



POMS

The POMS International Conference in Israel

Tel Aviv, Israel
June 27 – 29, 2017



Jointly organized by:

POMS (Production and Operations Management Society)

ORSIS (Operations Research Society of Israel)

June 27, 2017

7:00 PM 10:00 PM Cocktail reception at the conference hotel

June 28, 2017

7:30 AM 8:30 AM Conference breakfast
 8:30 AM 10:00 AM Parallel session WA
 10:00 AM 10:30 AM Coffee break
 10:30 AM 12:00 PM Parallel session WB
 12:15 PM 1:15 PM Conference keynote, Avishai Mendelbaum
 1:15 PM 2:30 PM Lunch
 2:30 PM 4:00 PM Parallel session WC
 4:00 PM 4:30 PM Coffee break
 4:30 PM 6:00 PM Parallel session WD
 6:30 PM Buses depart for optional dinner at the Goshen restaurant

June 29, 2017

7:30 AM 8:30 AM Conference breakfast
 8:30 AM 10:00 AM Parallel session ThA
 10:00 AM 10:30 AM Coffee break
 10:30 AM 12:00 PM Parallel session ThB
 12:15 PM 1:15 PM Conference keynote, David Zvilichovsky
 1:15 PM 2:30 PM Lunch
 2:30 PM 4:00 PM Parallel session ThC
 4:00 PM 4:30 PM Coffee break
 4:30 PM 6:00 PM Parallel session ThD
 6:20, 6:40, 7:00 PM Buses depart for closing dinner at Punch Line
 9:15, 9:45, 10:00, 10:15, 10:45 PM
 Buses return from closing dinner

Dear POMS Israel 2017 Conference Participants,

On behalf of the Conference Organizing Committee, the program co-chairs, and ourselves, the conference co-chairs, we wish to welcome you to the POMS Israel 2017 Conference, jointly organized with the Operations Research Society of Israel (ORSIS). We have a great conference planned with many exciting talks and social activities. For your convenience, below is a summary of the conference highlights. We look forward to an enjoyable and productive conference.

Conference Program: The detailed program for the conference including all the sessions and abstracts follows in the rest of this booklet. During the two days of the conference, we will have two great keynote speakers. On Wednesday, June 28th at 12:15 PM, we will hear from the Dean of the Technion's Faculty of Industrial Engineering and Management, Professor Avishai Mendelbaum, about theoretical and empirical research in OR/OM. On Thursday, June 29th, also at 12:15 PM, we will hear from Dr. David Zvilichovsky from Tel Aviv University (who served as a special economic advisor to the Israeli Prime Minister's Office) on the Innovation and Technological Revolution in Israel.

Social Events: Three social events will take place during the conference. The first, on Tuesday, June 27th at 7 PM, is a reception at the conference hotel (included in the conference registration). The second, on Wednesday, June 28th at 7 PM, will be a dinner at the Goshen restaurant (note: this is not included in the conference registration and costs \$75 per person). The third, on Thursday, June 29th at 7 PM, is the closing dinner at the Punch Line restaurant (included in the conference registration). Buses will be available to take you to and from the dinners on Wednesday and Thursday, see the conference schedule for details

Conference Tours: Prior to the start of the conference, we offer two exciting tours. The first is a tour of Jerusalem including a visit to both the Old City of

Jerusalem with its ancient sites, holy to the world's three largest monotheistic religions (a must-see when visiting Israel) and Israel's important government institutions, the Israeli Parliament (The Knesset) and the Supreme Court. The tour includes a unique opportunity to meet a member of Parliament and a Supreme Court Justice. The second tour visits two innovative and exciting global companies: Intel Corporation and NaanDanJain. The visits take you for a tour of the companies' respective factories as well as allow you to meet their management. Company representatives will speak to the group and provide insight into Israel's technology revolution, which has resulted in Israel being described as the "Startup Nation" and constituting a leading world innovation force.

