. The decision-makers worldwide are trying to set carbon emission constraints to tackle this. This paper adds to this growing literature by modelling price competition between two manufacturers facing carbon tax in a common retailer channel. This paper also studies the effect of emissions on demand, the nature of penalty or tax charged, and the nature of investment done by the manufacturer to reduce emissions. The model is solved using backward induction, and the results provide insights to the stakeholders regarding reducing emissions.

Sustainable Joint Pricing and Inventory Policies for Perishable Food

Zichun Liu* (McGill University), Sentao Miao (McGill University), Wei Qi (Tsinghua University)

Substantial amount of food are produced but not consumed has non-negligible negative impacts environmentally, socially, and economically. In the research, we address the simultaneous determination of pricing and inventory control for perishable food. The optimal policy is computationally intractable due to the curse of dimensionality. Thus, we develop a heuristic policy to maximize profit and prove our policy is asymptotically optimal under several parameter regimes. Compared with several benchmarks, we show theoretically and numerically that our heuristic policy not only increases profit but also decreases waste.

36	Wednesday, 09:20 AM – 10:50 AM, Room 3 Session: Routing Problem Variations and Applications Chair: Yong-Hong Kuo
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Track: Supply Chain Management

A Continuous Location and Routing Problem for Offshore Wind Farms

Chandra Irawan* (University of Nottingham Ningbo), Said Salhi (University of Kent), Hing Kai Chan (University of Nottingham Ningbo), Eko Wahyu Utomo (Universitas Langlangbuana), Suhardi Suhardi (Institut Teknologi Bandung)

We examine the integrated continuous location and maintenance routing problem wherein a service operation vessel and a safe transfer boat are used to maintain offshore turbines. The aim is to simultaneously determine the best locations for the service operation vessel in the plane and the best delivery and pick-up routes by which the safe transfer boat can access the turbines. An optimisation model of the problem is first developed to minimise the total maintenance cost. Given the limitations of this method, a novel hybrid approach is designed. The computational results demonstrate the effectiveness and robustness of the proposed hybrid method.

Two-Echelon Location Routing Model for Freight Last Mile Delivery

Reza Eshtehadi* (University of Portsmouth), Mohanad Al-Behadili (University of Portsmouth), Djamilia Ouelhadj (University of Portsmouth), Graham Wall (University of Portsmouth), Andrew Bullock (University of Portsmouth)

The Solent Future Transport Zone Freight Consolidation Project, funded by the UK Department for Transport, aims to explore and demonstrate new micro-consolidation concepts for making urban logistics more sustainable, reducing the negative environmental and social impacts of goods movement in the Solent region in addition to minimising financial costs. This paper presents a Multi-modal Two-echelon Location Routing model for Freight micro-consolidation centres. In the first echelon, goods are transferred from supplier depots to micro-consolidation centres with trucks. The second echelon is the last mile delivery of parcels to the final customers using e-vans and e-cargo bikes.

Vendor-Managed Routing Problem with Multi-Compartment Vehicles

Sena Artarslan* (Özyeğin University), Taha Huzeyfe Aktaş (Özyeğin University), Ali Ekici (Özyeğin University), Okan Örsan Özener (Özyeğin University), İhsan Yanıkoğlu (Özyeğin University)

Our study proposes a method to solve a vendor-managed routing problem. The problem involves distributing products with varying consumption rates to customers with different capacities for each product, using multi-compartment vehicles, over a given planning horizon. The compartments have fixed sizes, and the products to be placed in each compartment can vary. The setting analysed has applications in the collection of olive oils of different qualities from the producers. To solve this problem, we developed a metaheuristic approach that integrates Adaptive Large Neighborhood Search algorithm with mathematical programming models.

Synchronized Deliveries with a Bike and a Self-Driving Robot

Yanlu Zhao* (Durham University), Diego Cattaruzza (Université Lille), Ningxuan Kang (JD.com), Roberto Roberti (University of Padova)

Online e-commerce giants are continuously investigating innovative ways to improve upon their practices in last-mile deliveries. Inspired by the current practices at JD.com, we investigate a delivery problem that we call Traveling Salesman Problem with Bike-and-Robot (TSPBR) where a cargo-bike is aided by a self-driving robot to deliver parcels to customers in urban areas. We present two mixed-integer linear programming models and describe a set of valid inequalities to strengthen their linear relaxation. With extensive numerical tests, we provide some managerial insights to assess the impact of deploying the bike-and-robot tandem to deliver parcels in the TSPBR setting.

Scenario-based Distributionally Robust Optimization for the Stochastic Inventory Routing Problem

Runjie Li (The Hong Kong University of Science and Technology), Zheng Zui (Zhejiang University), Yong-Hong Kuo* (The University of Hong Kong), Lianmin Zhang (Shenzhen Research Institute of Big Data)

We consider a class of the inventory routing problem in a discrete and finite time horizon, where the demand for homogeneous products at retail stores is uncertain and varies across different scenarios. We propose a scenario-based distributionally robust optimization framework to tackle this problem.

37	Wednesday, 09:20 AM – 10:50 AM, Room 7 Session: Sustainability of SMEs Chair: Ruiz-Benitez Rocio Track: Sustainable Operations
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A Roadmap to Address Circularity Readiness from SME's Perspective

Umair Tanveer* (University of Exeter), Shamaila Ishaq (University of Derby)

Considering the emerging intersection between circular economy (CE) and sustainable supply chains, this study analyses the relevance of the CE and its adoption by the small and medium enterprises (SMEs) in their supply chains. This study deploys the resource-based view as theoretical lens to examine the endogenous and exogenous factors contributing towards the readiness of SMEs for circularity. A holistic qualitative case study approach is used to collect data regarding factors serve as motivation towards sustainability and circular economy in SMEs supply chains. Based on the findings, a CE Readiness Framework (CERF) is developed for SME's for better sustainable performance.

Investigating Challenges and Drivers for SMEs to Implement Netzero Capabilities

Samir Dani* (Keele University), Tolu Olarewaju (Keele University), Abdul Jabbar (University of Leicester)

Our research will investigate the net-zero climate change business strategies being adopted by SMEs and the perceptions of support they receive for these strategies. At COP26 the major countries of the world set ambitious targets for NetZero capability. The UK has set a zero-carbon target for 2050. Within this perspective, this research investigates the drivers and barriers for SMEs to implement NetZero capability. The SME perspectives are sought from SMEs based in the UK Midlands. One aspect of the research is also focused on the experiences of the BAME SME community.

The Impacts of Sustainable SCM Practices on Performance: An Empirical Study of Manufacturing SMEs

Said Usman* (Roehampton University), Nasrin Asgari (Anglia Ruskin University), Wantao Yu (Roehampton University)

Despite the growing interest in sustainable supply chain management (SSCM) practices, manufacturing firms in emerging economies are still struggling to implement these practices. Using a mixed-method approach, this research aims to shed light on how technology orientation and supply chain information integration can enable manufacturing firms to implement SSCM practices and improve business performance in emerging markets. The study also seeks to address the varying significance of institutional forces. The findings of this study are expected to contribute to the literature on SSCM in emerging markets and provide practical insights for manufacturing firms seeking to improve their sustainability practices.

Relationship between Sustainability of SMEs and their Supply Chain

Ruiz-Benitez Rocio* (University Pablo de Olavide), López Cristina (University Pablo de Olavide)

Business sustainability and supply chain (SC) sustainability are key in reducing companies' environmental impact leading to a responsible production. Whether is the company the one that drives the sustainability in the SC or is the opposite case, still remains as an unsolved question. The present study evaluates the relationship between SME's sustainability and SC sustainability over time, considering the three dimensions of sustainability -economic, environmental and social. Findings show that for social aspects the company drives sustainability through the supply chain meanwhile for environmental aspects is the supply chain the one that drives sustainability through the company.

38	Wednesday, 09:20 AM – 10:50 AM, Room 8 Track: POM-Marketing Interface Session: Order Fulfilment in Omni-Channel Retailing & Market Competition Chair: Aditya Jain
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The Value of Ship-From-Store Order Fulfilment in Omni-Channel Retailing

Shandong Mou (Central University of Finance and Economics), Ruobing Ling* (Central University of Finance and Economics), Junhong Chu (The University of Hong Kong), Yi Xiang (China Europe International Business School)

Many omni-channel retailers have started to utilize local establishments to fulfil online orders. Ship-from-store (SFS) initiative is one of the main order fulfilment methods that allow consumers to place online orders and have their items delivered to designated locations by physical stores. While widely used by businesses, the value of such an approach is understudied and lacks empirical evidence. This study leverages a unique dataset provided by a large apparel retailer in China to quantify the value of ship-from-store order fulfilment method. The results show that SFS approach has positive impact on online sales and spillover effect on offline sales.

Managing In-Store Order Fulfilment with a Multi-Skilled Workforce

Shandong Mou* (Central University of Finance and Economics)

It is becoming prominent to make use of local brick-and-mortar stores to fulfil online customer orders in omni-channel retailing. Despite extensive studies conducted in the setting of traditional warehouses, research focusing on in-store order fulfilment with the multi-skilled workforce in omni-channel retail stores is scant. This work constructs an in-store order fulfilment model with the multi-skilled workforce in omni-channel grocery stores and proposes an efficient heuristic solution. Numerical experiments are conducted and managerial suggestions are put forward for O2O grocery store operations.

Returns-Based Partnerships: Can Competing Retailers Become Allies?

Ahmed Timoumi* (Indian School of Business), Abhinav Uppal (Indian School of Business)

Amazon recently formed a partnership with its competitor Kohl's that allows Amazon's customers to return products at conveniently located Kohl's stores. While this makes returns more flexible for Amazon's customers, it also sends additional footfall to its competitor's stores. In this paper, we investigate a theoretical rationale for this non-trivial partnership. We model customers' purchase and return decisions for products with digital and non-digital attributes and analyze the impact of such a partnership on horizontally differentiated online and offline retailers.

Vertical Competition with Common Attributes

Xiaojuan Puyang (Sichuan Normal University), Jane Gu (University of Connecticut), Juan Li (Nanjing University), Rachel Chen* (University of California at Davis)

Vertically differentiated products in a competitive market often share common attributes (e.g., location value, infrastructure, or technologies) provided by third-parties. In this study, we characterize how common attributes affect high- and low-quality firms in their offerings of individual attributes and pricing, and consequently affect market competition and social welfare. First, we disentangle three distinctive effects of common attributes on vertical competition. Second, we show that more desirable common attributes have different implications for vertical competition in different product markets. Finally, we examine a retail platform's commission policy when its infrastructure constitutes common attributes for vertically differentiated vendors.

The Role of Product Quality in Marketplaces

Leela Nageswaran (University of Washington), Aditya Jain* (The City University of New York), Haresh Gurnani (Wake Forest University)

Traditional retailers have started to offer marketplaces, wherein suppliers may sell directly to customers. We study which mode of operation - marketplace, wholesale, or a combination - will prevail when the product quality is uncertain. In contrast to marketplace's dominance when quality is certain, we show there may be a separating equilibrium wherein the low-quality product is offered via marketplace and high-quality via wholesale. Using data from a leading US-based retailer, we empirically verify that products sold via marketplace are associated with lower quality than those sold via wholesale.

39	Wednesday, 09:20 AM – 10:50 AM, Room 9 Track: Service Operations Management Session: Novel Approaches and Optimization in Service Systems Chair: Ricky Roet-Green
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In-queue Queueing: Gaining Utility through Ancillary Service while Waiting

Yang Li (Western University), Baolong Liu* (ShanghaiTech University), Rowan Wang (Southern University of Science and Technology)

We investigate a queueing system with the primary service provider also offering an ancillary service which attracts more demand but hurts the utility of the primary service customers. In this regard, there exists a trade-off between the demand expansion and the queue congestion effects. By comparing it to the primary queue and priority queue, we find the ancillary service improves profit and welfare under certain conditions. We also extend the model with heterogeneous customers and reach consistent conclusions.

Co-Exposure Measures in Service Systems

Binyamin Oz (The Hebrew University of Jerusalem), Yael Perlman* (Bar Ilan University)

A central measure of interest in queueing theory is waiting time, which reflects the time spent with customers who are ahead in line. We introduce two additional performance measures related to the exposure of customers to each other while waiting in the system. These measures also consider the impact of subsequent arrivals. For a general multi-class queueing system we show how to find the optimal priority rule that minimizes the overall exposure costs.

Competition in Optimal Stopping: Behavioral Insights

Ignacio Rios* (UT Dallas), Pramit Ghosh (UT Dallas)

We theoretically and experimentally study the secretary problem under competition, focusing on the effect of two market design choices: (i) transparency about agents' priorities; and (ii) the mechanism to collect decisions (simultaneous vs. sequential). We theoretically characterize the optimal policy for each case and derive predictions. Our experimental results show that the mechanism to collect decisions affects the saliency of competition and induces frustration. Moreover, we theoretically show that transparency may lead to higher welfare, but the benefits do not translate to practice due to information friction.

Machine Learning-Based Evaluation of Risk of Delay in Activity Networks

Alice Calamita* (Sapienza University of Rome), Carlo Meloni (Sapienza University of Rome), Marco Pranzo (University of Siena), Marcella Samà (Roma Tre University)

We investigate the evaluation of quantile-based measures of delay risk for scheduling problems represented as activity networks. We consider the case in which the duration of the activities is uncertain and only the range of possible duration values for each activity is known in advance. Given a schedule affected by uncertainty, VaR and CVaR of the makespan associated with the schedule are delay risk common indicators. We propose a machine learning-assisted approach to determine a rapid estimate of VaR and CVaR based on specific features of the network. Computational experiments validate the proposed approach and the accuracy of our estimates.

On Pricing a Quality-Diversified Service with an Option to Stall

Ricky Roet-Green* (University of Rochester), Aditya Shetty (University of Rochester)

When customers arrive at a busy restaurant, they may choose to wait for a table, or sit immediately at the bar. Motivated by such services we assume two heterogeneous servers, that may differ in their service value and/or their service rates, making one server more preferable to customers. When offered service by the less preferred server, customers may choose to "stall" and continue waiting for the more preferred server to become available. We analyze how the service provider can use pricing as a lever to simultaneously manage this stalling and balking behavior in order to maximize revenue.

40	Wednesday, 09:20 AM – 10:50 AM, Room 10 Track: Humanitarian Operations & Crisis Management Session: Disrupting Human Trafficking and Illicit Markets Chair: Michel Fathi
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Social Drug Dealing on Peer-to-Peer Fintech Platforms

Panteleimon Loupos* (UC Davis), Jorn Boehnke (UC Davis)

Digital platforms have revolutionized the way drug trafficking is taking place. Modern drug dealers use social platforms, such as Instagram and TikTok, as direct-to-consumer marketing tools. But apart from the marketing side, drug dealers also use payment apps to transact with their clients. In this work, we leverage a large dataset from Venmo to investigate the money trail of drug dealers and the social networks they create. We use text and social network analytics to identify users who engage in drug dealing activity. Our findings provide law enforcement agencies with insights to combat illegal drug trafficking in digital payment apps.

Decision Sciences Applications to Combat Modern Slavery

Kezban Yagci Sokat* (San Jose State University/ Mineta Transportation Institute), Ayca Erdogan (San Jose State University), Nezih Altay (DePaul University)

There are almost 50 million people living in modern slavery. Modern slavery happens everywhere, in every industry, among every community. Decision sciences has a lot to offer to combat this hidden crime. This session presents various cross cutting decision sciences examples of multi-disciplinary anti-trafficking efforts. It also provides lessons learned from those efforts.

Do Anti-Trafficking Policies Impact Firms' Supply Chain Risk Management Development?

Jennifer Nowicki* (Penn State University), Kevin Linderman (Penn State University)

Firms are facing mounting scrutiny from stakeholders to reduce the risk of human trafficking within their supply chains. Many initiatives have been announced to eliminate this risk, however the reliability of firms' commitment towards enacting improvements is ambiguous, particularly when policies lack enforcement. This study looks at firms' responses to a labor trafficking policy intervention to investigate their ability to identify, contextualize, and mitigate risks, as well as construct progress development mechanisms in their supply chains. Analyses of firms' risk management strategies are conducted for firm size, industry classification, and temporal variations.

Systemic Investigation of Climate Change and Modern Slavery in Supply-Chains

Mahnaz Hosseinzadeh* (The University of Sheffield), Marzieh Samadi Foroushani (University of Tehran), Amin Vafadarnikjoo (The University of Sheffield), Dominic Essuman (The University of Sheffield)

While various factors lead to modern slavery in supply chains, evidence shows that climate change impacts are also worsening the vulnerability of people in the affected areas. In this research, we model the causal interrelationship among climate change factors and modern slavery outcomes in the Hawizeh Marsh (Iran), which is highly affected by the operations of oil& gas companies in the region, using System Dynamics. Then, we simulate the model and do policy analysis. Since the climate change factors and the resulted vulnerable are not confined to a country's borders, integrated governance strategies including international contracts would improve the situation.

Fighting Human Trafficking in the U.S.A: The Role of Technology

Katia Guerra* (Boise State University), Anna Land (Boise State University)

This study investigates human trafficking activities and how victims can be identified and helped through the use of information technology. First, we analyze definitions and typologies of human trafficking in the United States. Then, we explore how technology can be used to find victims (e.g., "TraffickCam" app) and to empower victims to receive help (e.g., "National Human Trafficking Hotline"). We will carry out our study through a systematic literature review methodology. This paper will have significant implications for future studies, law enforcement agencies, and humanitarian organizations by shedding light on how technologies can be effectively used to contrast human trafficking.

41	Wednesday, 11:00 AM – 12:30 PM, Room 1 Track: Service Operations Management Session: Management of On-Demand and Platform-Based Services Chair: Alp Arslan
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Models of On-demand Platforms with Different Levels of Delay Information Sharing

Mehmet Aydemir (Walmart Global Tech), Mohammad Delasay* (Stony Brook University), Siddharth Singh (University College London), Mustafa Akan (Carnegie Mellon University)

We consider different delay information-sharing regimes with varying levels of information sharing in on-demand platforms. We model on-demand platforms as two-sided queueing systems and study delay information disclosure policies when a platform serves two classes of strategic users (consumers and providers) who seek matches to each other using the platform. Users on each side decide whether to join the system or balk based on their expected delay to be matched, conditional on the information provided by the platform to them. We investigate when hiding delay information from one user class or both might result in a higher match rate.

Information Provision from a Platform to Competing Sellers: The Role of Strategic Ambiguity

Tal Avinadav (Bar-Ilan University), Tatyana Chernong (Bar-Ilan University), Noam Shamir* (Tal Aviv University)

With the rapid growth of e-commerce, platforms are able to gather and analyze large quantities of data, which can result in high precision forecast. A fundamental question is whether a platform has the incentives to share such non-verifiable information with its sellers. We demonstrate that sharing the precise value of the platform's private information by means of cheap-talk cannot result in an equilibrium due incentives misalignment. However, region-forecast information-sharing equilibrium can emerge. In this equilibrium, the support of the platform's private information is divided into several intervals, and the platform reports truthfully the interval containing its private information.

Integrated Platform for Independent Service Firms

Jing Yang (Sunny) Xi* (Tsinghua University - Haas School of Business), Wai Kin (Victor) Chan (Tsinghua University)

Multi-server service firms such as restaurants usually operate independently. But with digital technologies, they may join an integrated platform (IP), such as a delivery platform, through which customers place orders interchangeably. Given the IP charges a commission on each joining firm, we investigate when a firm should join the IP. At low potential demand, the smallest (largest) firm always earns a higher (lower) market share and revenue in the IP. At medium to high potential demand, the IP increases total market revenue and welfare, and all firms are incentivized to join if the commission rates are below certain thresholds.

Platform Leakage and Disintermediation Prevention

Pradeep Chintagunta (University of Chicago), Liqiang Huang (Zhejiang University), Wei Miao* (University College London), Wanqing Zhang (City University of London)

In this study, we investigate how willing sellers are to engage in disintermediation initiated by buyers via a randomized field experiment in which independent contractors were hired as undercover buyers to reach out to sellers under different experimental conditions. Our results show that communications being unmonitored significantly increases the level of seller disintermediation. Next, we apply the multi-arm causal forest algorithm to estimate the CATE for each individual observation. Second-stage analyses reveal a U-shaped effect of sellers' tier status on CATEs. In addition, sellers with shorter tenure and higher recent sales are more motivated to disintermediate while being unmonitored or facing higher commission savings. Our results provide important managerial implications for online platforms on whom to target for more effective disintermediation management.

Queueing Models for On-demand Grocery Delivery Systems

Jelmer Van der Gaast (Fudan University), Alp Arslan* (Lancaster University), Jan Fransoo (Tilburg University)

Recently, there has been a rapid rise of on-demand grocery delivery services (ODS), which allow online customers to receive selected goods in minutes via dark stores or corner shops. However, running such a service platform is challenging from a logistical point of view since the platform faces tight order delivery deadlines, small order sizes and high product variability. We propose a stylized queueing system to design and assess the on-demand grocery delivery services analytically. Ultimately, our model captures the salient features of ODS, including stochasticity in order arrivals and inventory availability at stocking locations and provides tools beyond the unit economics.