Venue: The conference is being held on the -1 and -2 floors, just below the lobby, of the Crown Plaza Hotel in Tel Aviv.

Presentation Halls: The plenary sessions will be held in Bareket Hall (floor -2), while the rest of the conference sessions will be held in the following halls (floor -1): Bareket, Shoham, Inbar, Odem, and Sapir. You should check the program for the precise location of each session.

Wireless: Wireless access is available in all conference areas.

Coffee breaks and lunches: Breakfast and coffee breaks will be held outside of the Bareket Hall (floor -2) while lunch will be served on floor -1.

Help: If you have any questions or need any help, you should apply to the registration desk or speak with someone wearing a blue tag.

Welcome to Tel Aviv,

Yale Herer and Gal Raz
POMS Israel Conference Co-Chairs

Conference Keynote**12:15 – 13:15, Wednesday, June 28, 2017****Bareket Hall (Floor -2)****Theompirical Research in IE/OM/OR: Theoretical & Empirical Journeys through Service Systems (Hospitals, Call Centers, Banks...)****Speaker: Avishai Mandelbaum**

Abstract: I shall describe a personal research journey through service systems. I view these systems through OR/OM/IE lenses, often more specifically as a queueing scientist, and sometimes using operational characteristics as surrogates for financial, psychological and clinical performance. The theory of queueing is ideally suitable for capturing the operational tradeoff that is at the core of any service: quality vs. efficiency. Three cases in point are the Erlang-A, -R and -S models: the first has become a common call center model, by accommodating the choice that customers enjoy; the second arose from emergency departments, in which returns to service are prevalent; and the third captures operational symmetry between servers and customers. All three models valuably portray complex realities. Here value is tested against real service systems, in contrast to prevalent OR/OM/IE practice. My ultimate goal is automatic creation, in real-time, of data-based models for service operations—analytical and simulation. The latter will serve as a validation ground for the former, and both will be universally accessible for applications by researchers, students and practitioners. Prerequisites include measurements of individual events, which then support inference of model primitives, structure and protocols. The above goal is pursued at Technion IE&M Faculty.

Bio: Avishai Mandelbaum is the Benjamin & Florence Free Professor and Dean of the Faculty of Industrial Engineering and Management, Technion, Israel. He has a B.Sc. in Mathematics and Computer Science and an M.A. in Statistics, both summa cum laude from Tel Aviv University. His Ph.D. is in Operations Research, from Cornell University. After graduation, in 1983, he joined the Graduate School of Business at Stanford University. He then left the U.S.A., in 1991, to assume a position at the Technion. Prof. Mandelbaum was an associate editor of the leading journals in his field, and his research and teaching have enjoyed various prizes, in particular the Yanai Prize for Academic Excellence at the Technion. His research has covered stochastic models and statistics, with applications to queueing theory/science and service systems. Prof. Mandelbaum is a founder and the director of the Technion SEE Laboratory. This lab has been collecting and maintaining a unique rich repository of data from service operations.

Conference Keynote**12:15 – 13:15, Thursday, June 29, 2017****Bareket Hall (Floor -2)****The Israeli High-Tech Eco-System: History and Perspective****Speaker: David Zvilichovsky**

Abstract: *“Israel is, by many measures, the country (relative to its population) that has done the most to contribute to the technology revolution”* (Bill Gates).

In this talk we will review some of the shaping episodes in Israel’s Innovative path. Israel, in many ways a true entrepreneurial venture supports the creation of hundreds of new startups every year. A country that, over decades, invested in research and development (as a % of GDP) more than any other nation on the globe; a country where the heavy burden of security financing and a challenging environment encouraged rather than stiffened innovation; a country where the availability of venture capital, measured per capita, is highest in the world. Evaluating the recipe, which created the startup nation, is an ongoing task. Many feel that part of the magic incorporates a disobedient culture, where thinking out of the box and not doing exactly what you are told are common practices, even as part of the mandatory military service. Notwithstanding such a culture trait, much of Israel’s success is also attributed to government policies and smart interventions which supported and continue to actively support innovation and investment in technology and R&D.