42	Wednesday, 11:00 AM – 12:30 PM, Room 2 Session: Sourcing, Purchasing and Procurement Chair: Andreas Holzapfel	Track: Supply Chain Management
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E-Procurement and Supply Chain Performance: Mediating Role of Quality of Information (Systematic Literature Review)

Michael Gyabaah* (Brunel University, London), Behzad Hezarkhani (Southampton Business School), David Gallear (Brunel University)

The aim of the study is to examine the effects of electronic procurement on supply chain performance in the manufacturing sector in Ghana. The study further investigates the mediating role of quality of information. The study anticipates that E-procurement has a positive effect on supply chain performance. The study employs structural equation modeling to conduct confirmatory factor analysis (CFA) and confirmation of hypothesis. Accordingly, 200 employees from ten manufacturing companies are randomly selected to respond to the questionnaire. The study provides deeper knowledge to scholars on the relationship between e-procurement and supply chain performance as well as the mediating role of quality of information. Managers are provided with valuable insight on the need to use information to facilitate e-procurement implementation to boost supply chain performance.

Global Sourcing under Tariffs: Time Series Analysis of Product-Level Evidence

D. James Zhang* (Eindhoven University of Technology), Maxi Udenio (KU Leuven), Shaunak Dabadghao (Eindhoven University of Technology)

This paper investigates how U.S. tariffs impact global sourcing of U.S. manufacturing importers based on product-level evidence, by utilizing their monthly time series of sourced products. Relying on FactSet Shipping database, we extract 222 manufacturing importers. Utilizing an unsupervised learning approach, i.e., multivariate time series clustering, we extract 7 unique clusters. We further apply intervention analysis in time series analysis to investigate how tariffs changed the sourcing patterns. We find evidence that the sourcing behaviors have been changed due to tariffs in 3 clusters. Overall, the findings show dynamics of global sourcing by these firms.

Aircraft Fuel Purchasing Strategy Utilizing Artificial Intelligence

Sehwan Lim* (Yonsei University), Soonhong Min (Yonsei University), Kyunghwan Choi (Defense Acquisition Program Administration), Seonghyun Lee (Yonsei University)

Republic of Korea Air Force (ROKAF) make decision on monthly amount of aircraft fuel purchase based on statistical forecasting. Forecasting accuracy greatly influences fuel inventory level and operational efficiency. The forecasting accuracy at ROKAF has further deteriorated due to supply chain disruptions during the COVID-19 era. This study proposes an AI-based price forecasting model. The proposed model is designed to reflect security, social, and environmental changes in addition to economic factors for realistic forecasting. The analyses show that the AI-based model offers a high level of accuracy. This study contributes to the operations literature by expanding potential applications of AI.

Procurement and Production Planning for Horticulture Considering Short-Term Re-Order Options

Andreas Holzapfel* (Hochschule Geisenheim University), Marius Marius (Hochschule Geisenheim University)

Procurement and production planning of ornamental plants, perennials and cut flowers constitutes significant challenges for small and medium-sized enterprises in the horticultural business. Planners have to consider lead and production times of several months, as well as distinctive seasonality and high perishability of the products. Additionally, they have to anticipate short-term re-order options adequately. We present a stochastic procurement and production planning model as well as a MILP approximation reflecting these conditions and apply our solution approach to several industry cases.

43	Wednesday, 11:00 AM – 12:30 PM, Room 3 Session: Supply Chain Contracts & Game theory Chair: Jose Guajardo Track: Supply Chain Management
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Introducing Fairness Concerns in Agency Contracts for Virtual Products

Nelly Bart* (Bar-Ilan University), Tatyana Chernonog (Bar-Ilan University), Tal Avinadav (Bar-Ilan University)

We investigate the effect of fairness concerns on a platform-based supply-chain when the parties interact via an agency contract. We compare two commission schemes (proportional and fixed) applied under an agency contract and obtain analytical results which yield interesting properties of the equilibrium under fairness concerns. An interesting finding is that by using a certain value of the fairness indicator, it is possible for the principal to achieve the maximal profit (as can be achieved in absence of fairness concerns), while enabling the agent to achieve a profit which is higher than that obtained without fairness concerns.

Contracting under Information Superiority in Supply Chains of Subscriptions-Based Apps

Tal Avinadav (Bar-Ilan University), Priel Levy* (Bar-Ilan University)

We introduce a supply chain of subscription-based apps, consisting of a platform and a developer. The demand distribution is common knowledge, but only the platform can reduce the demand uncertainty. The platform decides whether to disclose this information to the developer. Two types of consignment contract are investigated: fixed fee and commission rate. For each, we examine two scenarios regarding the platform's information status: hidden superiority and known superiority. We show that under hidden superiority, the platform should disclose its private information only when the demand forecast is pessimistic, whereas under known superiority, the platform should always disclose it.

Enhance the Performance of a Supply Chain via Option Contracts

Pooya Hedayatinia* (University of Rennes), Guillaume Massonnet (IMT Atlantique) Jean-Laurent Viviani (University of Rennes), David Lemoine (IMT Atlantique)

This study examines the influence of combining financial decisions, specifically using a loan or trade credit, and contract design utilizing option contracts, on operational performance of a decentralized and simple supply chain. The study demonstrates that when option contracts are incorporated as a supplement to a wholesale price contract, they effectively alleviate one of the primary drawbacks of decentralized supply chains, known as the "Double Marginalization Effect." This approach can lead to enhanced profitability for all supply chain members, reduced bankruptcy risks, and improved overall supply chain performance, particularly in the presence of financial constraints.

Leadership's Effect on the Supply Chain of a Perishable Product

Tal Avinadav (Bar-Ilan University), Tatiana Chernonog (Bar-Ilan University), Yael Lahav* (Shenkar College & Bar-Ilan University)

We examine the impact of leadership on perishable product supply chains. The main findings are: (i) for a given cycle length, the selling price, thus the total profit of the channel are not affected by the identity of the leader; (ii) the selling price encompasses a narrow band; (iii) for each party, being a leader is more profitable than being a follower; (iv) consumers enjoy a fresher product when the retailer is the leader. When the cycle length is determined cooperatively, the total profit of the channel is slightly higher when the retailer is the leader as opposed to the manufacturer.

Managing Payment Flexibility in Rent-to-Own Contracts for Off-Grid Energy Products

Jose Guajardo* (University of California Berkeley), Elaheh Rashidinejad (University of Toronto), Gonzalo Romero (University of Toronto), Hosain Zaman (University of Toronto)

We study consumer behavior and firm decision-making in the design of Rent-to-Own contracts for the distribution of off-grid energy products in developing economies. We use a dynamic programming model to examine how different contract designs affect consumer behavior and firm performance under uncertainty, and characterize the impact of payment flexibility in these environments.

44	Wednesday, 11:00 AM – 12:30 PM, Room 7 Session: Circular Economy, Remanufacturing, Recycling & Return Chair: Thanos Goltos
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Track: Sustainable Operations

Behavioral Research in E-Waste Management: A Systematic Literature Review

Md Shah Newaz* (University of Rome), Andrea Appolloni (University of Rome)

E-waste (WEEE) is drawing substantial attention in different domains. This study aims to perform a bibliometric review study on WEEE-behavioral research. First, bibliometric analysis was done using Biblioshiny (R packages) on an initial sample of 293 articles combining SCOPUS & WOS databases to determine the evolution of WEEE-behavioral research, themes, and clusters via network analysis. Second, content analysis has been performed with 41 relevant articles able to answer the research questions. In terms of findings, this study presents 1) the evolution of the WEEE-behavioral domain 2) sustainability mapping via SDGs, 3) theoretical implications, and 4) the avenue of future research.

Is Remanufacturing Always Profitable: When Should the Retailer Engage in Remanufacturing?

Qin Zhou* (University of Southampton), Jih-Bing Sheu (National Taiwan University)

The impacts of remanufacturing by independent third-party players are extensively covered in the current literature. The impacts of retailer remanufacturing on supply chain earnings, however, have not yet been thoroughly studied. This study explores whether a retailer should go into the remanufacturing industry and, if so, what quality levels it should remanufacture used goods at. In a two-period model setting, we demonstrate how the retailer's options regarding remanufacturing and remanufacturing quality are significantly influenced by the manufacturer's marketing choices in the first period and the quality level of new items.

Strategic Analysis of Formal-Informal Recycler in Power Battery Recycling Market

Zhe Wang* (Nanjing Audit University)

The huge economic value of the retired power battery recycling market has attracted the attentions of informal recyclers with market advantage and formal recyclers with environmental advantage. Considering the possibility of complementing each other's advantage, the research on the recycling cooperation strategies of formal and informal recyclers under different market structures still lacks. Thus, a Hotelling model is constructed and the impacts of cooperation strategy on the formal and informal recycler's optimal recycling prices and quantities, economic profits and environmental benefits are analyzed. Finally, the threshold conditions of cooperation between formal and informal recycler are determined.

Managing Returned Product Flows under Multiple Return Windows

Esra Gökbayrak (Ozyegin University), Enis Kayış* (Ozyegin University)

Retailers have to deal with increasing product returns as e-commerce sales soars and redesign their processes to manage the returned product flows. We study a retailer's optimal inventory control policy under stochastic product returns and multiple return periods to maximize expected profit during a selling season. We formulate the problem using dynamic programming and design an approximate dynamic programming algorithm using basis functions to solve the resulting formulation. Our proposed algorithm reduces the solution time drastically and generates solutions for instances that are not solvable exactly. Finally, we quantify the value of incorporating detailed product return information into inventory management.

Forecasting for Circular Operations: Net-Demand Characterisation and Forecast Accuracy Measurement

Thanos Goltos* (Cardiff Business School)

The linear economic model is leading to irreparable ecological damage and is no longer a viable option. The shift towards a Circular Economy (CE) is already underway but is a complex undertaking that has major implications for operations management. Circular operations rely upon accurate forecasts of demand, returns and net demand (demand minus returns). Net demand is challenging and underresearched, and the measurement of forecasts' accuracy problematic. We attempt to address this dual shortcoming by a) characterising empirical net demand distributions, and b) proposing appropriate accuracy measures that can deal with the intricacies of net demand forecasting.

45	Wednesday, 11:00 AM – 12:30 PM, Room 8 Session: Advertising and Marketing Practices for Sales Promotion Chair: Jane Gu
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Track: POM-Marketing Interface

Exploring the Effects of Disseminating Sustainability-Related Information in Agri-Products Sales

Kotomichi Matsuno* (Waseda University), Yoshikuni Edagawa (Waseda University), Shintaro Nishibe (Denso Corp.), Yoshifumi Takehana (CRAZYTANK, Inc.), Yasuhiro Otake (Tokyo Sokusei Seika Co., Ltd), Takahiro Ohno (Waseda University)

Efforts to "realizing sustainable agriculture" are required to improve problems such as labor shortage and environmental conservation in Japanese agriculture. Meanwhile, awareness, understanding and sympathy for the SDGs among Japanese consumers is increasing rapidly. It is possible to help consumers to support farmers and improve their image of producing areas through purchasing activities by disseminating SDGs initiatives in agriculture to consumers. In this study, we collect emotion assessment data based on sustainability-related information in agriculture by simplified electroencephalograph and clarify the impact of information at different assessment levels on consumers' decision making by empirical experiments.

Vertical Product Location Effect on Sales: Evidence from a Field Experiment

Zahra Jalali (McGill University), Maxime Cohen (McGill University), Necati Ertekin* (University of Minnesota), Mehmet Gumus (McGill University)

Through a series of three studies in a field experiment conducted at a global convenience store chain over four months, we examine the effect of vertical product location on sales and how this effect changes across various factors. Our findings from the field experiment are used to optimize planograms.

Customized Coupon Promotions with Minimum Purchase Requirements

Yordan Soelster* (WHU – Otto Beisheim School of Management), Arnd Huchzermeier (WHU – Otto Beisheim School of Management), Christian Schlereth (WHU – Otto Beisheim School of Management)

Minimum Purchase Requirement (MPRs) coupon promotions are widely used by retailers – yet, the literature gives no comprehensive answer on how to optimize and individualize MPR policies. We demonstrate how retailers can use bespoke MPRs to induce incremental spend in the promotion period and highlight the value that comes from customizing MPRs based on customers' purchase histories. Moreover, we add to the conditional promotion literature by uncovering the effects of varying levels of MPRs on trip incidence, redemption likelihood and spend. Using data from a large-scale field experiment with an omnichannel retailer, we empirically show the value of our approach.

Advertising by Recruiting Influencers

Maya Jalloul* (HEC Paris), Vasiliki Kostami (HEC Paris)

The growth of social media platforms allowed customers to rely on influencers and online reviews for their purchase decisions. We address some of the firm's challenges of influencer marketing by considering different types of influencers and partnership schemes with them and we address the effect of social learning. Influencers can differ in popularity and credibility and firms can partner with them through sponsored advertising or public relations. We consider the role of echo chambers and heterogeneity of review propensity across those chambers, and investigate how the optimal marketing campaign structures are affected by influencer traits, market characteristics, and social learning.

Consumer Self-Design and Brand Competition

Jane Gu* (University of Connecticut), Giri Tayi (SUNY Albany)

We examine competing brands' incentive to offer a self-designable package that consumers can modify to ensure fit, in addition to a standard, pre-configured product. We find that asymmetric equilibrium can arise where only one brand offers a self-designable package and the other brand offers a standard product only. Between two competing brands whose standard products have different attractions, the less powerful brand that offers the less attractive standard product is more likely to be the only provider of the self-designable package. Consumer surplus can be greater when the more powerful brand is the only provider of the self-designable package.

46	Wednesday, 11:00 AM – 12:30 PM, Room 9 Session: Global Supply Chain & Operations Strategy Chair: Xavier Brusset
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Track: Global Operations Strategy

The Evolution of Global Supply Chains under Geopolitical Uncertainty

Remi Charpin* (HEC Montreal), Martin Cousineau (HEC Montreal)

Geopolitical tensions have led governments to be increasingly concerned about national firms' collaborators. Firms may reconfigure their global supply chains to comply with foreign policy or to buffer their supply chain resilience against geopolitical risk. The purpose of this study is to investigate the evolution of global supply chains according to geopolitical developments. Implications for supply chain practitioners, policymakers, and global challenges are examined.

Effectiveness of Vertical Crossborder Acquisitions in Global Supply Networks

Maria Holgado (University of Sussex), Keivan Aghasi* (University of Sheffield)

Vertical crossborder acquisitions (VCBAs) are common practice for manufacturing firms to extend their strategic positions, and increase their supply network resilience. The integration of the acquired firm in acquirer's current supply chain network and global operation is usually the main cause of unsuccessful VCBA. As integration occurs at both operational and organizational levels, we investigate how acquirer (i.e. US manufacturing listed firms between 1990 and 2017) capabilities at these levels improve outcomes from VCBA under regimes of low and high national cultural distance. This advances knowledge on the effects of VCBA in the performance of manufacturers' global supply networks.

Locking in Overseas Buyers Amidst Geopolitical Conflicts

Di Fan* (The Hong Kong Polytechnic University), Pengcheng Ma (The Australian National University), Lin Cui (The Australian National University), Daphne You (University of Oklahoma)

How global suppliers mitigate geopolitical uncertainties to lock in their foreign buyers have not been well examined. Using a quasi-natural experiment setting, this study examines the effect of the 2018 US-China trade war on the transaction relations between Chinese suppliers and their United States buyers. Our long-horizon event study finds that the trade war event caused a negative abnormal transaction value for the exposed buyer-supplier dyads. However, the scale of such negative impact can be mitigated when the Chinese suppliers possess a superior innovation capability, higher corporate social responsibility performance, or fewer political connections, which ultimately improved the supplier's profitability.

Impact of Brexit on the UK-EU Automotive Supply Chain Operations

Nasrin Asgari* (Anglia Ruskin University), Xavier Cordero Nicolaide (Roehampton University), Reza Gharoie Ahangar (Lewis University), Reza Zanjirani Farahani (Rennes School of Business)

In 2016, 52% of Britons decided to leave the EU, known as "Brexit", which happened on 31 January 2020. This study aimed to investigate the impact of Brexit on the UK automotive supply chain management. The study adopted a quantitative research approach employing time series data on the UK's automotive sector and other macroeconomic variables. The research used a longitudinal research design to identify structural disruptions in market indicators that affect the automotive SC between the UK and EU member states before and after Brexit. We recommend a readjustment of UK automotive supply chains to align with the future market expectations to remain competitive.

Do Firms with ESG Risks Develop Enough Managerial Control Effort?

Xavier Brusset* (SKEMA Business School), Xuefei Lu (SKEMA Business School), Jean-Louis Bertrand (ESSCA School of Management), Miia Chabot (ESSCA School of Management)

The way Manufacturing firms in European countries try to control their exposure to environmental and social risks are under ever more scrutiny by other stakeholders. Using measures of managerial effort, we analyze a cross-section of manufacturing firms listed on European stock exchanges to provide insights into their exposure to such risks and their effort in controlling them. We use data envelopment analysis on a database of ESG scores to characterize the firms by industrial sector. We draw some conclusions about the merits of such analysis and recommendations to firms about their ESG policies.

47	Wednesday, 11:00 AM – 12:30 PM, Room 10 Session: Production Optimization Chair: Erfan Asgari
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Track: Manufacturing Operations

Managing Process Time Uncertainty in Mixed-Model Assembly Lines

Milad Elyasi* (IMT Atlantique Nantes), Simon Thevenin (IMT Atlantique Nantes), Audrey Cerqueus (IMT Atlantique Nantes), Alexandre Dolgui (IMT Atlantique Nantes)

The automotive industry faces a rising demand for customized vehicles, which requires the use of Mixed-Model Assembly Lines (MMALs). However, these lines struggle with uncertainty in process time, making production planning challenging. To solve this issue, the proposed solution is to use a Markov Decision Process (MDP) to model the uncertainty in process time, task assignment, and workers' movements dynamically. We formulated this line balancing problem as a Mixed-Integer Linear Programming model and solved it using a Benders decomposition algorithm. The approach demonstrates significant improvements over the traditional approach currently used in the automotive industry.

Exact Analysis of Two Workstation Lines with Parallel Deteriorating Machines.

Giannis Kechagias (Aristotle University of Thessaloniki), Alexandros Diamantidis (Aristotle University of Thessaloniki), Stelios Koukoumialos* (University of Thessaly)

This work considers a serial discrete-material production line with two parallel machine workstations, and an intermediate buffer. Each workstation consists of non identical unreliable parallel machines which deteriorate during their operation. Machines receive maintenance that improves its deterioration degree. The processing times, failure times, repair times, deterioration times and maintenance times of each parallel machine are assumed to be exponentially distributed with non-identical mean rates, and depend on the degree of deterioration. The system is modelled as continuous time, discrete state Markovian process. Various performance measures of the system, such as the throughput and the work-in-process are evaluated.

On the Optimality of Stepwise Policies

Melda Ormeci Matoglu* (University of New Hampshire), John H. Vande Vate (Georgia Institute of Technology)

We consider the problem of simultaneously managing capacity, inventory and backorders in a multi-mode production environment modeled via Brownian motion. The presence of more than two modes adds an additional level of complexity: not just when to change modes, but also which mode to change to. We identify two conditions under which, a stepwise policy that moves from one mode to the next faster or the next slower mode minimizes long-run average cost. Our constructive proof leads to a practical algorithm for finding an optimal policy. A numerical study demonstrates impact of offering additional modes and backordering.

Joint Pricing, Inventory, and Lead time Decisions in an ATO System

Erfan Asgari* (Excelia Business School), Simon Thevenin (IMT Atlantique), Mehrdad Mohammadi (IMT Atlantique)

This study investigates the optimal strategy of a manufacturer operating under an Assemble-To-Order system, where the market is sensitive to retail price, lead time, and collected price. The study includes a closed-loop supply chain, where the manufacturer collects used products to reuse components. The components' inventory replenishment time and products' demand are stochastic. The manufacturer determines the selling price, lead time, order size, and customer credit. We consider two scenarios: independent assembly cost and dependent assembly cost. An analytical method is used to solve the models, and findings indicate that increasing the return rate may not lead to increased profit.

48	Wednesday, 01:30 PM – 03:00 PM, Room 1 Track: Manufacturing Operations Session: Analytics and Advanced Technologies in Manufacturing Operations Chair: S. Ehsan Hashemi-Petroodi
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Deep Reinforcement Learning for Optimal Planning of Assembly Line Maintenance

Michael Geurtsen* (Eindhoven University of Technology), Ivo Adan (Eindhoven University of Technology), Zumbul Atan (Eindhoven University of Technology)

The impact of maintenance planning on production is typically underestimated, which is unfortunate as maintenance and production activities are deeply intertwined and a tremendous impact can be realised. Therefore, we study a novel problem where the goal is to find an optimal policy for planning maintenance that maximizes the average production rate of an assembly line. Maintenance decision-making is based on allowed flexibility, buffer contents and machine production states. A new Deep Reinforcement Learning (DRL) Algorithm for the long-term average reward setting is proposed. A case study with real-world production data shows that the DRL algorithm outperforms current factory practices.

A Learning-Based Multi-Agent Approach for Real-Time AGV and Machine Scheduling

Quang-Vinh Dang* (Eindhoven University of Technology), Jeroen Didden (Eindhoven University of Technology), Bilgenur Erdogan (Eindhoven University of Technology), Ivo Adan (Eindhoven University of Technology)

Customer profiles have rapidly changed toward high-mix, low-volume, high-complexity products. In addition, manufacturers explore smart factories alongside technological advancements facilitated by Industry 4.0. This research presents a learning-based approach for the real-time scheduling of automated guided vehicles (AGVs) and machines using a decentralized multi-agent system. AGV and machine agents are equipped with the intelligence to respond autonomously to their environment. The goal is to minimize the mean weighted tardiness of all jobs. The proposed approach is evaluated through its learning capabilities and attributes relevant to learning. Computational experiments also show the outperformance of the proposed approach over common dispatching rules.