Bio: David Zvilichovsky is a faculty member at Tel Aviv University’s School of Management. He joined the business school after serving as an executive in the Israeli hi-tech sector for more than 20 years. Dr. Zvilichovsky started his career as a software engineer for Eshed Robotec and later became the company’s Head of R&D. David worked with and consulted for some of Israel’s leading technology companies. He co-founded IPHighway, a pioneer in the Network QOS space and has been active in numerous financing and M&A transactions including the sale of Ad4Ever to aQuantive (now Microsoft). Over the years David has been active as a board member and advisor in the areas of venture capital, technology innovation and early stage ventures. During the 2008 market crisis he also served as a special economic advisor to the national economic council at the Israeli Prime Minister’s Office. David holds a Ph.D. in Economics as well as an M.S. in Computer Science from Tel Aviv University. Dr. Zvilichovsky’s research emphasizes the interconnection between innovation, uncertainty and financial markets with a focus on venture financing, network externalities and the new Internet economy. Dr. Zvilichovsky teaches courses in entrepreneurship, innovation and micro-economics, as well as an interdisciplinary course which is offered as a joint program together with the Wharton Business School.

Parallel Session WA
8:30 – 10:00, Monday, June 28, 2017
Bareket Hall (Floor -2)

Supply Chain Management 1:
The Use of Data and Information in Supply Chains
Chair: Dina Smirnov

Penina Orenstein

Leveraging financial data to understand the structure, financial performance and vulnerabilities of supply chain networks

Supply chain networks are incredibly complex yet the structure of a company's supply chain directly contributes to its performance. This research harnesses the power of financial data with network visualization software, to create visual maps of key supply chains. We then examine structure, vulnerability and performance using these maps.

Eugene Khmelnitsky, Hadar Amrani

Optimal Division of Inventory in a Supply Chain through Estimation of Demand Distribution Quantiles

We study the problem of the optimal division of inventory between a logistic depot and several geographically-dispersed bases. We show that the solution of the problem is given in terms of quantiles of the demand distribution functions, and suggest a method for estimating the quantiles from the data samples.

Jianjun Xu, Matthew F. Keblis, Youyi Feng

Optimal Dynamic Production and Transshipment Management in a Manufacturing System with Two Facilities and Backordering

We study the problem of controlling a production and distribution system with backlogging over a finite discrete time horizon. The system consists of two manufacturing facilities each producing the same product with proactive transshipment of product between facilities allowed. We characterize the optimal production and transshipment policy for this system.

Dina Smirnov, Yale T. Herer, Assaf Avrahami

The Two-Phase Newsvendor Problem with Optimally-Timed Additional Replenishment

We utilize in-cycle demand information, available from modern information systems, to optimize a newsvendor system with an option of an additional inventory review (AR) and replenishment at an endogenously determined, a priori set time during the period. We jointly optimize the AR timing and order quantities at each ordering opportunity.

Parallel Session WA
8:30 – 10:00, Wednesday, June 28, 2017
Shoham Hall (Floor -1)

Humanitarian Operations 1:
Early Response Operations in Humanitarian Logistics
Chair: Felipe Aros-Vera

Eyal Berliner, Avi Herbon, Yuval Hadas, Boaz Benmoshe

On deploying first response communications infrastructure in sudden onset disaster (SOD) scenarios

We will present the unique logistical challenges that Sudden Onset Disaster (SOD) scenarios pose in general and particularly in deploying first response communications infrastructure. We examine a fundamental offline model for the problem. We will share our experience in WLAN deployments as possible solutions.