Markov Decision Process for the Robust Balancing of Mixed-Model Assembly Lines

S. Ehsan Hashemi-Petroodi* (IMT Atlantique Nantes), Simon Thevenin (IMT Atlantique Nantes), Sergey Kovalev (INSEEC), Alexandre Dolgui (IMT Atlantique Nantes)

This study deals with a reconfigurable mixed-model assembly line where tasks can be dynamically assigned to stations at each takt, workers can move among stations at the end of each takt, and the order of entering product models is unknown. The dynamic task assignment and workers' movements are modeled as a Markov Decision Process (MDP) that can be translated as a Linear Program (LP). We propose some reduction rules and a decomposed transition process to reduce the model. The developed model considering stochastic parameters is built to solve the robust problem, with the objectives of total cost minimization in the worst takt. Computational experiments with benchmark instances demonstrate the performance of the proposed MDP model.

Manifestations of the Sustainable Development Goals in the Automobile Industry

Parisa Dolati Neghabadi* (ICN Business School), Sohrab Faramarzi Oghani (Rennes School of Business), Atieh Jafarian (Université Rennes), Ahmad Jafarian (Rennes School of Business - Linköping University)

Legislative policies and growing demand for an environment-friendly economy motivate the Automobile to move towards green production and adopt more sustainable actions. This research work presents a systematic review of annual reports of successful companies in the automotive industry to figure out their sustainable development's environmental and social measures. The aim is to analyze the actions taken by these companies critically and discuss their achievements against the Sustainable Development Goals, and finally provide insights into what could still be achieved in the future.

49	Wednesday, 01:30 PM – 03:00 PM, Room 2 Session: Supply Chain Social Sustainability and Modern Slavery Chair: Maryam Lotfi	Track: Sustainable Operations
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Tackling Modern Slavery in Supply Chains through B2N Collaborations

Vanja Strand* (Cardiff University), Maryam Lotfi (Cardiff University), Anthony Flynn (Cardiff University), Helen Walker (Cardiff University)

Although collaboration between businesses and NGOs (B2N) is common practice in tackling modern slavery in supply chains, no research to date has focused on this area. The aim of this research is to investigate the nature of B2N collaborations when working with prevention, detection, remedy, and response efforts of modern slavery in supply chains. A qualitative approach was taken through semi-structured interviews with NGO and business representatives working directly with the collaborative efforts with regards to modern slavery in supply chains. The research shed lights on theoretical framing, challenges, and benefits of this collaboration.

Operational Implications Arising from Increasing Non Financial Reporting Requirements

Rima Elsayed (Universite Catholique de l'Ouest, Nantes), Bruce Pinnington* (University of Liverpool)

Firms' operations and supply chain practices face increasing scrutiny as moves to improve corporate Environmental Social and Governance (ESG) accountability arise from myriad sources including France's Duty of Vigilance Act, 2017, the UK Modern Slavery Act, 2015, and EU Due Diligence and NFR directives. Ameliorating the dominance of financial objectives over ESG objectives is a recurrent problem that schemes such as B-Corp certification and the recent French PACTE law target. We examine French société à mission firms to assess the operational implications of ESG reporting requirements on practice and the challenges experienced by operations managers in protecting ESG objectives.

A Decision Framework Towards Circular Fashion Operations - Brazilian Empirical Evidence

Leticia Vidal Ozorio (Pontifical Catholic University of Rio de Janeiro), Maryele Vieira de Arruda Benites (Pontifical Catholic University of Rio de Janeiro), Roberta Valentim Martim dos Santos (Pontifical Catholic University of Rio de Janeiro), Rodrigo Goyannes Gusmão Caiado* (Pontifical Catholic University of Rio de Janeiro), Renan Silva Santos (Pontifical Catholic University of Rio de Janeiro), Daniel Luiz de Mattos Nascimento (University Of Barcelona)

The fashion industry's crucial role in the global market and economy makes the discussion over its transition to sustainability vital. Garments, usually designed and produced under a volatile context of consumer needs, lead to a production model that can harm the environment and society. This study proposes a decision support framework through a mixed-method approach combining a scoping review and a hybrid MCDM method applied in a real-world case study (a small fashion company). This approach leads to a circular model where fewer resources are wasted, the workload is minimized, remuneration maximized, and profits are still ensured.

Beyond Adaptation: Toward a New Paradigm for Sustainable Supply Chain Management

Adel Guitouni* (University of Victoria)

Scholars focus on sustainability and UN SDGs, yet conceptualizing sustainable supply chain management remains elusive in the context of current societal challenges such as climate change and inequality, and the advancements in data analytics and artificial intelligence. This study contributes a nested framework and foundational propositions for sustainable supply chain, arguing for a paradigm shift beyond “do no harm” and trade-offs. We establish that sustainable supply chains should contribute to economic progress, social well-being, and environmental integrity. We discuss implications for theory and practice of sustainable supply chain management.

How Franchised Business Model Is Challenging Modern Slavery Risk Management

Maryam Lotfi* (Cardiff Business School, Cardiff University, UK), Mireia Guix Navarrete (The University of Queensland)

Although franchise chains are committed to sustainability transitions, no research to date has focused on modern slavery in the case of franchising. The aim of this paper is to discuss how franchised business model is challenging modern slavery risk. A qualitative approach was taken to explore the research question of “How franchised Business Model is challenging modern slavery risk in the Hotel sector” through both secondary and primary data from hotel sector in the UK. We found that franchised business model is challenging modern slavery through franchisor potential lack of power, visibility and capacity and franchisee resistance to change.

50	Wednesday, 01:30 PM – 03:00 PM, Room 3 Session: Business Accounting and ESG Reporting Chair: Maria J. Alvarez-Gil Track: POM-Accounting/Finance Interface
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Supply Chain Relationship and Corporate Earnings Manipulation

Shih-Sian (Sherwin) Jhang* (National Sun Yat-sen University), Winston T. Lin (The State University of New York, University at Buffalo)

Using data from the database from Wharton Research Data Services and hand-collected data from 10-k that report firms and their major customers, we examine the relationship between supply chain relationship and corporate earnings manipulation. We focus on U.S. public firms for the years 1980-2021 and different regression models to conduct this empirical research.

Accounting for Healthcare Management; Lessons Learned from the Pandemic.

Nevine El-Tawy* (Brunel Business School), Mohamed Eltawy (Misr Bank)

This paper provides a review of the key themes arising from literature concerning the accounting for healthcare during the pandemic and post pandemic period. It reviews the studies written from 2019 until 2023 from the highly rated journal to show the role of accounting in controlling and disclosing the information that the clinicians use them in their decisions. This paper investigates the role of changes in accounting practices during the pandemic and those changes can affect organisational dynamics between hospital managers and clinicians (Carr & Beck, 2022). The paper has implications in terms of decision making and the information needed to be disclosed. It also shows the role of accounting and the management accounting techniques as evidences of success in decision making in healthcare operations management

Adapting ESG “Commercial” Proposals to the Needs of Small Companies

Maria J. Alvarez-Gil* (Universidad Carlos III de Madrid), Clara Herranz (Universidad Carlos III de Madrid)

ESG reporting is getting a lot of attention today. Small size manufacturing companies are not “little big companies” and they are compelled to design ad-hoc methodologies and instruments. We bring into the fore the case of a small European company that will have to comply with the new CSRD directive and apply the ESRS standards: its investors identify ESG as a necessary business strategy. This company is interested in using adequate and accurate data to back up ESG and sustainability commitments, it is not interested at all in being accused of greenwashing. We follow the Action Research Methodology.

The Impact of Increasing Entry Fee on Emergency Department Demand

Hyun Seok Lee* (Korea University Business School), Eric Park (University of Hong Kong), Timothy H. Rainer (University of Hong Kong)

Emergency department (ED) overcrowding is a global health problem. In hopes of reducing patient traffic to mitigate ED overcrowding, several countries have heightened the financial burden for access to ED care by increasing ED entry fee. We perform a territory-wide study of the universal public health system of Hong Kong SAR and empirically investigate the impact of the June 2017 ED entry fee increase from HK\$100 (US\$13) to HK\$180 (US\$23) on the ED patients' visit behavior and the underlying mechanisms. The study data covers all patient visits from 2014 to 2019 at the 18 public Eds.

51	Wednesday, 01:30 PM – 03:00 PM, Room 4 Session: Organizational Behavior and Information Sharing in Operations Chair: Guillaume Roels	Track: Behavioral Operations
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Too Many Meetings? Scheduling Rules for Team Coordination

Guillaume Roels* (INSEAD), Charles Corbett (UCLA Anderson)

Workers in knowledge-intensive industries often complain of having too many meetings, but organizations still give little thought to deciding when or how often to meet. We investigate the efficiency and robustness of various coordination scheduling rules. Using a stylized game-theoretic model, we formalize the tension between meeting (coordinating) and producing, and indicate how to adapt team coordination scheduling rules to the degree of worker heterogeneity and team size.

The Impact of Teleworking on the Professional Services Industry

Kalliopi Michalakopoulou* (University of Huddersfield), Alexandros Nikitas (University of Huddersfield)

Professional service firms (PSFs) due to their human capital intensity and customer interface have been affected by Covid-19. Innovation adoption in the form of alternative working patterns is a source of competitive advantage for PSFs that promotes employees' creativity, productivity and efficiency and thus can be a response to the pandemic-induced disruption. This paper explores through a systematic literature review the impact of teleworking on PSFs. We specifically generate a thematic map of challenges and opportunities underpinning teleworking in PSFs. Preliminary results show that teleworking causes technostress and poor work-life balance, but also provides higher autonomy and organisational freedom.

The Lean Sensei: A Pedagogical Approach to Business Improvement

Daryl Powell* (University of South-Eastern Norway)

Lean is a system to gain competitiveness by continuously developing people. It is more accurately described as an education system rather than a production system. Ultimately about creating a learning organization, a key character in any successful lean transformation is that of the sensei. This paper combines pedagogical theory with practical insights from multiple case studies to explain and highlight the importance of executives engaging with so-called lean sensei for successful lean transformation. We also draw upon problem-based learning to codify the scholarship of sensei-ing as an approach to educate managers and associates to become self-directed, independent, life-long learners.

Information-Sharing and Adapting Coordination Structures of Intra-Organisational Supply Chains

Yvonne Lont* (Delft University of Technology), Jan Kwakkel (Delft University of Technology), Tina Comes (Delft University of Technology)

Information-sharing is vital for supply chain coordination. We use an observational study within a series of military training to study information-sharing mechanisms (sharing behaviour, process and tools as well as informational use) and analyse how they impact the adaptation of coordination structures of intra-organisational supply chains over time. Our results show the importance of individual leadership and behaviour over and beyond processes.

Managing Cross-Departmental Knowledge Flows to Accelerate Learning in a High-Tech Firm

Massimo Manca* (Eindhoven University of Technology), Alex Alblas (Eindhoven University of Technology), Fred Langerak (Eindhoven University of Technology)

Although several studies found knowledge transfer between operational units to be effective in accelerating learning curves, the question of which mechanisms improve knowledge transfer between departments the most remains to be answered. Using a rich dataset involving information on operational experience and communication between departments in the context of a company in the semiconductor industry, we examine the role of direct and indirect knowledge flows between departments on knowledge transfer. The study contributes by shedding light on the most effective knowledge flows (e.g., emails, meetings, documents, work instructions, etc.) to accelerate the learning curves of machine availability and manufacturing cycle time.

52	Wednesday, 01:30 PM – 03:00 PM, Room 5 Session: Inventory Decisions for Expensive, Low-Demand Items Chair: Geert-Jan van Houtum	Track: Supply Chain Management
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Design of Unreliable Flow Lines with Buffers and Spare Parts

Florian E. Sachs* (University of Cologne), Gudrun P. Kiesmüller (Technical University of Munich), Stefan Helber (Leibniz University Hannover)

The buffer allocation problem is a fundamental optimization problem if flow line planners need to cope with stochastic influences. Additionally, practitioners include spare part planning for manufacturing systems to increase the machine's availability directly. Hence, we tackle this crucial question and are the first to present a joint optimization of buffer capacities and spare part stocks for flow lines of arbitrary length. Among others, we find that spare parts tend to be more effective when arranged at or near the center of a flow line, as it is already known for buffers.

Dealing with Uncertainty in Repair Contracts for Spare Parts

Simon Voorberg* (NEOMA-BS), Willem Van Jaarsveld (TU/e), Rik Eshuis (TU/e), Geert-Jan Van Houtum (TU/e)

Decision-making processes are becoming increasingly complex due to the exponential increase of information availability in this era. This paper addresses the need for a decision-support solution in complex decision-making processes with throughput time constraints. We formulate a solution method that uses deep reinforcement learning to find a policy for such a decision-making process. We adapt and then apply this method to a specific problem of making a quotation for a repair contract of spare parts with deadlines. The method is compared to a heuristic and shown to perform close to optimal for small size quotation problems.

Selective Use of Advance Demand Information in Inventory Systems

Engin Topan* (University of Twente), Tarkan Tan (University of Zurich), Geert-Jan Van Houtum (Eindhoven University of Technology)

Inspired by a real-life spare part application, we consider an inventory system where collecting imperfect advance demand information (ADI) is possible. However, using the collected imperfect ADI requires an additional monitoring cost per period. The objective is to select items to be monitored and find the optimal inventory policy that minimizes the total inventory holding, regular and emergency replenishment, and return costs. We characterize the optimal inventory policy, and the selection policy. Using our analytical results, we develop heuristics, each using only demand signals, pipeline information, and no information. Using our heuristics, we develop insights about using partial information.

Substitution or Emergency Order? Averting O-Negative Blood Shortages

Geert-Jan Van Houtum* (Eindhoven University of Technology), Zahra Hosseinfard (University of Melbourne), Mostafa Khatami (Queensland University of Technology), Babak Abbasi (RMIT University)

In many countries, there is a severe over-usage of O-negative blood in hospitals. O-negative units are too often taken as the substitute product when a demand for another blood type cannot be satisfied from stock (because everyone can receive it). For the demand fulfilment at a hospital, we formulate a finite-horizon stochastic optimization problem that is applied in a rolling-horizon approach. This problem is solved by sample-average approximation and distributionally robust optimization. The new methods are compared to the currently used method in the Australian blood transfusion practice. The new methods clearly outperform the current method.

ES	Wednesday, 01:30 PM – 03:00 PM, Room 6 Track: Disruptive Technology & Operations Management Session: Blockchain and Operations Management (I) Chair: Maher Agi
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Blockchain Technology and Operations Management: A Systematic Literature Review

Jing Dai* (University of Nottingham Ningbo China)

The main purpose of this study is to improve the understanding and comprehension of blockchain technology in the operations and supply chain management (OSCM) field by presenting a systematic literature review. Due to the infancy of mass blockchain implementation and the scatter of empirical evidence, there lacks a comprehensive and unified framework that can depict the integration process between blockchain technology and OSCM. In this regard, we summarize and consolidate the previous findings and accordingly establish a concrete development roadmap for blockchain-enabled OSCM for researchers and practitioners. Gaps and opportunities for future research are further identified.

Blockchain Adoption Considerations of a Global Manufacturer

Efstathios Papanikolaou* (Technical University of Crete), Jannis Angelis (KTH Royal Institute of Technology), Vassilis Moustakis (Technical University of Crete)

Distributed Ledger Technology (DLT), such as blockchains, promotes new way that organizations interact and create value through enhanced transparency and visibility across supply chains. Trust, as the key DLT adoption driver, is only one variable that forms organization's business context. This study, based on qualitative inductive research through a carefully selected case study, explores the DLT adoption causations under a manufacturing supply chain context answering the research question of "What conditions make DLT adoption a feasible option?". The main contribution of this paper is the identification of the factors that affect and either support or prohibit in-house supply chain DLT adoption.

Blockchain Investments in a Supply Chain with Downstream Entry

Guanmei Liu* (Nanjing Audit University), Xiaofeng Shao (Shanghai Jiao Tong University), Yunning Zhao (Central South University), Shenghai Zhou (Central South University)

We examine the impact of downstream entry on blockchain technology investments in a supply chain including an incumbent manufacturer, an entrant manufacturer and a supplier. We show the entry may motivate the incumbent manufacturer to take aggressive strategy on blockchain technology investments. Furthermore, the entry may trigger off a 'win-win-win' outcome for all firms in both permissioned and non-permissioned scenarios. Finally, if the products cross-transparency sensitivity is small or it is large while the using cost of blockchain technology with a low investment cost is high, the incumbent manufacturer should establish a non-permissioned blockchain platform, and otherwise a permissioned one.

Blockchain Adoption and Its Impacts on Inventory-Pricing Management

Aichih Jasmine Chang (New Jersey Institute of Technology), Jim Shi* (New Jersey Institute of Technology), Michael Katehakis (Rutgers Business School), Benjamin Melamed (Rutgers Business School)

Blockchain has been embraced as a disruptive technology, but very little research examines its impact and adoption issues from the Supply Chain optimization perspective. This paper investigates the impact of blockchain technology (BCT) on Supply Chain Management (SCM) and studies the fundamentally inherent adoption issues. We first show that the deployment of BCT can assist firms in reducing order quantities, lowering selling prices and reducing target-inventory levels. It is also shown that volatility of either supply or demand lowers the expected profit. The analysis is robust with some major extensions, such as lost sales of demand and random capacity.

Strategies for Offering Vertically Differentiated Products on Blockchain Platforms

Maher Agi* (Rennes School of Business), Erfan Asgari (Excelia)

A model based on consumer utility and self-selection (Moorthy, 1984) is proposed for studying the strategic choice of using blockchain and the pricing decisions by a firm that offers two vertically differentiated versions of the same product. Various scenarios involving the two vertically differentiated products, blockchain use options and pricing decisions are studied using mathematical modeling. Preliminary results show that using blockchain impacts consumers targeting strategy with the two products and may not always be profitable for the firm.

5A	Wednesday, 01:30 PM – 03:00 PM, Room 7 Session: Impact of Governmental Policies on Supply Chain Chair: Nader Azad	Track: Sustainable Operations
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Impact of Taxes on the Adoption of Green Technologies

Gal Raz* (Ivey Business School, Western University), Paolo Letizia (University of Tennessee), Wangcheng Yan (Tongji University)

In this paper we examine government emissions taxes on consumers and firms and show how these taxes impact the behavior of manufacturers in adopting a clean technology in a competitive market with two competing firms. We analyze the government choice of taxing either firms and consumers and show that while taxing consumers might be simpler, taxing firms can sometimes bring more benefits to the environment and society. However, when the tax rates become too high, taxing firms can result in the opposite affect reducing environmental innovation in the market.

Two-Sided Subsidies for Complementary Products: The Case of Electric Vehicles

Runyu Tang* (Xi'an Jiaotong University), Saed Alizamir (Yale University), Michael Blair (Yale University)

Electric Vehicles (EVs) are touted as the future of urban transportation and a solution to climate change. Despite their benefits, EV adoption has not met the expectations globally, primarily due to high prices and "range anxiety" created by inadequate charging infrastructure. To overcome these obstacles, many governments have introduced financial incentive policies, ranging from directly supporting EV purchasers to hybrid policies that subsidize both buyers and station developers. We analyze a government's problem of designing subsidy policies for EVs and investigate the benefits of implementing a hybrid policy and characterize the optimal subsidy mechanism.

A Distribution Model of Subsidy and Tax: Social Welfare Perspective

Shadi Goodarzi* (California State University), Mohammad Amini (University of Florida)

Different regulations such as taxes or subsidies are enacted to restrict fossil fuel consumption and promote renewable energy and green products. However, designing optimal policies that increase social welfare, promote renewable energy consumption and green product purchase is a great challenge. Using game theory, this study aims to provide an appropriate tax and subsidy distribution model to maximize social welfare while incentivizes manufacturing of green product and controls emissions. Extensive comparative statics and experimental data analysis using real data from the automotive industry in the U.S. from 2009-2019 have been performed to generate important managerial and policy implications.

Government Policies to Incentivize Citizen Preparedness for Supply Disruptions

Xiaoyan Zhao (City University of Hong Kong), Venus Lo* (City University of Hong Kong), Stephen Shum (City University of Hong Kong)

The public can suffer from significant loss due to inadequate preparation ahead of supply disruptions due to emergencies. Governments can minimize impact of disruptions by encouraging the public to store supply at home as part of emergency preparation. We study a government's problem of incentivizing emergency preparation via financial incentives: either by subsidizing production of spare supplies during regular times or reducing citizens' cost of purchasing necessities in advance. These incentives are effective under different circumstances. We present an approximation algorithm to find a hybrid policy which combines both incentives and has lower social loss significantly than a single policy.

Investigating the Role of Government Incentives in Environmental Transparency of Corporations

Nader Azad* (Ontario Tech University)

Multiple studies have shown that the government could help corporations improve sustainability through transparency development. The government can offer subsidy/taxes to incentivize corporations for transparency development and penalize for unaccountability. Given the significance of transparency, this research will investigate three important questions. First, which types of government subsidies and controlling mechanism would motivate the corporations to become more transparent? Second, how much environmental disclosure, and which part of environmental information should be declared by corporations in their reports? Third, what is the impact of each investigated subsidy/taxes on the policies such as sustainability development, social welfare and maximal financial efficiency?