Igor Averbakh, Jordi Pereira

Pairwise connection restoration problems in networks

We present a branch-and-bound algorithm for the problem of finding an optimum schedule for restoring connectivity of a transportation network damaged as a result of a disaster. Due dates for restoring the connectivity between some pairs of vertices are given. The maximum lateness of the pairs is minimized.

Simona Cohen Kadosh, Sinuany-Stern Zilla, Jaffe Eli, Ilan Klain, Mia Prachia, Mor Shmuel, Bitan Yuval

Optimal Dynamic Production and Transshipment Management in a Manufacturing System with Two Facilities and Backordering

The first hours after a nature disaster are critical in saving lives. Infrastructure destruction require insightful preparedness for unforeseen events. Based on data we sampled during paramedic services (MDA) drills we run simulations to compare two deployment settings for emergency medical services during nature disasters - static versus dynamic setting.

Tsung-Sheng Chang, Jia-Ying Lin

Victim-to-hospital assignment strategies after mass-casualty incidents

After a mass-casualty incident, nearby hospitals are overwhelmed by the surge of victims. Many victims may thus die due to failing to efficiently and effectively utilize limited medical resources. Hence, this research uses queueing network and simulation techniques to suggest efficient and effective victim-to-hospital assignment strategies to save most lives.

Parallel Session WA
8:30 – 10:00, Wednesday, June 28, 2017
Inbar Hall (Floor -1)

Healthcare Operations Management 1:
Appointment Systems
Chair: Yariv Marmor

Illana Bendavid, Yariv Marmor, Boris Shnits

Appointment scheduling for systems with multiple servers and rigid standby time under pre-determined service levels

We develop a method for determining a patient appointment scheduling in systems with multiple servers and rigid standby time in order to minimize the end of day and increase resource utilization while keeping minimal pre-determined service levels. We conduct some experimental runs and compare to current practice given different environments.

Matan Sudry, Yariv Marmor

Multi objectives appointment scheduling with single server and multiple customers under restricted start time

Patients appointment scheduling with rigid start time, such as PET scan examination, is a stochastic optimization problem with both service and operation objectives. We examine how patients characteristics and systems objectives impact the effectiveness of different priority rules.

Christos Zacharias, Talys Yunes

Multimodularity in the stochastic appointment scheduling problem with discrete arrival epochs

We address the problem of designing appointment scheduling strategies that account for patients' no-show behavior, non-punctuality, emergency walk-ins and random service times. We maintain the discrete nature of the appointment scheduling problem by considering arrival epochs with discrete supports. We demonstrate that the optimal scheduling strategy minimizes a multimodular function.

Ken Klassen, Reena Yoogalingam

Outpatient appointment systems for multi-stage clinics

The addition of physician assistants or nurse practitioners that carry out portions of the patient care before patients see the physician provides a viable alternative for augmenting physician capacity. Appointment scheduling policies are developed for a multi-stage service system using a simulation optimization approach.

Parallel Session WA
8:30 – 10:00, Wednesday, June 28, 2017
Odem Hall (Floor -1)

Technological Operations Management 1:
Empirical Research on the Drivers of NPD Performance
Chair: Felix Giedziella

Daniel Arias Aranda, Francisco Gustavo Bautista Carrillo, José Fernández-Menéndez, Beatriz Minguela Rata, Francisco Sánchez-Montesinos García

An empirical analysis of the impact of AMT and e-commerce on innovation and performance in Spanish firms

The purpose of this research is to analyze the relationship between AMT and E-commerce with innovation in companies, in order to find out their real ability to generate performance. Results confirmed that Advanced Manufacturing Technologies (AMT) and e-commerce have a significant influence on the different measures of innovation.

Sue Abdinnour

A unique enterprise resource planning (ERP) selection process for Envision

We will share the story of helping Envision select an ERP system. The uniqueness of this company is that it employs visually impaired people, who work in administration and on the production line. We will describe our selection process, which also included a usability study of all the ERP systems.

Stefan Pöhler, David Bendig, Malte Brettel

Continuity for renewal? – How management retention in young firms influences post-acquisition product innovativeness

After acquiring technology start-ups, established companies need to decide whether to retain or replace the acquired management team. Our empirical study demonstrates, under which conditions management retention is most beneficial in order to increase radical and incremental innovativeness and whether the number of retained members or their importance is decisive.

Felix Giedziella, Grit Walther

Impact of agile new product development on time-to-market and market diffusion under competition

We present a system dynamics simulation model that connects agile new product development (NPD) and market diffusion under competition. We analyze the effects of different resource allocation strategies for NPD on time-to-market and market success of innovative products. First results will be presented from a case study.

Parallel Session WA
8:30 – 10:00, Wednesday, June 28, 2017
Sapir Hall (Floor -1)

Service Operations 1:
E-Commerce and Service Supply Chains
Chair: Tatyana Chernonog

Stéphane Dauzère-Pérès, **Michael Hassoun**, Alejandro Sendon

Optimizing capacity assignment of multiple metrology tools

We assign the limited capacity of multiple identical metrology tools to minimize the risk on heterogeneous production machines. The control of each production machine is directed to only one metrology tool. The resulting problem is formulated as a Multiple Choice Multiple Knapsack Problem and solved heuristically.

Yuval Cohen, **Eli Weintraub**

Cloud computing economic models for service providers and consumers

This paper provides economic models for suppliers' pricing and consumers' acquisitions in the cloud computing (CC) supply chain. CC has three layers: infrastructure, platform, application. We show that the consumers are better-off buying each service level independently. The CC providers, are better-off bundling their three-layered services as one product.

Amir Elalouf, Imed Kacem, Eugene Levner

Routing in supply networks with forbidden intervals

Consider a routing problem in which operation durations and benefits are given. Forbidden intervals are given for auditing operations wherein the routing operations are stopped. The problem is to find the route maximizing the total benefit not exceeding the given total time for routing. Efficient dynamic programming algorithms are suggested.

Yulia Tseytlin, H. Sebastian Heese

Inventory allocation with substitution under multi-dimensional ordering

Motivated by a production planning problem in the carbon industry, we study a single-period multiproduct allocation model with downward substitution, where products differ along several dimensions.

Parallel Session WB
10:30 – 12:00, Wednesday, June 28, 2017
Bareket Hall (Floor -2)

Supply Chain Management 2
Inventory Decisions in Supply Chains under Uncertainty
Chair: Yonit Barron

Bo Li, **Antonio Arreola-Risa**

Financial risk, inventory decision and process improvement for a firm with random capacity

Consider a company aiming to maximize its firm value in a newsvendor setting with a randomly capacitated supplier and a stochastic demand correlated with the market return. We demonstrate that while the optimal order quantity is independent of the supplier's random capacity, capacity process improvements and firm value are not.

Ülkü Gürler, Emre Berk, Deniz Yenigün

A joint replenishment inventory problem with lost sales

We consider an inventory problem with multiple products under hybrid joint replenishment policies where the unsatisfied demand is lost. We derive the operating characteristics of the model and conduct numerical experiments to assess the sensitivity of the policy parameters to external parameters.

Yonit Barron, **Dror Hermel**

Shortage decision policies for a fluid production model with MAP arrivals

We study a continuous production process with one machine and finite buffer. Demands arrive according to a MAP governed by a continuous-time-Markov-chain, with phase-type distributions depending on type of arrival. For backlog and lost-sales policies, applying regenerative-theory, and tools from exit-time theorem for fluid-processes, we obtain the discounted cost functional.

Yonit Barron, Opher Baron

Perishability models with lead time under (S,s) policy

We consider cost minimization for an (S,s) continuous-review perishable inventory system with random lead-times, perishability time, and a state-dependent Poisson demand. Based on Queuing and Markov Chain Decomposition, we derive the stationary distributions for the inventory level under both backordering and lost sales assumptions. Numerical results and insight are provided.