55	Wednesday, 01:30 PM – 03:00 PM, Room 8 Session: Application of Analytics in Retail & Revenue Management Chair: Hiroki Sano
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Track: POM-Marketing Interface

The Impact of Retailers' Loyalty Programs in a Supply Chain Context

Amirhossein Bazargan (Fairleigh Dickinson University), Salma Karray* (Ontario Tech University)

We study retailers' loyalty programs (LPs) in a supply chain where a manufacturer sells through competing retailers. First, we develop a game-theoretic model using a multinomial logit choice model where consumers' utility depends on the LP rewards. Then, applying an iterative algorithm, we solve different games for the equilibrium prices and LP policies. We find that LPs can inflate prices at both levels of the supply chain and show the benefit of profit-sharing when retailers do not benefit from LPs. Finally, retailers should only offer LPs when consumers either have a low discount rate or/and value rewards highly.

Price Consistency in Multi-Channel Retailing with Consumers' Fairness Concern

Xiameng Guo* (The Hong Kong Polytechnic University), Yumeng Li (Shanghai University of Finance and Economics), Guang Xiao (The Hong Kong Polytechnic University), Wenxin Xu (University of South Carolina)

The rise of multi-channel retailing brings challenges to retailers in determining the selling prices for the same product sold through different channels. We propose a game-theoretic model to investigate a multi-channel retailer's optimal pricing strategy in the presence of fairness-concerned consumers who will incur disutility if the channel they buy from charges a higher retail price than the other channel. Among other results, we find that the retailer should maintain consistent price across both online and offline channels only when the fraction of fairness-concerned consumers is in an intermediate range, and otherwise charging inconsistent channel prices is more profitable.

Green Versus Non-Green Products under Government Regulations and Cost-Sharing

Manish Kumar* (IIM Indore), Nagarajan Krishnamurthy (IIM Indore)

Green products are becoming increasingly popular with consumer awareness and government regulations. This study adds to the growing literature on the competition between substitutable green and non-green products by examining this competition under government subsidy, carbon tax and cost sharing of green sales efforts. The study models this as a Stackelberg game between a manufacturer and a retailer, and analyzes different cases based on whether cost sharing, government subsidy and carbon tax are there or not. The findings can be used by policymakers and players in taking decisions to promote green products.

Cardinality-Constrained Continuous Knapsack Problem with Concave Piecewise-Linear Utilities

Carlos Cardonha* (University of Connecticut), Miao Bai (University of Connecticut)

We study an extension of the cardinality-constrained knapsack problem where each item has a concave piecewise-linear utility structure. For the offline version of the problem, we present a fully polynomial-time approximation scheme and show that it can be cast as the maximization of a submodular function with cardinality constraints; the latter result allows us to derive a greedy $(1 - 1/e)$ -approximation algorithm. For the online problem in the random order model, we present a 6.027-competitive algorithm. Finally, we investigate the empirical performance of the greedy and online algorithms in numerical experiments.

Who Should Invest in Logistics Infrastructure for Home Delivery?

Hiroki Sano* (Ritsumeikan University), Kaede Sano (Wakayama University)

A brick-and-mortar retailer's online retailing service can be developed led by either the retailer or a supplier. To examine which case is more preferable for each player, consumers, and the service system, we consider a supply chain in which a retailer sells products to consumers either at its physical store or via its online retailing service. In this supply chain, either the retailer or the supplier can invest in the logistics infrastructure to improve the service quality. Based on a microeconomic analysis, we discuss the relationship between the initiative in development of the home-delivery service and the system efficiency.

95	Wednesday, 01:30 PM – 03:00 PM, Room 9 Session: Supply Chain Financing Chair: Vlad Babich	Track: POM-Finance Interface
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A Neo-Configurational Approach to Financing Cash-Strapped Suppliers in Supply Networks

Calvin Klein* (University St.Gallen)

Deep-tier supply chain financing (DTF) has been identified as a compelling solution for supporting the growth and development of small and cash-strapped suppliers, particularly in developing economies. However, from the perspective of initiating corporates, the implementation remains a complex task since no consideration of the supply networks has been studied to date. We employ a neo-configurational approach through qualitative comparative analysis of multiple case studies to identify necessary and/or sufficient conditions for effective DTF implementation. Our research provides new insights into the implications of supply networks for DTF and could guide practitioners to establish best practices for DTF application.

Facilitating Supply Chain Resilience with Buyer Intermediation in Supplier Financing

Sairam Sriraman (Technical University of), David Wuttke* (Technical University of Munich), Andreas Gernert (Kühne Logistics University), Volodymyr Babich (Georgetown University)

We examine tradeoffs that arise at the interface of investing in resilience and financing decisions in imperfect markets. Using game theory, we study the financial arrangement of buyer intermediation in supplier financing (BIF), where a buyer formally guarantees its supplier's debt repayment. We characterize when BIF leads to more resilience. To that end, we identify various effects, including operational resilience, credit rationing, and survival. We further discuss their interaction. Interestingly, BIF does not guarantee a resilience increase. And so we also characterize when BIF reduces operational resilience effort and when it still might be optimal for buyers to offer BIF.

How Platform's Private Label Strategy Interacts with Seller's Financing Choices

Sambit Brata Rath (XLRI - Xavier School of Management), Prasenjit Mandal* (NEOMA Business School), Preetam Basu (Kent Business School)

In addition to traditional banks, online platforms such as Amazon and Alibaba often provide working capital loans to capital-constrained sellers who may face supply risk. Conversely, platforms have started introducing private labels (PLs) to fulfil customer demand. We study how the platform's private label strategy interacts with sellers' strategic financing choices: platform financing (PCF) vs bank financing (BCF). We find that if the quality of PL is high, and the referral fee is low (high), the platform should introduce the private label, and the manufacturer should prefer BCF (PCF). With high supply risk, the platform may introduce a low-quality PL.

Economics of Multi-Tier Supply Chain Financing

Vlad Babich* (McDonough School of Business)

We compare immediate-tier with remote-tier supply chain financing. While immediate-tier SCF has been popular for decades, applications to multi-tier financing arose with the development in Blockchain technology. We solve for equilibrium among multiple firms in a supply chain and their investors, in the model with moral hazard, stochastic collateral assets, and dynamic forecasts of those assets. Interestingly, Blockchain enabled, remote-tier financing does not emerge as the dominant choice even if the immediate and remote-tier buyers are identical in all operational and financial characteristics. We identify two reasons: risk spillover from downstream tiers to upstream ones and accumulation of noise in the forecast. We provide conditions for the remote-tier financing to be preferred, compare preferences of individual firms and the supply chain, and discuss how this affects Blockchain adoption. We determine the economic boundary on the number of tiers in a supply chain financing solution.

57	Wednesday, 03:20 PM – 04:50 PM, Room 1 Session: Emerging Logistics Models Chair: Nasrin Mohabbati - Mohammad Moshref-Javadi	Track: Supply Chain Management
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Policy Regulations in E-Hailing Taxi Sharing Platforms: A Game-Theoretic Perspective

Rahul Marathe* (Indian Institute of Technology Madras), Srivatsa Srinivas S (Indian Institute of Technology Jodhpur), Swaminathan Rammohan (Indian Institute of Technology Madras)

The demand for platform taxis is not homogeneously distributed with certain zones facing high demand and the remaining zones facing low demand. We consider a game between the government and the platform, where the government first decides on the tax to be levied for serving high-demand zones and the incentive to be provided for serving low-demand zones. There is evidence of similar governmental policies for road-hailing taxis, but the interests of the platform needs to be considered. We find policy interventions that may be beneficial to the platform as well as the customers from the low demand zones.

A Multi-Objective Optimization Model for Circular Supply Chain: Case of Tire Industry

Ali Nazarinia* (Kedge Business School), Amir Pirayesh (Kedge Business School), Olivier Dupouet (Kedge Business School), Maider Saint-Jean (University of Bordeaux), Mostafa Zandieh (Shahid Beheshti University)

Strategic interactions between Supply Chain firms can have a significant impact on the Circular Economy (CE) transition and its economic and environmental implications. This research integrated CE into Supply Chain Management by proposing a Bi-Objective Mixed Integer Linear Programming Model with a focus on vertical strategic interaction deriving from ecologic investments. This model has been adapted to the tire industry as the test application field considering its environmental importance. Augmented ϵ -constraint is adopted to solve the problem and generate Pareto optimal solutions. The insights are designed for practitioners in this sector, but they are also applicable to analogous contexts.

Port Logistics Coordination to Reduce Emission Using Machine Learning

Maurício Randolfo Flores da Silva* (Federal University of Santa Catarina), Enzo Morosini Frazzon (Federal University of Santa Catarina), Júlia Cristina Bremen (Federal University of Santa Catarina)

Port terminals located in urban areas are dealing with the challenging scenario of truck congestion, long waiting time and, consequently, a significant amount of CO₂ emission by trucks during this waiting time. Thus, in the context of smart technologies, the main objective of this research is to develop a flexible Truck Appointment System using Machine Learning algorithm to predict and coordinate the truck arrivals, reducing the waiting time that causes congestion and pollution emission at the port area. Comparing three different scenarios with simulation of a real use case, we achieved a reduction of about 90% in the CO₂ emission.

Integrated Inland Port Solution for Sustainable Developments of Southern California

Nasrin Mohabbati* (California State University San Bernardino)

The Ports of Los Angeles and Long Beach are the busiest cargo ports in the United States, handling over 40% of the nation's containerized trade. However, their operation causes significant environmental and social problems, including air and water pollution, traffic congestion, and negative impacts on nearby communities. This study proposes an integrated inland port solution to mitigate these problems by reducing truck traffic and emissions, improving supply chain efficiency, and creating new economic opportunities in Southern California. Such a solution also contributes to achieving the UN Sustainable Development Goals, including sustainable economic growth and building sustainable cities and communities.

Micro-Fulfilment Centre-Based Sustainable E-Grocery Business Models

Banu Y. Ekan (Cranfield University), Sara Perotti* (Politecnico di Milano), Alessandro Ventola (Politecnico di Milano), Mirko Tinor (Politecnico di Milano)

In the context of rising e-grocery sales and ever-demanding customer expectations, Micro-Fulfilment Centres (MFCs) have appeared as small and highly automated logistics hubs allowing orders to be picked and packed in a local facility located close to the end customer, thus reducing delivery times. Despite their recent boost and the mounting interest among practitioners, works on MFCs are still scarce. This paper aims at addressing this gap and proposes MFC-based business models developed on weighted k-Means algorithm by taking into consideration the environmental effect of last-mile delivery. Multiple scenarios are discussed and compared to identify the optimal configuration model.

85	Wednesday, 03:20 PM – 04:50 PM, Room 2 Session: Energy Transition and Renewable Energy Chair: Rodrigo Goyannes Gusmão Caiado	Track: Sustainable Operations
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Urban Mining, Scarcity and the Energy Transition

Clara Carrera* (INSEAD), Serasu Duran (Haskayne School of Business), Atalay Atasü (INSEAD), Luk Van Wassenhove (INSEAD)

Clean energy technologies require large amounts of critical metals, whose demand is skyrocketing due to the shift towards renewable energy. The scarcity of critical materials may prevent governments from reaching their ambitious clean energy targets and jeopardize the profitability of producers. Inspired by this challenge, we model a supply chain and investigate two mechanisms that can address the impact of scarcity on the renewable energy transition momentum: improving the material efficiency and recovering materials from waste through urban mining. We then elaborate policy recommendations to overcome the incentive misalignment between clean energy producers and policymakers regarding the optimal strategy.

Energy Transition: Hydrogen Supply Chain and the Sustainable Development Goals

Flavio Pinheiro Martins (University College London), Sofia De-León Almaraz* (Corvinus University of Budapest), Amilton Barbosa Botelho Junior (University of São Paulo), Catherine Azzaro-Pantel (Université Toulouse), Priti Parikh (University College London)

The aim of this research was to investigate connections between the development of hydrogen supply chain technologies and the 169 targets of the 2030 Agenda. A mapping methodology was used to identify linkages through a systematic literature review and specialist evaluation around the economic, environmental, and social dimensions. Most of the connections represent opportunities and calls for action from different stakeholders. SDGs 1, 7, 12 and 13, are some of the main SDGs connected to the hydrogen economy. An analysis around the hydrogen “colour” highlights the need for holistic interventions in energy policy combined with improved information and R&D efforts.

Arbitrage Opportunities for Renewable Energy Sources Using Battery Storage Systems.

Ashish Singh Bhandari* (Indian Institute of Management Bangalore), Amar Sapra (Indian Institute of Management Bangalore)

Battery energy storage system (BESS) helps Renewable energy sources (RES) manage intermittent energy generation and capture higher revenues. We investigate the optimal BESS usage when RES participates in the electricity market and faces real-time balancing costs. We model the RES's decisions on bids in the day-ahead market and real-time BESS charge/discharge as a finite horizon dynamic program. We find that RES would act as both arbitrage seeker and balancer. Further, the actions of RES are affected by real-time balancing penalties.

Public Utility Obstacles and Productivity Growth: The Moderating Effect of National Culture

Huan He* (Tianjin University - University of Birmingham), Shenyang Jiang (Tongji University), Xiaowei Liu (Zhejiang University)

High-quality public utilities are essential for sustainable operations. However, firms around the world are facing public utility obstacles, leading to operational challenges. We investigated how two important public utility obstacles, namely, power outages and transportation obstacles, influence firms' productivity growth. We further examined how the relationships between public utility obstacles and firms' productivity growth are moderated by national culture (i.e., power distance, uncertainty avoidance, long-term orientation, and individualism). We conducted an empirical analysis of a multi-country dataset from the World Bank Enterprises Survey.

A Machine Learning Approach to Identify Sustainability Patterns Among Countries

Rodrigo Goyannes Gusmão Caiado* (Pontifical Catholic University of Rio de Janeiro), Renan Silva Santos (Pontifical Catholic University of Rio de Janeiro), Mozart Caetano Heymann (Federal Fluminense University), Felipe Santos Dutra (Pontifical Catholic University of Rio de Janeiro), Antonio Márcio Tavares Thomé (Pontifical Catholic University of Rio de Janeiro)

In this study, 180 countries are scrutinized regarding sustainable energy consumption and economic development by using an artificial intelligence approach by combining fuzzy logic and machine learning (ML) - fuzzy clustering - to group these countries. Data regarding renewable energy consumption, CO2 emissions and GDP per capita are used. The fuzzy-based machine learning technique employed leads to four clusters, with developed and developing countries mostly aggregating in the same clusters respectively and emerging economies being distributed among two different sets, according to the energy consumption and CO2 emissions. These results can be practical for benchmarking with other sustainability indicators.

59	Wednesday, 03:20 PM – 04:50 PM, Room 3 Session: Inventory Control and Management Chair: Stefan Minner	Track: Supply Chain Management
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Integrated Inventory and Workload Control

Ruud Teunter* (Groningen University), Arno Kasper (Groningen University), Martin Land (Groningen University)

In customized production systems, materials must be allocated to individualized orders before they can be released to the shop floor. Thus, it is surprising that material inventory control and shop floor capacity / workload control have been studied in isolation for over 40 years – under the presumption of a hierarchical control design. Motivated also by developments in Industry 4.0, making real-time system information sharing and global system control more realistic, we propose an integrated production control design. Our numerical results indicate a drastic cost savings of 27% to 80% for a variety of settings.

BOPS: Optimal Store Inventory Control Policy under Batch Ordering

Kushal Saha* (XLRI - Xavier School of Management), Subir Bhattacharya (Indian Institute of Management Calcutta)

‘Buy online and pick up in-store’ (BOPS) is a popular omnichannel service allowing a customer to buy a product online but pick it up from the physical store at her convenience. This paper considers a two-echelon dual-channel supply chain model serving both BOPS and direct walk-in customers. It complicates the store’s inventory control policy as units waiting to be picked up by BOPS customers block store inventory space delaying inventory replenishments. We discuss an approach to determine the inventory control policy – both base-stock level and batch ordering quantity – optimal for the store to cater to both BOPS and walk-in demands.

eps-Optimal Policies for the Joint Replenishment Problem

Danny Segev* (Tel-Aviv University)

The main contribution of this paper resides in developing a new algorithmic approach for addressing the continuous-time joint replenishment problem, termed Ψ -pairwise alignment. The latter mechanism, through which we synchronize multiple Economic Order Quantity models, allows us to devise a purely-combinatorial algorithm for efficiently approximating optimal policies within any degree of accuracy. As a result, our work constitutes the first quantitative improvement over power-of-2 policies, which have been state-of-the-art in this context since the mid-80's. Moreover, in light of recent intractability results, by proposing an efficient polynomial-time approximation scheme (EPTAS) for the joint replenishment problem, we resolve the long-standing open question regarding the computational complexity of this classical setting.

Event-level Newsvendor Problem

Huihui Chi* (emlyon), Chenlin Gu (Tsinghua University), Wei Zhou (ESCP Business School), Selwyn Piramuthu (University of Florida)

In the classical single-period newsvendor problem, the length of period is predetermined. Retailers decide the order quantity in the beginning and discard the remaining inventory in the end. Within the period, some customers are quality-sensitive if quality change perception influences their buying decisions. Therefore, retailers adjust the price over time. However, in the literature, the time to promote is remaining to be solved. In this paper, we study the quality-sensitive demand and derive the time-specific marginal profit function. We observe that there is an optimal timing to reduce price or end the selling period than expected.

Data-Driven Safety Stock Placement in Multi-Echelon Networks

Stefan Minner* (TU Munich), Josef Svoboda (TU Munich)

Strategic placement and sizing of safety stock under demand uncertainty pose a challenging, nonlinear stochastic optimization problem. Solution approaches often require distributional assumptions and parameter estimation. We build on recent advances in data-driven inventory optimization to propose a novel approach based on the guaranteed service model and use a nonparametric approach based on historical demand and feature data. The optimization problem is formulated as a mixed-integer linear program and solved with mathematical programming solvers and Benders decomposition. We show that the approach is scalable by solving the large-scale supply chain networks for 38 real-world industry supply chains.

60	Wednesday, 03:20 PM – 04:50 PM, Room 4 Session: Consumer Behavior and Market Dynamics in Operations Chair: Arnd Huchzermeier	Track: Behavioral Operations
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How COVID-19 Changed Consumers' Shopping Habits

Mohammad Moshref-Javadi* (University of Illinois-Urbana Champaign)

Due to several reasons, such as a surge in demand for many essential items, long delivery delays, stay-at-home orders, and other reasons, many consumers changed their preferred way of shopping. In this research, we study the effect of COVID-19 on consumers' shopping habits to understand how shoppers' preferences changed during and after the pandemic compared to the before-pandemic period. We study whether shopping channels and time have changed as well as the reasons for these changes. The data is collected using a questionnaire distributed to more than 1000 shoppers in the United States.

Drive-through Is the Preferred Mode Post-COVID in Fast-Food Retailers

Partha Sarathi Mishra* (Northwestern University), Sunil Chopra (Northwestern University), Yannis Stamatopoulos (The University of Texas at Austin)

Comparing the foot-traffic data of fast-food customers before and after the COVID-19 pandemic, we empirically show that there are signs of a permanent shift in customer preference from stores without a drive-through option to stores with one. Both of these kinds of stores offer home delivery, curb-side and in-store pickup options. We show that this shift in preference for drive-through is consistent across several popular fast-food chains across the US. Our finding is particularly instructive to retailers, as it indicates investment into drive-through, and not curbside, is the right direction in the future.

Modelling Consumer Behaviour in Consumer Product and Packaging Returns

Lavanya Meherishi* (Rotterdam School of Management, Erasmus University), Sushmita Narayana Aghalaya (National Institute of Industrial Engineering Mumbai)

Consumer product and packaging returns are typically assumed to be a factor that is dependent on the product demand, although studies depict that this is dependent on a variety of factors that include consumer behaviours and regulations. Using an analytical model, this study aims to demonstrate the role of consumer behaviours on a variety of product and packaging disposition attributes and its potential impact on supply chain payoffs.

Competition in Grocery Home Deliveries: Experimental Evidence and Environmental Implications

Afshin Mansouri* (Brunel University London), Emel Aktas (Cranfield University United Kingdom)

E-commerce has provided new business opportunities to retailers and offered convenience to consumers. This trend, however, has brought about environmental implications. We provide preliminary results to show the attrition dynamics of competition in grocery home deliveries as a driver of extra emissions through lab experiments on the oTree platform. We then approximate the amount of emissions attributable to competition as a function of the number of competing retailers. Using data from two retailers in UK and Sweden, we estimate the scale of extra emissions because of competition between e-retailers and highlight the need for policy interventions to regulate online retailing.

Behavioral Simulation of Blockchain-Enabled Market for Capacity Trading among Retailers

Arnd Huchzermeier* (WHU), Volodymyr Babich (Georgetown University), Daniel Hellwig (WHU), Kai Wendt (WHU)

We study a supply chain distribution system (comprising a supplier and multiple retailers) and investigate experimentally how the trading by retailers of digital claims (tokens) on the supplier's capacity can reduce supply-demand mismatches. We conduct six behavioral experiments (featuring two wholesale prices and three market sizes) and find that: 1) the supply chain benefits from markets, and larger markets are better than smaller ones; 2) retailers always prefer having the option to trade; but 3) suppliers in experiments involving a low wholesale price earn lower profits with markets. We observe reinforcing ordering and trading strategies: spot sellers and spot buyers.