Parallel Session WB
10:30 – 12:00, Wednesday, June 28, 2017
Shoham Hall (Floor -1)

Humanitarian Operations 2:
Allocation of Resources in Humanitarian Crises
Chair: Marianne Jahre

Ohad Eisenhandler, Michal Tzur

A novel formulation and solution technique for a rich humanitarian logistic problem

We address a problem inspired by the logistic challenges of food banks, in which routing and resource allocation decisions need to be made simultaneously so as to balance effectiveness and equity. We develop a solution methodology based on a novel formulation, which exploits the special structure of the allocation decisions.

Stella Despoudi, Xiao Yang

Challenges of humanitarian logistics in responding to refugee crises

Humanitarian logistics dealing with refugees differs significantly from that of disasters. In refugee crisis, there is no urgent need for relief supplies, however there is need for continuous assistance to meet their short-term and long-term needs. This paper presents a case study of the role and challenges of humanitarian logistics in responding to the refugee crisis

Marianne Jahre

Sharing logistics resources – Mapping and developing logistics preparedness to strengthen societal resilience

One dollar invested in preparedness can save up to seven in the aftermath. The paper presents an approach for developing an all hazards framework and tool for mapping logistics capacity and capabilities, gaps and solutions with the purpose of developing logistics preparedness measures and a method for comparing solutions.

Parallel Session WB
10:30 – 12:00, Wednesday, June 28, 2017
Inbar Hall (Floor -1)

Healthcare Operations Management 2:
Capacity, Inventory, and Predictions in Healthcare Systems
Chair: David Anderson

Raïsa Carmen, Galit Yom-Tov, Inneke Van Nieuwenhuysse, Yishai Ofran, Bram Foubert

How capacity availability and capacity decisions affect hematology patients' health

Patients with hematological diseases undergo chemotherapy treatment at regular intervals. After treatment, physicians decide on the place and length of hospitalization but they are constrained by the availability of beds. Using a detailed and extensive database from a real-life hematology ward, we investigate how these decisions affect the patients' health.

Noa Zychlinski, Avishai Mandelbaum, Izack Cohen, Petar Momcilovic

Capacity planning for geriatric institutions: Analysis of hospital networks via fluid models with blocking

Bed-blocking in hospitals has become a challenge to healthcare operators due to its economic implications and quality-of-life effect on patients. We develop a mathematical fluid model for the patient flow between hospitals and geriatric institutions, to improve their joint operation. Analyzing bed allocation decisions shows that significant cost reductions are achievable.

Vera Tilson, Gregory Dobson

Management of medication inventory in hospital units

Automated dispensing systems are a feature of pharmacy inventory management in many US hospitals. We will discuss the trade-offs involved in exploiting such systems, and formulations for optimization.

David Anderson, Margret Bjarnadottir, Leila Zia, Kim Rhodes

Predicting colorectal cancer mortality

Using a comprehensive dataset of all colorectal cancer patients in California, we generate models that estimate short-term and medium-term survival probabilities for patients. We address contradictions in the literature and significantly improve predictive power over previously published models. Accurate, unbiased predictions can help patients and providers make better treatment decisions.

Parallel Session WB
10:30 – 12:00, Wednesday, June 28, 2017
Odem Hall (Floor -1)

**Technological Operations Management 2:
 Upstream Decision Making in Innovation Efforts**
Chair: Harry Groenevelt

Ayhan Aydin

Upstream technology investments, consumer markets, and R&D risk

We investigate the equilibrium investments in a technology by competing upstream firms in a supply chain considering the consumer demand, profitability, and the riskiness of the R&D process related to the technology. Seemingly positive factors are shown to negatively influence equilibrium investments and the vertical diffusion.