61	Wednesday, 03:20 PM – 04:50 PM, Room 5 Session: Large-Scale Multi-Echelon Inventory Systems Chair: Geert-Jan van Houtum
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Track: Supply Chain Management

Optimization of Inventory and Capacity in Large-Scale Assembly Systems Using Extreme-Value Theory

Mirjam Meijer* (Kühne Logistics University), Dennis Schol (Eindhoven University of Technology), Willem Van Jaarsveld (Eindhoven University of Technology), Maria Vlasίου (University of Twente/Eindhoven University of Technology), Bert Zwart (CWI/ Eindhoven)

High-tech systems are produced in two stages: production of components and system assembly. Component production capacity is subject to fluctuations, causing high risk of shortages of at least one component, resulting in costly delays. Companies hedge this risk by strategic investments in excess production capacity and in buffer inventories of components. To optimize these, it is crucial to characterize the relation between component shortage risk and capacity and inventory investments. We apply extreme value theory to gain analytic insights into this optimization problem and obtain asymptotically exact methods and show that these methods typically work well outside the asymptotic regime.

Multi-Echelon Inventory Control with Hybrid Shipment Consolidation

Filip Malmberg (Lund University), Jana Ralfs* (Technical University of Munich), Johan Marklund (Lund University), Gudrun Kiesmüller (Technical University of Munich)

We focus on integrated decisions for inventory replenishment and shipment policies for a one warehouse-multiple-retailer distribution system. The warehouse applies a hybrid (time and quantity based) shipment consolidation policy to replenish retailer groups facing Poisson demand. We provide an exact method to obtain the probability mass function (pmf) of the inventory level at each retailer, which enables us to evaluate the expected inventory and shipment costs of the system. After jointly optimizing the safety stock levels and shipment policy parameters, we provide managerial insights into the circumstances in which a pure time-based, a pure quantity-based, or a hybrid policy should be applied.

Order Advancement in a Multi-Item Two-Echelon Inventory System

Quinziano ten Hagen (Slimstock), Matthieu van der Heijden* (University of Twente), Dennis Prak (University of Twente)

Motivated by a case at a Dutch retailer, we study short-term order advancement in large-scale multi-item, two-echelon systems. Traditional inventory replenishment rules cause a strongly fluctuating workload for order picking at the distribution center (DC), often exceeding capacity. By advancing replenishments for slow movers, we balance workload at the DC with backroom usage and workload at the stores, without affecting final customer service levels. We develop a performance evaluation method and an optimization heuristic suitable for large problem instances. Application to our case shows a capacity shortage reduction at the DC up to 70% without major issues at store level.

Tactical Production Planning for Uncertain Seasonal Demand

Pardis Sahraei* (University of Mannheim), Moritz Fleischmann (University of Mannheim)

Seasonal demand patterns force companies to pre-produce to fulfill peak-season demand in a competitive market without wasting idle resources off-season. However, market uncertainty and long production lead times complicate corresponding planning tasks, since production cannot react quickly to new demand information, gathered by approaching the season. Production planning has to take this uncertainty into account. In this paper, we model demand uncertainty in a novel way by expressing it through seasonal rather than monthly parameters. To estimate these parameters, we cluster the products, based on relevant seasonal structural features. We then use the obtained error distributions for sampling-based stochastic demand scenario generation.

62	Wednesday, 03:20 PM – 04:50 PM, Room 6 Track: Disruptive Technology & Operations Management Session: Blockchain and Operations Management (II) Chair: Samir Dani
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Blockchain Arbitration: A Supply Chain Perspective

Marianna Riabova* (Grenoble Alpes University), Paul Ready (Grenoble Alpes University)

Blockchain offers substantial benefits to Supply Chains (SCs). Along with transparency and traceability, blockchain technology enables Smart Contracts integration. Blockchain and Smart Contracts are, however, not flawless and can create a new category of disputes. The recognition of these disputes by traditional legal institutions is questionable. This paper presents the concept of Blockchain Arbitration that allows for Smart Contract and blockchain dispute settlement via a decentralized resolution platform. The paper reveals that despite existing challenges, Blockchain Arbitration can enhance the resolution process in terms of flexibility, cost and time reduction, increase trust among SC stakeholders and boost overall SC performance.

Analysis of Blockchain Implementation to Cope with the Unauthorized Selling?

Abhishek Srivastava* (Indian Institute of Management Kashipur), Aarushi Mahajan (LM Thapar School of Management)

The unauthorized selling of genuine products is a growing concern for companies worldwide. Often, consumers unknowingly purchase a product from the unauthorized channel and feel deceived by the brand upon discovering that the product lacks in terms of after-sales services and warranty benefits. It adversely affects the brand image, ultimately reducing the brand's profit. We study this relevant problem by analyzing the implementation of blockchain technology by brands to combat gray markets. Interestingly, we find that despite of reduction in the total channel sales, the brand remains better-off under the blockchain implementation only if the myopic consumers are sufficiently large.

Blockchain-Enabled Supply Chain Transparency: Conditions, Challenges, Commitments and Consequences

Zahra Seyedghorban* (The University of Melbourne), Hossein Tahernejad (Deakin University), Ambika Zutshi (Deakin University), Matthew Mount (The University of Adelaide)

Blockchain is seen as a revolutionary force for enabling supply chain transparency, although transparency itself remains a conundrum: who, when and how much information should be shared for transparency? This tension brings to the surface an important decision point regarding where, how and when to deploy blockchain in supply chain operations. To address this question, semi-structured interviews with supply chain managers in Australia were conducted. This led to the development of an inductive framework identifying the supply chain conditions conducive to the deployment of blockchain-enabled transparency, the associated challenges, the successful implementation of commitments and the consequences of such implementation.

Investigating Smart Contracts in Supply Chains Using a Virtual Blockchain Environment

Samir Dani* (Keele University), Abdul Jabbar (University of Leicester)

In this paper and research, we investigate the use of smart contracts within supply chains. The smart contracts are introduced as a mechanism to complete operational transactions within the supply chain. Smart contracts are used within the Blockchain environment. We also investigate the latency of the blockchain transaction. The methodology for this research is an experimental methodology. We develop and implement a fully functional virtual public Blockchain simulation environment to store, validate and maintain transactions to measure computational costs, frequency, and intensity of transactions. The paper presents an insight into whether smart contracts can be used for automated decision making.

63	Wednesday, 03:20 PM – 04:50 PM, Room 7 Session: Environmental Sustainability Chair: Martin Glanzer	Track: Sustainable Operations
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Environmental Hedging Policy for Land Conservation with Simulation-Based Optimization Approach

Seyedmojtaba Sajadi* (Aston Business School), Reza Behnamfar (University of Tehran), Mehrdad Sadeghi (Amirkabir University of Technology), Mahshid Tootoonchy (University of Sydney)

This study evaluates the effect of environmental land conservation policies in paper industries with regard to customers satisfaction and production cost. We develop a novel environmental hedging policy to consider failure-prone production plants and environmental uncertainties as well as consumer awareness towards eco-friendly products. Referring to the stochastic context of the problem, a simulation-based optimization has been developed. This approach provides a novel insight for authorities to examine the effectiveness of environmental policies in paper industries. It also helps production plants to dynamically plan operations not only to improve efficiency of supply chain but also to fulfill environmental responsibilities.

Carbon Neutral Announcements and Shareholder Wealth: The Role of Carbon Abatement Strategies and Operational Capabilities

Gabriele Mauro* (iCite/Solvay Business School/ULB), Evelyne Vanpoucke (iCite/Solvay Business School/ULB)

This paper examines the shareholder wealth impact of carbon neutral operations (CNOs) by measuring the stock market reaction to 211 CNOs announcements issued between 2019 and 2021 by US listed firms. We find significant, positive abnormal returns positively to CNOs (+0.45%, p-value=.10), especially in CO2-intensive industries, that the CNOs value is larger with supply chain emission reductions, and evidence of an early mover advantage. The paper helps firms frame their competitive response and manage their operations in pursuit of carbon neutrality and policymakers in assessing the firm-level financial outcome of voluntary carbon neutral programs.

Impact of Carbon Capture on the Use of Lignocellulosic Biomass

Sebastián Lubjuhn* (School of Business and Economics, RWTH), Sandra Venghaus (School of Business and Economics, RWTH)

Carbon capture technologies in combination with bioeconomy allow the replacement of fossil resources with bio-based ones while also removing CO2 from the atmosphere. Yet, the amount of available bio-resources is limited, rendering some technologies successful while leaving behind others. Lignocellulosic biomass is a key resource already used on a large scale for heating purposes or electricity production and increasingly to produce chemicals and biofuels. Because market mechanisms do not necessarily drive a cost-optimal use with respect to its GHG-reduction potential, a new bi-objective linear optimization model under long-term scenarios was developed for Germany accounting for competition with non-biobased technologies.

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

Dmitry Krass (Rotman School of Management), Anton Ovchinnikov* (Smith School of Business)

We consider a response to environmental taxes by firms producing a commodity good with a polluting by-product. Firms are heterogeneous with respect to production efficiency and pollution control technology. Cournot competition is assumed, with two demand functions: iso-elastic and linear. In this setting, we consider a market response, where firms choose production quantities given their technology choices, and a technology response, where firms also choose among a discrete set of available technologies. We characterize the equilibria and examine using environmental taxes to incentivize “green” technology choices. We also show that results may qualitatively differ depending on the demand function assumed.

Sustainable Management of a Water Reservoir System Under Climate Uncertainty

Felipe Caro (UCLA Anderson School of Management), Martin Glanzer* (University of Mannheim Business School), Kumar Rajaram (UCLA Anderson School of Management)

We present a strategic model for the long-term management of a water reservoir system, when the objective is to sustainably satisfy vital demand streams. A cycle starts and ends when all reservoirs in the system are full. To account for the unpredictable effect of climate change on future water supply, we consider a robust model where nature chooses the most adversarial rainfall distribution. This leads to a stochastic shortest path problem under ambiguity. We discuss structural properties of our model as well as important policy insights. A case study for the Sacramento River Basin in Northern California complements the talk.

6A	Wednesday, 03:20 PM – 04:50 PM, Room 8 Session: Assortment Planning and Optimization in Retail Supply Chain Chair: Olivier Vetter
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Track: POM-Marketing Interface

Coordination Mechanisms for Assortment Planning in Omni-Channel Retail Supply Chains

Amin Aslani* (University of Calgary), Osman Alp (University of Calgary)

This study investigates the assortment planning problem in an omni-channel retail supply chain, composed of an online sales website and a physical store, under both decentralized and centralized decision structures while accounting for product returns. We explicitly model the impact of assortment decisions on inaccuracy in customers' evaluation of products, which influences their purchase and keep/return decisions. We characterize optimal assortments in both decision structures and propose economies/diseconomies of scope contracts to coordinate the retail supply chain. Coordinated decisions mitigate adverse impacts of product returns on profitability and environmental sustainability caused by factors like additional shipping for returned products.

Introducing an Efficient Heuristic for the Dynamic Assortment Planning Problem

Lijue Lu (NEOMA Business School), Hamed Jalali* (NEOMA Business School), Mozart B.C. Menezes (NEOMA Business School)

Single-period dynamic assortment planning refers to the retailer's problem of deciding the set of products to offer and their initial inventory levels with stochastic demand and dynamic substitution. This problem is notoriously difficult to solve. We propose an efficient heuristic for this problem considering an online retailer that has hundreds of possible SKUs to choose from and has the possibility to stock thousand units in total. We impose no assumptions on preference lists and substitution patterns. Compared to the most recent heuristic, our algorithm is competitive in the average revenue obtained but it is significantly faster especially for large instances.

Omnichannel Assortment Optimization with Two-Stage Decisions

Venus Lo* (City University of Hong Kong)

Suppose an omnichannel retailer operates a physical store and an online store. A customer may visit both stores before completing her purchase. She arrives to the physical store to buy her favourite product, and she purchases it and leaves if it is available. Otherwise, she examines the in-store assortment before proceeding online. Her preferences for the online products depend on the assortment that she examined in-store. Computing assortments which maximize expected revenue over both stages and channels is NP-hard. I present a fully polynomial-time approximation scheme by introducing a staircase strategy, and discuss insights into assortment structures via numerical experiments.

Product Line Design vs. Assortment Optimization under Customer Heterogeneity

Olivier Vetter* (Business School of Mannheim), Niloufar Sadeghi (Business School of Mannheim), Cornelia Schön (Business School of Mannheim)

This paper studies solution procedures for the Product Line Design (PLD) and the Assortment Optimization (AO) problem under mixed multinomial logit demand and discrete pricing. Our contributions are: (i) We connect the two largely separate literature streams and discuss conditions when the problem formulations are equivalent. (ii) We improve the speed of a conic state-of-the-art AO approach by 35% - 66% by adding valid constraints and applying a branch and cut technique. (iii) We extend a fully polynomial time approximation scheme for AO to the pricing decision. (iv) We test whether solving the AO or PLD problem formulation is advantageous.

65	Wednesday, 03:20 PM – 04:50 PM, Room 9 Session: Circular Economy Chair: Maria Holgado Track: Sustainable Operations
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Circular Economy Adoption in Fashion: Theory and Sustainable Development Goals

Ina Maria Raible* (Vienna University of Economics and Business), Gerald Reiner (Vienna University of Economics and Business), Prasanta Dey (Aston Business School), Soumyadeb Chowdhury (TBS Business School)

Fast fashion raises difficulties linked to circularity and Sustainable Development Goals (SDGs) fulfillment in a way that other industries do not. Millions of tons of its products are landfilled each year and less than 1% is recycled in a closed loop, wasting both material and financial resources. Existing literature reviews have been unable to link the adoption of circular economy (CE) and the SDGs and the theoretical approaches used. To improve the synergies between current theories, CE, and SDGs for companies operating fast fashion supply chains, our goal is to overcome this lack of understanding and create a research framework.

Used Product Acquisition, Sorting and Disposition for a Circular Economy

Lahiru Gunasekara* (The University of Auckland), David Robb (The University of Auckland), Abraham Zhang (University of Stirling)

The transition to a circular economy (CE) relies on the effective implementation of circular supply chains (CSCs), which encompass returns acquisition, sorting, and disposition (ASD). We review 131 high-impact journal articles on ASD, and find that a lack of empirical studies, limited practical validation of mathematical models, and restrictive modelling assumptions about behaviour and uncertainty in returns constrain research applicability. In addition, we recommend further research to facilitate a CSC for transitioning to a CE.

Information Exchange for the Circular Economy: The Missing Link

Beverly Lege* (Hamburg University of Technology), Wolfgang Kersten (Hamburg University of Technology)

UN Sustainable Development Goal 12 calls for responsible and sustainable consumption and production patterns, incorporating the idea of the Circular Economy (CE). Presently, product-related information that enables repair, reuse and recycling to reduce waste is often not shared, which is a major obstacle on the way to the CE. In this contribution, we aim to present what needs to be done to improve the information exchange in the CE. Findings from our qualitative study based on interview data show which incentives and digital technologies should be provided, and give guidance on what information to share and how.

End-of-Life Management in Consumer Products and Industrial Assets: A Comparative Study

Irene Roda (Politecnico di Milano), Maria Holgado* (University of Sussex)

Lifecycle management of products and assets represents the cornerstone to sustainable production and consumption from a systems perspective. Within the Circular Economy (CE) paradigm, an effective End-of-Life (EOL) management is fundamental to return value to or recover value from used products and assets. As CE became a prevalent framework, the interest in EOL strategies increased within both industrial and consumer markets. This research investigates and compares the recent advances in EOL strategies and practices for both consumer products and industrial assets. By understanding and comparing successful EOL strategies and practices, we enable cross-sectorial learning for higher value retaining and recovery.

69	Wednesday, 03:20 PM – 04:50 PM, Room 10 Track: New Business Models & Operations Innovation Session: Food and Grocery Retail Business Models Chair: Soroosh Saghiri
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Food ATM: An Innovative and Responsible Supply Chain Business Model

Yaprak Anadol* (Dubai Business School, UAE), Arij Lahmar (Dubai Business School, UAE)

The aim of this article is to highlight the Food ATM as a prime example of a socially responsible and innovative business model. Using a agile supply chain management approach, the company leverages the gap between supply and demand for food to create a niche market for affordable, complete meals for blue-collar workers. By purchasing bulk near-expiry products, implementing lean production systems and just-in-time distribution methods, the Food ATM manages to sell complete meals for less than a dollar while ensuring profitability and sustainability.

Impact of Delivery Radius on the Profitability of Ultrafast Grocery Retailers

Navid Mohamadi* (Eindhoven University of Technology), Zümbül Atan (Eindhoven University of Technology), Sandra Transchel (Kuehne Logistics University), Jan Fransoo (Tilburg University)

Ultrafast grocery deliveries are struggling to increase their efficiency and become economically sustainable. One way to do so is to optimize the committed delivery time. Our results highlight while ultrafast grocery retailers commit to an identical delivery time in all their locations, this policy harms their economic sustainability. We show increasing the committed delivery radius to benefit from the pooling effect is not always helpful. Our study provides an extensive understanding of the influential factors on profitability and identifies the bottlenecks to improve their operations.

Optimizing Assortment and Inventory on Shelves When Products Perish

Lena Riesenegger* (Technical University of Munich), Alexander Hübner (Technical University of Munich)

Determining the assortment and inventory levels based on their shelf life is essential for grocery retailers to maximize profits while minimizing food waste. Assortment and inventory decisions are interrelated by the limited shelf space. A joint approach is needed that defines the assortment size and the maximum possible inventory levels under consideration of several replenishment periods and customers' freshness preferences. We develop the first approach to integrate product shelf life and outdating in assortment and shelf space decisions. To solve the model, we apply an iterative heuristic and analyze the profit and the occurrence of food waste for different scenarios.

Omnichannel Grocery: Cost-Waste Interplays in the Product Returns Process

Soroosh Saghiri* (University of Southampton), Maryam Mohammadipour (Middlesex University)

Online grocery shopping has expanded considerably in recent years, where consumers can have the choice of Buy-Online-Delivered-at-Home or Buy-Online-Pickup-in-Store (known as BODH and BOPS channels respectively). Online orders are fulfilled either from the store or the central warehouse. Although online shopping offers more convenience for consumers, it involves more operational costs and product waste, particularly for returned items with shorter shelf-life. This research investigates the grocery product returns process. It formulates the performance of the return process in terms of cost and product waste, and analyzes the cost-waste interplays and their sensitivity to the product shelf-life and channels integration.

Sessions for Thursday, July 20

Thursday, 08:15 AM – 09:45 AM

69	Thursday, 08:15 AM – 09:45 AM, Room 1 Session: Strategies and Sustainability in Nonprofit Operations Chair: Ville Satopaa	Track: Nonprofit Operations
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Designing Aid for Outcomes: A Study on the Effectiveness of Developmental Aid in Conflict Areas

Andres Jola-Sanchez* (Mays Business School, Texas A&M University)

Today, about two billion people live in conflict conditions. Although developmental aid can break the trap of rising conflict and underdevelopment, aid is insufficient and is mostly ineffective. Using propensity score analysis and 12,838 World Bank development projects, we investigate how project design attributes explain aid effectiveness (outcomes). Contrary to current understanding, we show that project size and duration do not explain effectiveness in conflict areas—effectiveness rests on project management quality. We also show that armed conflict wanes the effectiveness of energy and mining projects but improves the effectiveness of public sector governance and rural development projects.

Lakhpati Kisan: A Socio-Economic Intervention for Long Term Sustainable Poverty Reduction

Sushmita Srivastava* (S P Jain Institute of Management and Research), Lijo John (S P Jain Institute of Management and Research)

Agriculture based interventions directed towards sustainable income and livelihood have been of utmost importance for governments, policy makers, farmer communities, across the world. Lakhpati Kisan Programme undertaken by Tata Trust, in India, has been one such initiative which began in 2015-16 and has covered more than 100,000 households (HH) in the Tribal belt of India. Through this programme, the HH income has increased from INR 30,000 (USD 350) to INR 120, 000 (USD 1500) per annum and thereby irreversibly bringing these household from absolute poverty. The paper aims to study the factors that have led to increase in agricultural income in the state of Gujarat in India, and those that have proved to be impediments, so that the lessons can be extended to the rest of the country.

Self-Targeting in Social Assistance Programs: How to Harness Data's Power?

Yuanzheng Ma* (Shanghai Jiao Tong University), Guodong Lyu (Hong Kong University of Science and Technology), Chung Piaw Teo (National University of Singapore), Huan Zheng (Shanghai Jiao Tong University)

Proxy-Means-Test is often used in Social Assistance Programs to predict the consumption levels of individuals using big data. Self-Targeting is another approach developed to identify beneficiaries because the people living in poverty will more likely come forward to claim the benefit. Can we predict the shift in the subpopulation coming forward based on the big data collected for PMT and use it to develop a more accurate targeting method? A simple model characterizing the effect in emerging self-enrolling SAPs using the Bayesian approach is proposed. Real data from Sierra Leone was used to evaluate the efficacy of the proposed method.

Is Mid-Day Meal Scheme Effective to Reduce Malnutrition in India?

Shailly Chaurasia* (T A Pai Management Institute), Manish Jain (T A Pai Management Institute), Priyal Bansal (T A Pai Management Institute), Jugul SP (T A Pai Management Institute)

United Nations Sustainable Development Goals have targeted to end all forms of malnutrition in the world by 2030. However, the results are more perturbing as the malnutrition populations will surpass 840 million or 9.8% of the world population up to 2030. World Food Programme (WFP) provides Plumpy Nut in developing/under developing nations to decline the malnourished populations especially children under five years of age. The present study provides insights to the decisionmakers to opt better protein sources available for Plumpy Nut and win- win situation for farmers, government, manufacturers and malnourished children to attain the targets of Zero hunger (SDG-2).