Noam Shamir, David Zvilichovsky

Too talented to innovate? Dynamic entrepreneurial reputation, project selection and welfare

This paper studies heterogeneous execution abilities and asymmetric information where reputation facilitates access to projects generating higher profits. Interestingly, talented entrepreneurs may signal their ability by choosing to forgo profitable projects. We highlight the role of low-NPV projects which affect market efficiency and welfare far beyond their direct-NPV outcome.

Tasnia Reza, Jong Youl Lee, Jaemun Sim, Kyoung-Yun Kim

Comparison framework and repertory grid analysis of crowdsourcing services

This research is to review and analyze multiple crowdsourcing services and to establish a framework that allows systematic discussion, comparison, and assessment of different crowdsourcing service platforms. In this study, we review 25 representative crowdsourcing services and report statistical analysis results with the data gathered by a repertory grid approach.

Jagan Jacob, Harry Groenevelt

Pricing and product technology choice with possible reuse of components

We consider product technology and pricing decisions for a new generation of a product with potential reuse of components. Both monopoly and competitive scenarios are considered, and consumer upgrade and switching behavior depends on prices and technology decisions made by one or both firms.

Parallel Session WB
10:30 – 12:00, Wednesday, June 28, 2017
Sapir Hall (Floor -1)

**Service Operations 2:
 Resource Allocation and Risk Management
 in Service Operations**
Chair: Noam Goldberg

Hussein Naseraldin, Opher Baron

Robust capacity planning under service constraints

Capacity planning is an essential strategic decision. Uncertainty and long horizon are two complicating factors that make this decision hard to take. We propose various models of capacity planning in an uncertain environment where customers demand must be satisfied under a certain service level constraint in single server queues.

Miri Gilenson, Liron Yedidsion, Hussein Naseraldin

PTAS for the bi-scenario total completion time trade-off problem

We study the single-machine scheduling problem of minimizing the total completion time. Each instance includes two distinct scenarios of processing times, resulting in two different objective values for each solution. We present a PTAS for the problem of finding the Pareto-optimal set with regards to the two objectives.

Matan Shnaiderman, Liron Ben-Baruch

Control and enforcement by a leader customer that increase supplier inventory in a JIT contract

In order to ensure that suppliers meet their commitments, customers must formulate incentives or enforce penalties. Initiating a policy of sanctions, the customer becomes the lead player in a Stackelberg game and forces the supplier to hold inventory, which is made available to the customer in real-time.

Noam Goldberg, Tatyana Chernonog

New mathematical programming formulations for constrained multi-item newsvendor with extensions for display capacity constraints

We consider multiproduct newsvendor with uniform and triangular demand distributions. We prove a bound on the number of guaranteed shortage items, whose order quantity is below the distribution lower bound. As an extension to handle fixed costs, we reformulate the resulting MIP as an MISOCP to solve it more efficiently.

Parallel Session WC
14:30 – 16:00, Wednesday, June 28, 2017
Bareket Hall (Floor -2)

Supply Chain Management 3:
Supply Chain Network Design and Location Decisions
Chair: Yael Deutsch

Robert Aboolian, **Oded Berman**, Jiamin Wang

Responsive make-to-order supply chain network design

Consider network design of a congested responsive supply chain of make-to-order facilities. The objective is to determine number, locations and capacities of facilities. Three problems are considered where in one it is required to maintain an acceptable response time and in the other two different penalties on lateness are investigated.

Ebru Angün

Analysis of the value of component commonality through a risk-adjusted assemble-to-order system optimization

This work formulates an assemble-to-order system through a two-stage stochastic programming problem. The first-stage decisions are base-stock levels of components and the second-stage ones are allocation decisions to several products. Risk pooling and operational hedging effects of commonality are numerically investigated for a risk-averse decision-maker for non-stationary and correlated demands

Danny Segev, Ali Aouad

The ordered k-median problem: Surrogate models and approximation algorithms

Motivated by applications in supply chain management and machine learning, much effort has been devoted in the last two decades to various computational aspects of the ordered k-median problem, which develops a uniform and standardized approach to location theory. I will present the first provably-good approximation algorithms for this problem.