Estimating Burden of Severe Acute Malnutrition Among Children in Africa

Ville Satopaa* (INSEAD), Chris Coffey (WFP), Nicolo Bertani (Catolica Lisbon), Luk Van Wassenhove (INSEAD)

Estimates of program burden, defined in our context as the number of children suffering of severe malnutrition in a given region and period of time, are critical to humanitarian relief programs; yet no principled approach exists to estimate such numbers based on the kind of data typically available to humanitarian organizations. In this collaboration with the World Food Program, we develop a new approach that can estimate burden and other important quantities from prevalence and admissions data alone. To demonstrate our approach, we estimate these quantities for each administrative district in Somalia and compare our results with past survey-based estimates.

68	Thursday, 08:15 AM – 09:45 AM, Room 2 Track: Manufacturing Operations Session: Efficient Manufacturing System Design Chair: Sirish Gouda
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Shared Manufacturing-A Systematic Literature Review for Concepts and Research Directions

Ege Duran* (University College Cork), Cemalettin Ozturk (MTU), Barry O'sullivan (University College Cork)

Supply chain disruptions such as COVID-19 pandemic and ongoing political crisis, as well as increasing competition and product individualisation force manufacturing companies to be more resilient, efficient yet without losing their market share. This changing paradigm is leading companies to more flexible use of different globally distributed, scalable and sustainable, service-oriented production systems and resources within the concept of “shared manufacturing”. In this work, we will present a review of the current literature for a common understanding of what it means, discuss its variants, implementation issues and present future research directions.

Data Governance in Manufacturing

Xuejiao Li* (Aalborg University), Cheng Yang (Aalborg University)

Many manufacturing companies are jumping into the data-driven tide in the context of Industry 4.0 when they pursue digital transformation. However, most of them encounter data-related problems which greatly hinder the subsequent data analysis and decision-making. Data governance is perceived as efficient methods to solve data-related problems. The purpose of this study is to discuss data governance from the operations and supply chain management perspective. Based upon literature research and case study, we investigate research gaps in academia and real data-related problems in industry and suggest research pathway by which academia can support industry to clear data barriers for better decision-making.

Elasticity Requirements for Next-Generation Manufacturing Systems: Evidence from Multiple Case Studies

Nikolai Kazantsev* (Institute for Manufacturing, Cambridge), Karol Niewiadomski (University of Nottingham), Basem El-Shafei (University of Nottingham), Sudhir Rama Murthy (Institute for Manufacturing, Cambridge), Jack Chaplin (University of Nottingham), Giovanna Martinez Arellano (University of Nottingham), Chander Velu (Institute for Manufacturing, Cambridge), Duncan McFarlane Velu (Institute for Manufacturing, Cambridge), Tim Minshall (Institute for Manufacturing, Cambridge)

The 'black swans', such as military conflicts, pandemics, and semiconductor crises shorten the ways how manufacturers can cost-effectively respond to volume/mix changes. To inform future manufacturing, this paper collects data from 32 industrial companies and uses thematic analysis to derive the common themes in responding to v/m changes. First, we aggregate the business needs along factory, firms and supply chain levels. Second, we outline the current responses to these needs. Third, we conceptualise requirements for developing ‘elastic manufacturing systems’ that can better adapt to product volume/mix changes. The paper draws conclusions for production/automation from the elastic needs of manufacturing businesses.

The Contribution of Work Stress to Firms’ Efficiency

Onur Arin Ozturk* (Izmir University of Economics), Selin Ozpeynrici (Izmir University of Economics)

According to psychologists, stress is the fundamental issue that affects work efficiency. Numerous studies indicate that stress has physical effects as much as mental effects on people. The aim of this study is to ascertain indirect effects of stress to production efficiency and productivity. With the aid of Data Envelopment Analysis and Item Response Theory, two different production plants located in Izmir, Turkey have been examined via Likert-type questionnaire specifically designed to measure work stress (WSQ) and via detailed efficiency analysis. Results indicate that stress affects not only employees but also firms’ overall efficiency as well.

The Nexus Between Capacity Utilisation and Labour Productivity

Sandhiya E (Indian Institute of Management Tiruchirappalli), Sirish Gouda* (Indian Institute of Management Tiruchirappalli)

Our study aims to understand how training production and non-production employees affect a firm's capacity utilisation. Our research draws inspiration from the theory of swift, even flow and investigates a novel concept of understanding whether training can improve capacity utilisation. The secondary data used in this study is obtained from the World Bank Enterprise Survey. We utilise a firm-level dataset for over 30 countries belonging to developing countries of Eastern Europe and Central Asia (ECA) with various indicators. Our results suggest that training for both production and non-production employees significantly and positively impacts capacity utilisation.

	Thursday, 08:15 AM – 09:45 AM, Room 3 Session: Teaching and Publishing in Operations Management Chair: Hassiba Fadli
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Track: POM Practice & Pedagogy

The Art and Science of Publishing Literature Reviews

Rob Dekkers (University of Glasgow), Pauline Found* (Cardiff University), Yang Cheng (Aalborg University)

The purpose of publishing good literature reviews on production and operations management is to inform research agendas and managerial practices through evaluation and synthesis of the scholarly body of knowledge, thus serving as points of reference for empirical studies into manufacturing, supply chain management and related domains. This presentation, from the guest editors of a special issue on 'State-of-the-art for Manufacturing Management Advancing the Research Agenda and Practice through Literature Reviews', pinpoints findings from the editorial and review processes. It highlights themes that drive the success of getting accepted for publication and technical advice for researchers contemplating publishing literature reviews.

Members-only? International Authorship Diversity in Operations and Management Journals

Rodrigo Romero-Silva* (Wageningen University & Research), Erika Marsillac (Old Dominion University), Sander de Leeuw (Wageningen University & Research)

Recent years have seen frequent calls to increase diversity and inclusion in academia, but a large proportion of published papers in highly-regarded journals still comes from the USA and UK. We examine the implications that international authorship diversity has on a journal's performance by investigating whether statistical relationships exist among international authorship diversity indicators and citation performance, prestige and (multi)disciplinarity diversity indicators for Operations and Management journals. We found that authors' affiliation diversity was positively and statistically associated with the diversity in the topics covered by a journal and its network influence but negatively associated with citation performance and prestige.

Teaching Operations Management: Pre and Post Covid 19

Nesrine Eltawy* (Royal Holloway University of London- Management School)

The covid 19 has affected and changed the world. The change is not only medically or health care related activities, but the change also covers all areas of our lives. Education systems are among the important consequences of this change (G.L. Tortorell et al,2021). This put pressure on OM and Supply chain management lecturers and the teachers to focus on providing deep topics that cover the solutions of OM and supply chain management problematic areas. The aim of this paper is to explore the different required approaches to teach OM and Supply chain management post Covid 19 and comparing them to pre covid 19 teaching approaches. The research will include data collected from several lecturers among different universities in the UK as well as the student's feedback.

Gender Bias in Teaching: An Operations Perspective

Tong Wang* (London Business School), Kamalini Ramdas (London Business School), Monika Heller (UCL School of Pharmacy), Anandi Mani (University of Oxford)

Gender bias in teaching evaluations can impede career progression. We found evidence of bias against female trainers among male learners and bias against male trainers among female learners using an observational dataset. Moreover, we implement a controlled experiment design, where the instructor's gender is manipulated via a voice-over that accompanies a slideshow. The teaching quality is preserved to be identical across genders. We also propose designs to investigate operational aspects, such as whether or not prior ratings are displayed, and their interaction with gender bias. Our investigations about operational interventions may offer efficient ways to mitigate gender bias.

Creative Education for Sustainable Fashion Supply Chains in HE Business

Hassiba Fadli* (Anglia Ruskin University), Helen Benton (Anglia Ruskin University)

This research investigates the effectiveness of transformational education in preparing higher education business students for sustainable supply chain practices in the fashion industry. The study employs a mixed-method explanatory approach, combining exploratory and confirmatory factor analyses with qualitative data analysis using NVivo 12 Pro. The findings indicate that transformational education, aided by creativity, positively impacts students' sustainable behaviours and attitudes towards environmental issues. The research highlights the importance of preparing future managers and global citizens with ethics and sustainable behaviours. The study contributes to advancing the United Nations Sustainable Development Goals (SDGs), specifically SDG 4 and SDG 12.

70	Thursday, 08:15 AM – 09:45 AM, Room 4 Session: Trust, Ethics & Social Impact in Supply Chain Management Chair: Mauro Fracarolli Nunes
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Track: Behavioral Operations

Supply Chain Boundary Spanning Actors: Social Impact through Coffee

Eugenia Rosca (University of Groningen), Madeleine Pullman* (University of Sussex)

From the social side, supply chain (SC) research has focused on supplier compliance to company standards related to issues such as work conditions. Social enterprises, however, look to enhance their target group's lives in many ways. The SC field considering broader social impacts is referred to as social impact supply chain management. Here, social enterprises can take on different boundary spanning roles to address social issues in their supply chains. Previous research has considered boundary spanning and compliance to work conditions standards in SCs; this research considers how boundary spanning entities make broader social impacts in high quality coffee SCs.

Ethical Challenges in Supply Chain Design Decisions

Camila Lee Park* (EDC Paris Business School), Mauro Fracarolli Nunes* (EDC Paris Business School), Jose A.D. Machuca (Universidad de Sevilla), Maria Mar González-Zamora (Universidad de Sevilla)

We investigate the influence of competitors' resolution on the probability that a lead firm will substitute a socially irresponsible supplier for another. More specifically, we analyse the extent to which competitors' decision to continue or discontinue problematic relationships will affect a lead firm's willingness to switch suppliers. Data from a preliminary vignette-based experiment suggest that, while no disparities were found among the competitors' attitudes when grave social offenses are disclosed in the common suppliers, significant differences are detected in attitude toward switching suppliers when light social offenses are uncovered. Acknowledgements to projects: PY20-01209 and PID2019-105001GB-I00.

Unethical Purchasing: The Effect of Rational Risk and Social Norms

Andréa Olivera de Carvalho e Silva (EAESP/FGV), Paulo Arvate (EAESP/FGV), Yen-Tsang Chen* (NEOMA Business School)

We combined rational choice, social learning, and cognitive development theories to investigate the effect of strategy based on punitive tactics and an ethical culture on the inclination to act unethically in procurement. Methodologically, we conducted a controlled experiment with America-based managers and engineers, by manipulating two variables: past punishment frequency and business environment. From the rational choice perspective, we found that the frequency of past punishment (punitive tactics) negatively affects the inclination to act unethically. From the social perspective, we demonstrate that a pro-unethical business environment, mediated by the acceptance of unethical practices, positively affects the inclination to act unethically.

Interpersonal Trust, Uncertainty Aversion, and Sustainability Practices of Suppliers

Rahul Sahu* (Indian Institute of Technology Bombay), Tarikere T. Niranjan (Indian Institute of Technology Bombay)

The manufacturing process to create the finished goods involves many small and medium suppliers. Due to the uncertain and turbulent business environment, these suppliers often face various types of risks and ambiguities in their sustainability operations decisions. Suppliers exhibit inconsistent attitudes in risky and ambiguous situations. Behavioral factors like interpersonal trust are crucial in shaping suppliers' attitudes toward these risks and ambiguities. With the help of qualitative analysis, we posit that interpersonal trust reduces the supplier's risk aversion and ambiguity aversion and eventually influences their sustainability decision.

Fighting Corporate Social and Environmental (CSI-CEI) Irresponsibilities in Supply Chains

Mauro Fracarolli Nunes* (EDC Paris Business School), Camila Lee Park (EDC Paris Business School), Jose A.D. Machuca (Universidad de Sevilla), Maria Mar González-Zamora (Universidad de Sevilla)

Through three multi-factorial scenario-based experiments (503 UK participants), we assess if the disclaim of social and environmental irresponsibilities in the operations of suppliers affect customers' sentiments toward a focal company. We also investigate the impact of initiatives to fight such irresponsibilities. Preliminary analyses suggest that consumers react negatively to CSI and CEI events regarding their willingness to buy and trust in organisations. Moreover, although a bit skeptical, data suggest that consumers are more willing to buy and trust companies that implement new technologies that would help to prevent irresponsibility matters. Acknowledgements to projects: PY20-01209 and PID2019-105001GB-I00.

71	Thursday, 08:15 AM – 09:45 AM, Room 5 Track: Humanitarian Operations & Crisis Management Session: Modeling and Optimization for Disaster Relief Chair: Dylan Jones
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Emergency Supply Chain Configuration with Correlated Uncertainties

Sheng Bi (Shanghai University of Finance and Economics), Sarah Yini Gao* (Singapore Management University), Guodong Lyu (Hong Kong University of Science and Technology)

An emergency supply chain (ESC) is the supply chain that forms in response to emergencies. A wise design of ESC is crucial to serving the emergency demand. We study the ESC capacity configuration problem under uncertainties. We show that the ESC configuration problem is equivalent to a copositive program, and its solutions can characterize the impact of correlated uncertainties. Additionally, we show that its dual problem, a completely positive program, can be used for scenario generations to simulate emergencies when risk information is unavailable. The conic programming framework serves as a decision-support tool for the practitioners.

Disaster Relief Multi-Channel Transportation: Model and Simulation

Haibo Wang (Texas A&M International University), Bahram Alidaee* (University of Mississippi), Lutfu Sua (Southern University and A&M College), Jun Huang (Angelo State University)

In disaster mitigation plan, decision makers use simulation and optimization to create different scenario and levels of disaster relieve needed. This paper designs a multi-channel multi-modal transportation model using mixed integer programming to optimize the time and cost of disaster relief via simulation. We consider the network connecting FEMA, warehouses, and disaster areas via different routes based on transportation modes and the availability levels of the routes. The goal is to find several alternative routes to minimize the time or cost to delivery disaster relief supply when certain routes become incapable. We evaluate our model performance via simulation.

Investigating the Role of Artificial Intelligence for Modality Decisions in Humanitarian Operations

Amin Maghsoudi* (HUMLOG Institute, Hanken School of Economics), Wojciech D. Piotrowicz (HUMLOG Institute, Hanken School of Economics)

The study is investigating emerging practices and challenges of incorporating artificial intelligence (AI) in modality decisions for cash versus in-kind assistance in humanitarian operations. A literature review coupled with focused-group discussion is conducted to understand the emerging practices and challenges of modality decision-making concerning the interaction between humans and AI. The results reveal modality decisions in humanitarian operations is complex and influenced by multiple factors (e.g., donor preference, market availability). The integration of AI in the modality decisions has the potential to optimize humanitarian aid delivery. However, the challenges and risks must be taken into account to ensure AI is used ethically following the “do no digital harm” principle.

Multiple Sustainability Criteria Mapping of Petrol Station Risk

Svitlana Antoshchuk (University of Odessa), Olena Arsirii (University of Odessa), Phil Crook (University of Portsmouth), Oleksii Ivanov (University of Odessa), Dylan Jones* (University of Portsmouth), Ashraf Labib (University of Portsmouth), Vadym Oliinyk (University of Odessa), Sergiy Smyk (University of Odessa), Richard Teeuw (University of Portsmouth)

This paper presents work towards a systematic mapping of the consequences of an incident at a petrol (gas) station. A criteria hierarchy of economic, environmental and social sustainability impacts is proposed. A pairwise comparison method is utilized to differentiate between the sustainability criteria of stakeholder groups at different proximities to the petrol station. A lexicographic vulnerability score for a petrol station that considers potential loss of life and combined is then elicited. The potential use of goal programming to make decisions on closures of petrol stations at times of heightened risk, including consideration of inconvenience is discussed.

72	Thursday, 08:15 AM – 09:45 AM, Room 6 Session: Product and Policy Development Chair: Alex Alblas Track: Disruptive Technology & Operations Management
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Managing Task Concurrency During Product Development in Globally Distributed Technology Projects

Alex Alblas* (Eindhoven University of Technology), Manpreet Hora (Georgia Institute of Technology), Jayanth Jayaram (Price College of Business)

Technology projects involve task allocation decisions, and concurrency of and interdependencies between critical tasks can have a significant impact on costs. Building on extant literature, this study explores the role of task criticality and the conditional effects of task concurrency on task criticality to project costs relationship. Based on time series regression analysis on semiconductor industry data, our study shows that task criticality increases costs, but this effect is mitigated by task concurrency. These findings contribute to the literature and the practitioner's knowledge of managing technology projects, especially where employees are distributed across locations and stages of product development.

Economics of Smart Products with Machine Learning

Menghuan Zhou* (emlyon business school), Yeming Gong (emlyon business school)

Powered by machine learning, smart products possess a feature that their quality is improving. The quality improvement in smart products is relevant to consumer usage data. The quality improvement degree depends on the data size used for training and testing the algorithm. While the firm can take measures to acquire more data for quality improvement and increase its profit, some negative effects associated with machine learning can hurt the firm. However, little literature considers the economics of smart products with machine learning. We formalize this problem in a two-period model where the product quality is related to training data size. The firm can determine the data collection policy by setting prices.

Traffic Policies for Sustainable Cities: A Heterogeneous Analysis

Amir Babaei* (Frankfurt University of Applied Sciences), Yasaman Mashayekhy Fard* (Frankfurt University of Applied Sciences), Tobias Hagen (Frankfurt University of Applied Sciences), Marco Sunder (Frankfurt University of Applied Sciences)

This study evaluates the impact of traffic policies on emissions in the Rhein-Main region, with consideration of population heterogeneity. The study introduces changes to traffic policies including public transport on selected roads and employs MATSim simulation to analyze the effects on emissions in different areas. The aim is to identify effective mobility strategies that can enhance transportation sustainability while addressing the diverse needs of the population. The findings of the study can be instrumental in developing eco-friendly transportation systems and align with the goal of achieving sustainable cities and communities that prioritize the welfare of all groups.

The Impact of Phishing Emails Analyzed with Face-Reader and Eye-Tracker

Zisu Kim* (Korea Advanced Institute of Science and Technology), Hak Kim (Hofstra University), Chul Ho Lee (Korea Advanced Institute of Science and Technology)

Phishing emails are one of the most common cyberattacks. People often unaware of malicious emails because of their various attributes and characteristics. The purpose of this study is to observe and understand the behavioral characteristics and emotional differences of participants (victims) from phishing attacks. The methodology of this study is mainly based on experiments using face-reading and eye-tracking devices to observe human behavior and analyze emotions. Ten different emails were provided to the participants and tracking devices followed the participant's actions. The results of this study will objectively analyze the victim's position and provide implications related to security field.

73	Thursday, 08:15 AM – 09:45 AM, Room 7 Session: Healthcare Quality Improvement Chair: Zhichao Zheng	Track: Healthcare Operations
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Why Don't Healthcare Provider Organizations Pursue More Process Improvement?

Dana Romero* (University of Utah), Glen Schmidt (University of Utah), Brent James (Stanford)

Growing healthcare costs and inadequate quality endanger the sustainability of healthcare systems worldwide. We model the healthcare provider's optimal choice to invest in value-based interventions that improve processes and lower waste and cost. We consider the impact of various financial reimbursement types on such investments and find the existence of a tipping point at which the provider finds it profitable to begin reducing waste. We find that utilizing freed-up capacity for additional services, adjusting plans for fixed cost investments, and shifting fixed-variable cost structure via cross-training can have significant impact on the provider's investment decision and profitability during process improvement.

Improving Group Testing in a Pandemic

Tong Wang* (London Business School), Kamalini Ramdas (London Business School), S. Alex Yang (London Business School)

During a pandemic, accurate testing is crucial, but large-scale testing can be costly and capacity-limited. Group testing can efficiently test populations and significantly save testing capacities. In a group test, samples are first pooled and tested. If negative, everyone in the group is healthy. Otherwise, individual tests are conducted to detect the infected individuals. The appropriate group size depends on the underlying risk level of individuals. We examine different approaches that health policy makers or health administrators can use to improve group formation for the pooling stage of the testing procedure in the presence of heterogeneous risk levels among individuals.

The Interplay Between Safety-Net Hospital Utilization and Experiential Quality Ratings

Ankita Shirahatti* (Boston University), Anita Carson (Boston University)

Safety-net hospitals have historically been tasked with caring for underserved populations in the United States. Despite major advances in accessibility to elite, non-safety-net hospitals (e.g. through Medicaid expansion), several studies have shown that demand for healthcare has not shifted away from safety-net hospitals among underserved patient populations. In this paper, we derive experiential quality features from online reviews for safety-net hospitals in Massachusetts to extricate specific hospital features valued by underserved patients. Using a discrete choice framework, we then test the hypothesis that safety-net hospitals provide better healthcare experiences for underserved patients by meeting this population's unique needs.

Controlling Appointment Schedules: How and When to Intervene

Roshan Mahes* (University of Amsterdam), Alex Kuiper (University of Amsterdam)

Traditionally, appointment schedules have been determined by minimizing a specific cost function consisting of clients' waiting times and server idling. These schedules are often studied in a static sense; once announced no further updates will follow. However, advancements in technology have opened up the possibility of communicating with upcoming clients, which can lower costs. Yet, excessive updates may cause confusion and frustration among clients. In this study we consider how many updates one should send and what are the ideal moments to send these updates. On the operational level, the findings have broad applications in the management of appointment scheduling.

Air Pollution and Doctors' Work Performance

Yongjian Zhu (University of Science and Technology of China), Jingui Xie (Technical University of Munich), Yugang Yu (University of Science and Technology of China), Zhichao Zheng* (Singapore Management University), Haidong Luo (National University Hospital), Oon Cheong Ooi (National University Hospital)

When examining the impacts of air pollution on the healthcare system, most studies focus on the increased demand due to air pollution-related health deterioration, taking a demand-side perspective. We extend the literature from a supply-side perspective by studying how air pollution can affect doctors' behavior and work performance. Using a data set from a cardiothoracic intensive care unit in Singapore over 80 months, we find that exposure to air pollution lowers doctors' decision performance. Moreover, we also observe that doctors are less likely to follow the decision protocols on polluted days, thus partially leading to poor performance.

74	Thursday, 08:15 AM – 09:45 AM, Room 8 Session: Revenue Management in Business Chair: Ozge Safak	Track: POM-Marketing Interface
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Choice-Based Availability Controls for Urban Carsharing Revenue Management

Richlove Frimpong* (Loughborough University), Dong Li (Loughborough University), Wen Jiao (Exeter University), Jiyin Liu (Loughborough University)

We develop a user-based relocation strategy for one-way carsharing networks where customers are offered fare discounts to return vehicles to other alternative stations to rebalance the fleet. We formulate a finite-horizon dynamic program (DP) based on a multinomial logit choice model estimated from a discrete choice experiment, to determine the optimal destination-fare discount combinations which maximises the total expected revenue. We approximate the DP with a choice-based deterministic linear programme to address its computational complexity. Our numerical studies show incorporating customer choice behaviour increase the total expected revenue by capturing potential demand which is lost under the independent demand assumption.

Economic and Environmental Performance of a Hemp-based Biocomposite Supply Chain

Niloofer Akbarian-Saravi* (University of British Columbia), Taraneh Sowlati (University of British Columbia), Abbas S. Milani (University of British Columbia)

The techno-economic analysis and life-cycle assessment are known to be powerful tools to provide predictive insight towards the viability of biomass processing options when designing new supply chains. This case study assessed the importance of processing equipment selection in design of a hemp-based biocomposite supply chain. Considering Net Present Value (NPV) under uncertainty it was found that a full-screen hammer mill and square baler option would be favorable for achieving a 50% profit margin over 20-years, while offering a low carbon footprint. 20% fluctuation in the selling price, as the most influential factor, resulted in a 76% change in NPV.

The Effect of Revenue Models on the Net Neutrality Debate

Abhinav Uppal* (Indian School of Business), Jagmohan Raju (University of Pennsylvania)

There is an ongoing global debate on network neutrality, a principle that prohibits Internet Service Providers (ISPs) such as Comcast from charging content providers (CPs) like Netflix for preferential delivery of their content to end-users. In this paper, we shed new light on the debate by developing and analyzing a two-sided model of the Internet that considers different CP revenue models, such as advertising and subscription. We study the impact of network neutrality on the different players and show that the implications of a network neutrality regulation can vary significantly with the revenue models being used by the CPs.

Demand Response Impacts of Different Prosumer Profile: Towards Targeted Offers

Seyyedreza Madani* (HEC Montreal), Pierre-Olivier Pineau (HEC Montreal)

Peak loads impose the highest investment cost on the electricity networks. To secure the availability of sustainable electricity for all, demand response strategies are among the most recommended tools on the end user side, as they can effectively shave peaks. This study analyses different types of electricity consumers and investigates the effect of profile characteristics on the effectiveness of demand response. Moreover, using the real world records from Quebec, this study considers the interactions between the distributor, active prosumers, and passive consumers, identifies their optimal strategies and, calculates their respective costs and revenues. An innovative machine learning approach is used.

Optimising Airline Operations in Response to Increasing Passenger Demand

Ozge Safak* (University of Bath), Ozlem Cavus (Bilkent University), M. Selim Akturk (Bilkent University)

We propose a stochastic nonlinear program, which expands an existing flight schedule by operating new flights either with existing fleet resources or a leased aircraft. This work helps an airline to link a strategic decision of leasing an aircraft to the tactical aircraft assignment decisions by considering the fuel efficiency and the seat capacity of the aircraft alternatives in response to new passenger demand. The impact of departure time decisions on the probability distribution of random passenger demand is handled by using the stochastic programming. In the numerical experiments, we provide a significant cost savings over a deterministic approach.

75	Thursday, 08:15 AM – 09:45 AM, Room 9 Session: Risk Management & Resilient Supply Chain (III) Chair: Alina Diaz-Curbelo	Track: Risk & Disaster Management
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Building Resilience: A Dynamic Approach

Lijue Lu* (NEOMA Business School)

In recent years we have witnessed various supply chain disruptions that severely affect the normal flow of goods and profitability. The purpose of this paper is to analyze a dynamic game that involves a supply chain dealing with a normal-disruption cycle, which is characterized by a random and unpredictable environment. The supplier can invest in building resilience to minimize the potential disruption's impact. We derive the feedback equilibrium strategies and compare the policies and payoffs under different supply chain structures (centralized/decentralized). Finally, we propose a cost-sharing scheme to achieve coordination.

Strategic Global Supply Network Planning Under Disruptions

Aybüke Ekşi* (Özyeğin University), Zehra Melis Teksan (Özyeğin University)

In global supply chain networks, disruption management is an essential part of strategic decision making. Every component of the supply network is affected by the global disruptions in different ways. In this study, strategic disruption planning for a global supply chain network is considered. We consider a finite planning horizon which is divided into discrete time periods. The decisions are purchasing, production, distribution, and the demand satisfaction. We model the problem as a MILP to analyze the effects of different disruption scenarios on the optimal solutions then apply the simulation to compare the performance of deterministic and stochastic model's solutions.

Supply Chain Disruption Mitigation with Machine Learning

Xinyu Li* (Durham University), Li Ding (Durham University), Yanlu Zhao (Durham University)

In this paper, we propose a novel approach to identify high-risk nodes in supply chain networks, measure supply chain resilience, and output the risk-exposure index (REI) of each node by combining Natural Language Processing, Graph Neural Network, and Operations Research techniques. Our research demonstrates the validity and feasibility of applying large language models in supply chain management, which provides a new perspective for supply chain management. Moreover, we utilise machine learning to sort out complex supply chain network structure and apply operations research to optimise the structure. This will aid supply chain risk managers in identifying disruptions and enhancing performance.

Holistic Approach Of Supply Chain Risk Assessment

Alina Diaz-Curbelo (Universidad de Sevilla), Rafaela Alfalla-Luque* (Universidad de Sevilla), Macarena Sacristan-Diaz (Universidad de Sevilla)

This research proposes a methodological and practical model with a holistic approach to supply chain risk management. It integrates three key dimensions in the risk conception: dependency, random and epistemic uncertainty. A mathematical model integrating fuzzy logic is proposed to assess the Potential Aggregate Risk level. This model considers the correlations between agents and risk events (in aggregated and independent way) in the achievement of potentially conflicting objectives. This contributes to the optimization of mitigation strategies and thus to effective decision making. A case study was developed in a real telecommunications company to validate the proposal. [Projects: PY20- 01209 and PID2019-105001GB-I00]

76	Thursday, 08:15 AM – 09:45 AM, Room 10 Track: Disruptive Technology & Operations Management Session: Applications of AI and Technology in Business Chair: Adel Guitouni
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EventMining: Identifying Events Using Natural Language Processing and Machine Learning

Mingze Xu (Hong Kong Polytechnic University), Christina WY Wong* (Hong Kong Polytechnic University)

We designed and developed an approach, EventMining, to identify multiple event clusters from textual company data. This approach adopts Natural Language Processing (NLP) and Machine Learning, as two mainstream elements of Artificial Intelligence (AI) technologies. The EventMining approach help researchers and managers automatically collect, pre-process, analyze, and identify multiple event cases. Our application demonstrates its utility and robustness. To the best of our knowledge, EventMining is among the first efforts in machine-based event identification and event case generation. EventMining contributes to gaining an understanding of the event patterns contained in complex text data.

Time-Series-Forecasting through Feature-Generaton and Comparison Between ML Techniques and Linear-Programming

TND Tulsi Dashsharma* (Indian Institute of Technology Madras), Rajendran C (Indian Institute of Technology Madras)

Predicting the temperature of different cities can be extremely useful for human lives, agriculture, and many aspects. This study caters to the problem of weather prediction through feature generation engineering, specifically using linear and trigonometric functions. The generated features successfully capture the time-series data's Trends, Seasonality, Cyclicity, Damping, Skewness, etc. This forecasting problem is treated as an optimization problem where the objective is to minimize various forecasting errors. Finally, a thorough comparison has been made between multiple metrics using ML, traditional statistical forecasting techniques, and Linear Programming using weather datasets of various cities in different parts of the world.

Application of Deep Reinforcement Learning to Sustainable Human Resource Management

Adel Guitouni* (University of Victoria), Mohammadreza Nematollahi (University of Victoria), Nafiseh Izadyar (University of Victoria), Nabil Belacel (National Research Council of Canada), Andrew Park (University of Victoria)

We present a novel approach to solve the sustainable sequential human resource planning (SSHRP) problem in the context of farming. This problem involves hiring and firing agricultural workers while considering economic, social, and environmental consequences. While different solution methods have been applied previously, little attention has been given to the use of deep reinforcement learning (DRL) models to solve complex SSHRP problems. We contribute a DRL algorithm that enables a sustainability-responsible farmer-agent to learn the best sustainable policy based on preferences and risk attitudes across multiple sustainability dimensions. This approach represents a significant advancement towards sustainable farming practices and SGDs.

Stimulating Real-Time Feedback Contributions Using Digital Nudges: A Field Experiment

Michael Rivera* (Temple University), Xue Guo (University of North Carolina – Charlotte), Guohou Shan (Temple University), Liangfei Qiu (University of Florida)

Organizations have widespread access to feedback systems; however, employees often consider them ineffective. Our study uses a field experiment to examine the effects of timing and task significance of digital nudges on feedback contributions in a real-time feedback application. Results show that digital nudges implemented in the morning derive more feedback contributions than those implemented in the evening. Additionally, digital nudges that include task significance stimulate altruistic and intrinsic motives, resulting in more feedback contributions than generic message prompts. Finally, a combination of timing and task significance leads to a larger quantity of detailed feedback response.

77	Thursday, 10:05 AM – 11:35 AM, Room 1 Track: New Business Models and Operations Innovation Session: Logistics Management & Mobility Services Chair: Maurizio Faccio
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Who and When to Provide Return Shipping Insurance in Supply Chains?

Lingli Wu * (Central China Normal University/The Hong Kong Polytechnic University), Li Jiang (The Hong Kong Polytechnic University), Shiming Deng (Huazhong University of Science and Technology)

To alleviate online shoppers' concern on returns, firms have initiated to provide return shipping insurance (RSI), entitling consumers to shipping unfit products back for free. RSI can be provided by either retailers or third-party insurers to suppliers or consumers. Based on a complete analysis of the performance outcomes under different RSI scenarios, we examine the roles of RSI in influencing supply chain performances, and investigate who and when to provide RSI from the perspectives of the retailer, the supplier, the third-party insurer, and supply chain, respectively.

Transport Earned Recognition Schemes: Vietnamese Evidence and Conceptual Frameworks

Graeme Heron* (University of Sheffield), Erica Ballantyne (University of Sheffield), Tran Mien Kien (BW Ind Devlmts JSC)

Efforts to introduce transport recognition schemes into ASEAN countries are limited. These voluntary schemes are much more common in the geographical West, allowing operators to develop strong records of compliance to standards: They must be able to evidence that their systems and processes promote efficient transport management and reduce environmental impacts. Opportunities for these schemes include satisfying demands for major civil projects and urban transport/logistics, as well enjoying benefits of reduced burden enforcement. Our research reviews existing schemes, undertakes surveys and interviews with concerned actors in Vietnam and reveals a ready willingness towards adaptation and adoption of a readiness framework.

Integrating Neighborhood Delivery Services into Parcel Delivery Networks

Arpan Rijal* (University of Groningen), Paul Buijs (University of Groningen), Kees Jan Roodbergen (University of Groningen)

Neighborhood delivery service model relies on use of local residents to receive parcels and deliver within their neighborhood. Our study focuses on the integration of neighborhood delivery services into a parcel delivery network and its impact on profit for companies and earnings for residents. Insights are derived on the impact on the environment. We also provide guidance on proactively safeguarding the concerns of operators of the delivery point operators.

Mobility-On-Demand Meets Shuttles on the Same Mile

Sunil Chopra (Northwestern Univeristy), Sebastian Martin (Northwestern Univeristy), Partha Sarathi Mishra* (Northwestern Univeristy), Karen Smilowitz (Northwestern Univeristy)

We study a point-to-point transportation problem, where the transportation planner can use both shuttles and mobility-on-demand vehicles (MoDs) to serve the incoming random demand of passengers. For example, in employee commute, employers often use conventional shuttles to transport their employees to work but sometimes also reimburse ride-sharing trips instead. We suggest a novel way to combine shuttles and MoDs inspired by a popularly studied policy in dual sourcing in the supply chain literature. Interestingly, we show that while hybrid policies are promising, they deviate from traditional wisdom: to decrease the passenger waiting time, the transportation planner should use fewer MoDs.

Sustainable Home-Work Logistics: 2 Years of Bike-To-Work Project in Italy

Maurizio Faccio* (University of Padova), Serena Finco (University of Padova), Illenia Zennaro (University of Padova)

Sustainable companies and cities must consider people home-work logistics, that represents an important part of the whole people's mobility, responsible of about 20% of the total Green House Gas emissions. It has specific attributes: fixed time windows, short distances, one person for car, creating huge traffic congestions and negative impacts on economics and environment. The paper presents the final results of 2 years pilot project "Bike To Work" in Italy, Chiampo Valley, where an innovative scalable and self-sustaining model, involving public administrations and private companies, has been applied to economically incentivize the use of sustainable mobility systems.

78	Thursday, 10:05 AM – 11:35 AM, Room 2 Track: Humanitarian Operations & Crisis Management Session: COVID-19 Pandemic and Operations Management Chair: Monika Maria Moehring
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Examining the Optimal Strategies to Manage Migrant Workers during COVID-19

Niladri Palit* (Queen's University Belfast), Atanu Chaudhuri (Durham University), Nishikant Mishra (University of Hull)

The respective governmental bodies in India confronted the challenges of managing migrant worker movements during COVID-19 while minimising the economic impact of managing this operation and controlling the risk of infection. Several researchers questioned the efficacy of the strategies implemented. Thus, this research developed models to determine the optimal humanitarian operations strategy using optimal search techniques by considering the trade-off between the economic impact versus controlling the rate of infection, considering interstate movement of migrant workers. The results suggested that the right strategy depends on the willingness of the migrant workers to return and the number of days of lockdown.

How Employee Training Drives Firm Production Repurposing in COVID-19 Pandemic

Huan He* (Tianjin University - University of Birmingham), Yuxiao Ye (Tianjin University), Boafeng Huo (Tianjin University)

We find some firms successfully repurpose production (i.e., adjusting firm production/services partially/fully) to adapt to the pandemic, which motivates us to study what factors can drive firm production repurposing in COVID-19 pandemic. Drawing upon the ability, motivation and opportunity (AMO) framework, we use the World Bank data to test our hypotheses. The results indicate that formal training prior to the pandemic develops human capital and firm capability to initiate production repurposing during the pandemic. Government wage subsidy and less labor shortage will enhance firm motivation and opportunity respectively in production repurposing, thus amplifying the positive impact of formal training.

The Impact of Company Size on Disaster Response

Vess Johnson (University of North Texas), Katia Guerra* (Boise State University)

This study explores how small to medium-sized enterprises and large enterprises position, prepare, and respond to an economic downturn such as the one caused by the COVID-19 outbreak through the management of specific information technology (IT) areas. Data were collected from IT leaders in organizations across the United States during the height of the pandemic. Analysis of the data collected reveals interesting similarities and differences in how IT leaders in these companies responded to the economic downturn. Explanations for our findings serve as a guide for future studies and help IT managers to respond to an outbreak event.

Large-Scale Clinical Operations: Setup of a Pandemic-Induced Warehouse

Monika Maria Moehring* (Technische Hochschule Mittelhessen), Joerg-Uwe Braun (Universitätsklinikum Frankfurt am Main), Lea Bachmann (Technische Hochschule Mittelhessen), Viktor Weiberg (Technische Hochschule Mittelhessen)

The recent Covid-19 pandemic has shifted clinical operations from cost-optimized just-in-time procurement of medical products towards anticipatory warehousing to meet disasters such as wars, natural catastrophes and rapidly spreading diseases. Based on a case study at one of Germany's largest University hospitals, this contribution will highlight the decision streams and algorithms to strategically set up a warehouse for a federal country with over 6 million inhabitants. The resulting blueprint and spreadsheets can also be used for other types of large-scale storage planning for disaster response and supply resilience, thus enabling faster decision making in volatile real-estate markets and political pressure.

79	Thursday, 10:05 AM – 11:35 AM, Room 3 Session: Game, Pedagogy & Training in Operations Management Chair: Paul Gardiner
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Track: POM Practice & Pedagogy

User Perceptions of ERPsim Games in Learning about ERP Systems

Sung Shim* (Seton Hall University)

Enterprise resource planning (ERP) systems automate and integrate various business processes. ERPsim is a set of computer-based simulation games for ERP system in which participants use the system to manage their virtual company. ERPsim games have been widely used as instructional tools. This field study examines the factors of user interaction with ERPsim games and the extent to which users are satisfied with the factors. This study can help advance our understanding of user interaction with computer-based simulation games used for learning and training purpose and extend the line of studies on computer self-efficacy into the user interaction satisfaction.

Pedagogical Challenges for Online OSCM Courses in an AI World

Kaushik Sengupta* (Zarb School of Business, Hofstra University)

OSCM core courses delivered over a short duration in an asynchronous online mode have some unique challenges in ensuring academic integrity and that students learn the appropriate level of content covering traditional and timely topics in ESG, AI and Blockchains within a span of a few weeks. We discuss approaches to incorporate AI based tools such as ChatGPT in the course delivery and assessments. Fundamental and long-standing approaches to some assignments are modified with the advent of AI and we discuss initial attempts to effectively use AI in such courses.

Teaching UN SDG through Collaborative Online International Learning (COIL)

Annett Grossmann* (Heilbronn University of Applied Science), Xiangrong Liu (Bridgewater State University)

This presentation shares the experiences of how to teach UNSDG in Operations Management curriculum through integrating projects together in the framework of Collaborative Online International Learning (COIL). It demonstrates the successful collaboration between a Service Operations Management course in Bridgewater State University, United States, and a Logistics Course at Heilbronn University of Applied Sciences, Germany. This project is addressing the sustainability problems in the dining halls at the corresponding Universities, where students in both classes worked closely through 6 weeks and benefited from the comparisons of sustainability practices between both universities.

Understanding Barriers to Service Learning Participation in an OM/SCM Course

Thomas Gattiker* (Boise State University), Matthew Castel (Boise State University)

In service learning (SL) students participate in community service related to course content. Typically done in conjunction with an NGO, SL projects help students understand how OM/SCM tools can address social and environmental needs. Often SL experiences associated with a course are optional for students. Assuming SL is beneficial to students and the community, it is important to understand why some students participate and others do not. In this presentation, we describe an OM/SCM SL initiative at a large metropolitan university. We collected data from students on their reasons for participating/not participating. We present the findings here.

Reframing Project Manager Competencies towards Sustainable Challenges and Increasing Uncertainty

Paul Gardiner* (SKEMA Business School), Valerie Saintôt (SKEMA Business School), Desmond McGetrick (SKEMA Business School), Kadia Diallo (SKEMA Business School)

We investigate by focus groups and interviews the disparity between acquired project competencies and required project competencies in a global market shaped by: (1) Increasing uncertainty & complexity. (2) Growing need to adapt quickly; responding to climate change. (3) Innovation mindset, constant learning and evolution; self-maintenance of body, mind, spirit. (4) Embracing digital transformation; challenges and solutions. (5) Inclusive project society, alliances, community development/movement building, for larger impact. (6) Skills gaps, how to reinforce a stronger/responsive and equipped workforce. The results will help identify emerging directions in the education, training and self-development of young project managers within their ecosystems!

80	Thursday, 10:05 AM – 11:35 AM, Room 4 Session: Data & Decision-Making Chair: Mohsen Afsharian Track: Supply Chain Management
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Articulating Uncertainty through Intervals for Informed Managerial Decision-Making

Christian Wagner (University of Nottingham), Gabriela Gutierrez Huerter O (King's Business School), Tim Gruchmann* (Westcoast University of Applied Sciences,), Stefan Gold (University of Kassel)

Multi-criteria decision-support systems have been developed to help distil complex data into actionable recommendations for managers. Current approaches are commonly not designed to handle and communicate uncertainty inherent in available information and provide limited scope for engagement of managers' expertise/strategy. This paper proposes a shift in decision-support towards capitalizing on the richness in managerial insight and informed decision making. First, we discuss and present a process to elicit information—and associated uncertainty—from experts, leveraging a recently introduced interval-valued survey response mode. Second, we show how articulating this uncertainty back to managers enhances the capacity for informed decision making.

A New MCDM Distance-Based Model with Objective Dynamic Weights

Srimantoora S Appadoo* (University of Manitoba), Yuvraj Gajpal (University of Manitoba)

This paper proposes a distance-based decision-making model using possibility theory, Mellin's transform, and mixed objective dynamic criteria weights derived exclusively from the entropy, CRITIC, and variance methods. The mixed objective criteria weight gives decision-makers added flexibility in making an informed decision-making process. This paper extends the possibilistic decision-making model to include higher-order moments in calculating relative closeness amidst positive and negative ideal solutions space. In this research, we used the centered variance given by mellin's transform to account for arbitrariness and variability in the decision-making model. Toward the end of the paper, illustrative numerical examples are enlightened to demonstrate the appropriateness of the proposed approach.

A Two-Stage DEA Approach for Efficiency Correction in Incentive Regulation

Sara Kamali* (Technische Universität Braunschweig), Mohsen Afsharian (Leibniz FH, University of Applied Sciences), Heinz Ahn (Technische Universität Braunschweig), Peter Bogetoft (Copenhagen Business School)

This paper proposes a two-stage data envelopment analysis (DEA) approach for correcting efficiency scores of decision-making units (DMUs) in the context of incentive regulation. The approach evaluates the impact of contextual variables on individual DMU performance and avoids generating undesirably high/low efficiency scores. It is illustrated with data from the Brazilian electricity transmission sector, for which a DEA-based incentivization mechanism induces transmission service operators to economize their costs. Results demonstrate the effectiveness of the proposed approach in providing a more precise evaluation of DMU efficiency. This can help regulatory authorities to make decisions regarding incentivization and performance improvement in regulated industries

Identifying Critical Factors Influencing Warehouse Performance through a Hybrid Methodology

Ritika Saini* (Indian Institute of Management, Lucknow)

With increasing supply chain complexity, operations related to warehouse become more complex. Warehouses play a central role in supply chain, making it important to study warehouse performance. There are many factors when analyzing warehouse performance. It is difficult for warehouse managers to focus on important factors influencing warehouse performance. This study develops a methodology to identify critical ones. Thematic analysis is used for organizing initial data into different themes and getting their groups. Density-based spatial clustering algorithm is utilized to cluster the data set and form the groups in organized way. The clusters are ranked by using PROMETHEE II method.

Improving Performance-based Regulation with Input-Output Pattern Clustering

Mohsen Afsharian* (Leibniz FH, University of Applied Sciences), Peter Bogetoft (Copenhagen Business School)

We introduce a k-centroid clustering approach to enhance interpretability and simplify the evaluation process in the context of performance-based regulation. By clustering entities based on input-output mix patterns, the proposed approach reduces the complexity of underlying technology and prevents unwanted behaviors through extreme input-output combinations, which entities may use to inflate their performance scores. Applied to a real-world dataset of electricity distribution companies, the proposed approach helps entities understand tradeoffs and evaluate new proposals to improve performance. It also assists regulators in identifying inefficient practices, such as high energy losses and distribution costs, promoting a sustainable and efficient electricity sector.

81	Thursday, 10:05 AM – 11:35 AM, Room 5 Session: Wildfire Response and Risk Management Chair: Ahmad Jafarian
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Treatment Effect Estimation of Initial Attack Activities in Wildfire Suppression.

Mostafa Rezaei* (ESCP Business School), Ilbin Lee (University of Alberta), Jen Beverly (University of Alberta)

Wildfires have profound economic and social costs. The initial response to a newly reported fire is critical for ensuring fires are suppressed at small sizes. We estimate the causal effect of dispatched resources on initial attack success under different weather and fire conditions, using 15 years of historical data on wildfires in Alberta, Canada. To de-confound the effect of resources on success, we control for covariates related to weather conditions, wildfire operations, and fire behaviour. Our results provide insight into conditions under which a certain resource is most effective, which can be used to improve dispatching decisions.

Fire Suppression: Integrating Fire Spread, Optimization and GIS

Filipe Alvelos* (University of Minho), André Bergsten Mendes (University of São Paulo)

We consider the problem of managing a set of firefighting resources for attacking wildfire. We discuss optimization models that integrate fire spread (that take into account fuels, slope, wind directions and intensities) for positioning resources while minimizing burned areas and protecting sensible points. We describe a python package that allows the user to introduce data and visualize solutions through an open source geographical information system (QGIS) and exemplify its use in a specific landscape. This application is part of pyO3F developed within the scope of project O3F - An Optimization Framework to reduce Forest Fire, funded by the portuguese science and technology foundation (PCIF/GRF/0141/2019).

Modelling the Wind Effect in Forest Fire Spread

Catarina Santos (Universidade de Aveiro), Ana Raquel Xambre (Universidade de Aveiro), Andreia Hall (Universidade de Aveiro), Helena Alvelos* (Universidade de Aveiro), Filipe Alvelos (Universidade do Minho)

Forest fires are becoming a more and more common occurrence worldwide, endangering human health and the environment. The efforts to quickly extinguish or reduce fires are then very important. The aim of this work is to model the wind effect in forest fire spread using discrete event simulation. The model developed for the progression of the fire considered that the forest is represented by a network graph where the nodes correspond to forest stands and the arcs to the path between them. Some tests were performed, considering different nodes for the fire ignition point, the wind direction and the windspeed.

Designing Emergency Mass Evacuation Network Using a Risk Management Perspective

Ahmad Jafarian* (Rennes school of business - Linköping University), Reza Zanjirani Farahani (Rennes School of Business), Tobias Andersson Granberg (Linköping University)

This paper studies designing an emergency evacuation network (EEN) problem in urban areas. In this network, people should be moved to shelters from city regions during a disaster. Distribution centers (DC) should satisfy the relief demand requested by evacuees transported to shelters. The model minimizes the network's total risk and maximum risk imposed from each grid. To solve the problem, a simulation-based optimization approach is used. A scenario planning approach is used to analyze the effect of the different risk levels on the network configuration. Rennes city, France is considered a case problem to confirm the applicability of the model.

82	Thursday, 10:05 AM – 11:35 AM, Room 6 Track: Disruptive Technology & Operations Management Session: Analytics for Sales Forecasting & Product Review Analysis Chair: Fabian Siekmann
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Text Mining-Approach for Discovering Social Traces in Product Review Analytics

Fabian Siekmann* (University of Bremen), Aseem Kinra (University of Bremen)

The purpose of this study is to develop an online product review mining approach integrating reviewers' historical data. Rich online product review data from amazon.com are mined and analyzed using text analytics techniques and contrasted with historic reviewing behavior. The developed approach is able to augment online product review data to refine insights into consumer demands and potentially helps mitigate credibility issues in unstructured social media data. A new open-source tool for mining online product reviews and reviewers' historical data is published to facilitate online product review research for new product development processes in operations management.

Analysis and Forecasting of Sales in Multi-Channel Distribution through Simulation

Tobias Klima* (TU Dortmund University), Lara Kuhlmann (TU Dortmund University)

In supply chain management, the focus has shifted to greater sustainability and resilience. Demand forecasting is often the basis for process planning and has a major impact on production. The research focus is to investigate how simulation can support the generation of sales forecasts in multi-channel distribution. Therefore, it will be investigated if common simulation methods from logistics and production can be transferred to multi-channel distribution and which other methods of forecasting can be combined with simulation. To validate the simulation model, it will be applied to the product distribution of a large German household goods manufacturer.

Multivariate and Hierarchical Sales Forecasting for Smooth Operations Planning

Lara Kuhlmann* (TU Dortmund University), Tobias Klima (TU Dortmund University)

The focus in operations management has shifted from maximizing efficiency and minimizing costs to increasing both sustainability and resilience of supply chains. Demand forecasts are often the basis for process planning along supply chains and immensely affect the production of waste. The research aims on improving predictions in multi-channel retail through multivariate and hierarchical forecasting. I validate the forecasting models on data provided by the company Vorwerk. Given precise forecasts, deliveries within a logistic system can be aggregated and the need for short-dated deliveries decreases sharply. Moreover, perishable goods would be less likely need to be destroyed.

Resolving Paradoxes of Behavioral Visibility with Product Reviewers' Social Traces

Fabian Siekmann* (University of Bremen), Aseem Kinra (University of Bremen), Herbert Kotzab (University of Bremen)

This study demonstrates paradoxes of behavioral visibility in online product reviews, and how and under which conditions historical reviewer data can mitigate and increase perceived data credibility for new product development. Text analytics techniques are applied to online product reviews and reviewers' historic data from amazon.com to reveal common patterns of behavioral visibility. Focus group data is then used to propose how these patterns increase the perceived credibility of online reviews. The results demonstrate that behavioral-related properties in online product review social trace data can enhance perceived data credibility and challenge identity-related properties assumed necessary for new product development decision-making.

83	Thursday, 10:05 AM – 11:35 AM, Room 7 Session: Healthcare Management and Policy Chair: Abigail Richard Track: Healthcare Operations
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The Impact of Procedural and Distributive Justice in Patient Flow

Matias Kohn* (Technion Institute of Technology), Galit Yom-Tov (Technion Institute of Technology), Anat Rafaeli (Technion Institute of Technology), Salim Halabi (Carmel Medical Center), Shani Brosh (Carmel Medical Center)

We examine a patient routing policy implemented in a hospital, designed to improve fairness towards medical personnel. It governs the routing between the ED and medical wards. We assess its effects on operational and quality-of-care measures: ED and hospital LOS, probability to return to the hospital, and patient mix between the internal wards. We show that the new policy reduced hospital LOS by 14.7%, and ED LOS by 17%, without risking patients, hence, indicating an improvement in hospital operations. We also show that balancing patient mix is one of the drivers of those improvements.

Relieving Cash Constraints at Community Health Entrepreneurs

Lisanne Van Rijn* (Erasmus University Rotterdam), Harwin De Vries (Rotterdam School of Management), Luuk Veelenturf (Rotterdam School of Management)

Community health entrepreneurs (CHEs) sell health products in small rural stores, but frequently report stock-outs. CHEs work and live in areas with high poverty levels and are therefore often cash constrained. We conduct a field experiment in Kenya in collaboration with social enterprise Healthy Entrepreneurs with the aim to relief cash constraints and improve the availability of health products. We test two interventions: a business game and decentralized consignment stock locations. We show that the business game has a positive effect on CHE sales. We further show that the decentralized stock locations can positively affect sales under the right conditions.

An Empirical Examination into Interdependency of Entities in Healthcare Ecosystems

Anand Bhatia* (IE Business School)

The healthcare ecosystem is quite complex with numerous players: patients, providers, policy makers, and payors (insurers). Each entity makes strategic and policy related decisions can influence healthcare outcomes. Such strategies not only vary across entities, but also across levels within the healthcare ecosystem. Due to the interconnectivity of health care, strategies changes at one level may directly impact the effect of strategies at another level. We seek to examine how variations in operational decisions and strategies at both the policy maker and patient levels influence the impact of hospital operational strategies on healthcare outcomes.

Contraceptive Implant Removals: Mobile Outreach Teams to Increase Access

Lisanne Van Rijn* (Erasmus University Rotterdam), Harwin De Vries (Rotterdam School of Management), Dominik Gutt (Rotterdam School of Management), Luk Van Wassenhove (INSEAD)

The demand for contraceptive implant removals is rising due to increasing uptake of the contraceptive implant. Mobile outreach teams can help increase access to removal services. Using service delivery data from NGO MSI Reproductive Choices' outreach teams, we perform a regression analysis to identify drivers of the need for outreach removal services and how operational decisions impact this need. Our results show that the availability of other providers of removal services and poverty levels drive the need for outreach removal services and that visiting a site more frequently and using demand generation methods are strong tools to address this need.

Patent Citation Data Analysis to Inform Knowledge Directives

Abigail Richard* (University of Indianapolis)

It's well-accepted that innovation can potentially be greatly beneficial to firms. However despite the competitive advantage that innovation can provide, the innovation process can be risky. Consequently, it's important for firms to strategically consider potential avenues for research, and selectively choose among plausible research objectives. To aid R&D pharmaceutical partners, we examine the consequences of various relative proportions of knowledge on innovation, and the corresponding role of these knowledge proportions in partnerships. In particular, we examine how a firm's knowledge changes on a year-to-year basis and how that rate of change influences its innovation success.

84	Thursday, 10:05 AM – 11:35 AM, Room 8 Session: Power Purchase Agreement and Crowdfunding Chair: Guang Xiao
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Track: POM-Marketing Interface

Collective Renewable Power Purchase Agreements (PPA): Negotiation and Risk Sharing Mechanisms

Shi Chen* (University of Washington Foster School of Business), Xiaoxuan Hou (University of Washington Foster School of Business)

Corporate PPAs has gained popularity among buyers like Google and Amazon to achieve their renewable goals. Yet signing a PPA remains difficult for small-to-medium-sized corporate buyers, who may not have the expertise and financial resources. As a result, collective PPAs have emerged as a potential solution. We build Nash bargaining-based economic models to compare four risk-sharing mechanisms for these buyers to sign PPA contracts collectively: separate negotiation, agent-based negotiation (different price), agent-based negotiation (same price), and joint negotiation. Our analysis reveals conflicted economic and social interests among stakeholders and identifies negotiation mechanisms that result in the greatest renewable project investment.

Valuation of Power Purchase Agreements for Corporate Renewable Energy Procurement

Roosbeh Qorbanian* (University of Luxembourg), Nils Löhndorf (University of Luxembourg), David Wozabal (Technical University of Munich)

We present a model for pricing power purchase agreements in competitive electricity markets for industrial energy consumers. Central to our approach is a fundamental price model fitted using regularized inverse optimization. We compare the effectiveness of our approach against conventional machine learning approaches using data from the European electricity market.

The Role of Experienced Versus First-time Kickstarters in Crowdfunding Ecosystem

Seoungwoo Lee* (Tulane University), Hyung Sup (Zack) Bhan (Tulane University), Hyoryung Nam (Syracuse University), Joon Ro (Uber Freight)

This study investigates the roles of new and experienced entrepreneurs and backers in the crowdfunding ecosystem under two different platform policies: open and closed. Our results indicate that experienced users were more effective in generating cross-side network effects in open platforms, while new users were more effective in closed platforms. Moreover, new and experienced users had different impacts on supply-side and demand-side diversity, which in turn affected the funds raised on the platform. Our study provides insights on how crowdfunding platforms can balance their user acquisition and retention efforts to promote greater diversity in crowdfunding under different platform policies.

Index Policies for Campaign Promotion Strategies in Reward-Based Crowdfunding

Chenguang Wang (Loughborough University), Dong Li* (Loughborough University), Baibing Li (Loughborough University)

This study considers a stochastic resource allocation problem in Reward-based crowdfunding (with All-or-Nothing profit scheme). Through dynamically selecting projects to highlight on the homepage, we aim to boost their chance of success and investigate optimal promotion strategies that maximize platforms revenue over a fixed period. The model is formulated as a stochastic dynamic program which is however computationally intractable. We decompose the problem into a collection of single-project problem via Whittle's Restless bandit approach and then develop an efficient index policy. Extensive numerical experiments show the proposed index policy outperforms the other benchmark heuristics in most scenarios considered.

Innovation Against Imitation: How to Compete with Copycats in Crowdfunding?

Zepeng Chen (Hong Kong Polytechnic University), Xiaomeng Guo (Hong Kong Polytechnic Univ.), Guang Xiao* (Hong Kong Polytechnic University), Fasheng Xu (Syracuse University)

Information disclosure in crowdfunding is a double-edged sword: On the one hand, releasing more information can induce more contributors to pledge; on the other hand, more public information lowers the barrier to entry and attracts opportunistic copycats. This paper investigates how the startup can compete with copycats in crowdfunding via information and financing strategies. We employ a game-theoretical model where the startup can raise capital from either crowdfunding or bank financing, and characterize the startup's optimal pricing and information disclosure strategies.

85	Thursday, 10:05 AM – 11:35 AM, Room 9 Session: Interconnected Supply Chain & Planning Chair: Michael Plasch Track: Supply Chain Management
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Characterization of Interconnected Supply Chains Based on Network-Level Uncertainties

Matthias Winter* (University of Applied Sciences Upper Austria), Michael Plasch (University of Applied Sciences Upper Austria)

Supply Chains are global networks that are highly dynamic and exhibit non-linear behavior. As geopolitical events, such as acts of war and state-level measures in times of pandemics, can affect these interconnected supply chains (ISC), further research into their structures, dynamics, and resilience is needed. This presentation provides uncertainties and risks that can affect the performance of ISC, based on a systematic literature review. Building on measures of these risks and uncertainties, a method to characterize an ISC is proposed. The proposed framework is then applied to the ISC of a global producer to demonstrate its applicability.

Linked-Data and its Potentials in Interconnected Supply Chains

Michael Plasch* (University of Applied Sciences Upper Austria/ Logistikum Steyr), Matthias Winter (University of Applied Sciences Upper Austria/ Logistikum Steyr)

Worldwide, supply chain managers make millions of decisions every day, but cannot often fully comprehend the scope and implications of those decisions. This is because of the high interconnectedness among multiple supply chains and the constantly increasing complexity of data-sharing initiatives. Data sharing among supply chain entities requires comprehensive technology approaches such as Linked Data. This research applies expert interviews and aims to answer the question of how Linked Data can contribute to improved data exchange in these given supply chain contexts by identifying entry barriers, framework conditions, and interoperability issues that arise in these interconnected supply chain contexts.

Ties That Bind: Exploring Supply Network Evolution in Post-Keiretsu Japan

Ruihong Gao (Osaka University of Economics), Zhaohui Wu* (Oregon State University)

Keiretsu had become less relevant with the internationalization of Japanese OEMs. Until recently, researchers and policy makers become more aware of the crucial roles played by small Japanese firms in the manufacturing processes in hi-tech sectors. This so-called “Japan Inside” phenomena calls for understanding of the evolution of production networks in Japan in the last two decades. We carried out a case study of the evolution of a network precision machine tool equipment sector in Japan. We find that the nature of technology craftwork influence how firms organize their relationships and structure the production network.

Data Envelopment Analysis for Ranking the Reliabilities of Aircraft

Young Chun* (Louisiana State University), Seong-Jong Joo (Air Force Institute of Technology)

A critical system equipped in an airplane could fail during a flight. In such a situation, we abort the flight immediately and land the airplane at the nearest airport. The faulty system is then subject to corrective maintenance before the airplane is assigned for the next flight. Using the maintenance data of 26 airplanes collected during a 38-month period, we consider various prediction models to estimate the failure rate of airplane per flight. Based on the estimated reliability of each aircraft, we then rank the 26 airplanes via the data envelopment analysis (DEA).

86	Thursday, 10:05 AM – 11:35 AM, Room 10 Session: Workforce and Behavioral Operations Chair: Santosh Kumar Shrivastav	Track: Behavioral Operations
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Turnover Intentions in Mixed-Gender-Teams: Long-Term effects of Commitment and Prestige

Tal Harel* (Ariel University Israel), Abira Reizer (Ariel University Israel), Uzi Ben-Shalom (Ariel University Israel), Meni Koslowky (Ariel University Israel)

This study examines a longitudinal model in which organizational prestige is suggested as a potential mediator explaining the associations between team type (mixed-gender vs. non-mixed-gender) and two important outcomes: turnover intentions and commitment. The sample consisted of 280 men employed in similar roles. The study was performed at three points during the training period. We utilized a linear mixed-effects model to examine the long-term effects of turnover intentions, commitment, and prestige. The findings showed long-term effects between the mixed-gender and non-mixed-gender teams in turnover intentions, commitment and prestige. In addition, the hypothesized model was supported, with prestige mediating the relationship between team type and commitment.

Self-Efficacy and Sentimentality to Path from Cognitive Diversity to Ambidexterity

Poala S. Arce López (University of Granada), Dainelis Cabeza Pulles (University of Granada), Antonia Ruiz Moreno (University of Granada), Teresa Ortega Egea* (University of Granada)

This study explores the concept of cognitive diversity and its relationship to ambidexterity in public administration. It analyzes the direct and indirect influence through employees' behavior and traits that improve the capability of being ambidextrous. We draw on trait activation theory, which studies personality traits (sentimentality) according to context (cognitive diversity) and latent propensity to behave in a specific manner (ambidextrous behavior). Structural equations modeling (SEM) was used with data from a sample of 211 employees. The results show a positive direct effect of cognitive diversity on ambidextrous behavior and a mediating effect of behavior and traits on the relationship.

Do HHRR Practices Contribute to Achieving Agility, Adaptability and Alignment in the Supply Chain?

Rafaela Alfalla-Luque* (Universidad de Sevilla), Juan A. Marin-Garcia (Universitat Politècnica de València), José A. D. Machuca (Universidad de Sevilla), Alina Diaz-Curbelo (Universidad de Sevilla)

This research analyses HHRR practices (AMO framework) and SCO top managers support as possible drivers of Triple A-SC capabilities and their possible mediation role on customer satisfaction. The analysis has been done using Partial Least Squares (PLS) on a multi-country (14 developed&emerging countries) and multi-sector (electronics, machinery and automotive components) sample of 271 plants from the last round of the international High Performance Manufacturing (HPM) Project. Preliminary results show, among others, that SCO has a higher impact as direct antecedent of all AAA capabilities than the AMO practices. [Acknowledgements to projects: PY20-01209 and PID2019-105001GB-I00]

Sequential Decision-Making in Performance Management: An Experimental Investigation

Christopher Green (Georgia Tech), Morvarid Rahmani* (Georgia Tech), Karthik Ramachandran (Georgia Tech)

How firms choose to evaluate worker performance can have profound impacts on the workforce. We model the optimal behavior of a supervisor making sequential performance evaluation decisions and conduct an experiment to determine how a participant's behavior replicates the optimal behavior based on the characteristics of the pool of workers.

Investigation of the Issues Associated with Working Conditions in Small-Sized Engineering Firms

Santosh Kumar Shrivastav* (Institute of Management Technology)

This study investigates reasons behind non-compliance with health and safety standards among the owners of small engineering firms. The present study further also extends how this behaviour is demonstrated in their respective firms. Multiple small-sized engineering firms in India were examined by applying a case-based methodology. The findings from the exploration discover that the owners of these firms are myopic, focusing only on immediate and personal benefits, and are unaware of UN Sustainable Development Goals (SDGs). This study enriches the UN Sustainable Development Goals literature by exploring the reasons behind small engineering firm owners' non-compliance with health and safety standards.

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