Yael Deutsch, Oded Berman, Opher Baron

Service network design under congestion

The problem considered is how to choose the optimal number, locations, and capacities of facilities, taking into account that they may have finite or infinite waiting rooms. The goal is to minimize the sum of traveling, blocking or waiting, service, and setup costs. I will present the solution of the problem, and results of a case study.

Parallel Session WC
14:30 – 16:00, Wednesday, June 28, 2017
Shoham Hall (Floor -1)

Humanitarian Operations 3:
Humanitarian Supply Chain Design
Chair: Reut Noham

Dan Yamin, Shai Gertler, Martial L. Ndeffo-Mbah, Laura A. Skrip, Mosoka Fallah, Tolbert G. Nyenswah, Frederick L. Altice, Alison P. Galvani

Effect of Ebola progression on transmission and control in Liberia

The recent Ebola outbreak across West Africa was the largest, most volatile, and deadliest Ebola epidemic ever recorded. We developed a stochastic transmission model to examine the contribution of disease progression and case fatality on transmission and to examine the potential for targeted interventions to eliminate the disease.

Gregorio Gecchele, **Yuval Hadas**, Massimiliano Gastaldi, Riccardo Rossi, Carlo Pellegrino

Road network vulnerability assessment. A unified framework for infrastructure retrofitting

This paper proposes a multi-disciplinary unified framework for road network vulnerability assessment and infrastructure retrofitting, which takes into account road network functionality, information available on the built environment (bridges, buildings, other lifelines), and time horizon adopted for the analysis.

Nick Loree, **Felipe Aros-Vera**

Facility location and allocation of resources in post-disaster humanitarian logistics

This presentation introduces a facility location model that explicitly accounts for deprivation costs incurred by survivors in post disaster environments. It provides realistic measures of disaster response logistics by allowing for multiple sourcing, number of facilities as a model output, capacity limitations, and inventory allocation decisions.

Reut Noham, Michal Tzur

Design and incentive decisions in humanitarian supply chains

During humanitarian relief operations, designated facilities are established to which the beneficiaries will arrive to receive relief goods. We investigate how the authorities should invest in incentivizing the population to follow their instructions. These decisions need to be combined with those concerning the supply chain design, and the allocation of existing resources.

Parallel Session WC
14:30 – 16:00, Wednesday, June 28, 2017
Inbar Hall (Floor -1)

Healthcare Operations Management 3:
Topics in Healthcare Operations Research
Chair: Joseph Pliskin

Awi Federgruen, Lijian Lu

Medicare reform: Estimation of the impact of premium support systems

In the Medicare Advantage program, premia are heavily subsidized by the government. Various reform plans advocate determining these endogenously as a function of competitive premium bids. Based on oligopoly price competition models tailored toward this market, we estimate the impact such reforms would have on the plans' market shares, equilibrium premia, the government's cost, and the out-of-pocket expenses of beneficiaries.

Udonna Okeke, Wendy Phillips, Jens Roehrich, Steve Conway

The roles of governance mechanisms on the diffusion of innovation in complex healthcare networks

We investigate innovation diffusion in complex healthcare networks, focusing on the roles of contractual and relational governance. We report on an empirical investigation undertaken within the English National Health Service, presenting two in-depth case studies drawn from interviews and meetings with clinicians and practitioners, site visits and secondary data analysis.

Emmanouil Avgerinos, Bilal Gokpinar

The role of a non-clinical workforce on patient service: Evidence from the NHS helpline

Healthcare organizations rely on a mix of clinical and non-clinical personnel in delivering health services. Making use of a novel dataset based on National Health Service (NHS)'s new 111 non-emergency helpline in UK, we quantify and demonstrate trade-offs associated with employing non-clinical personnel in delivering patient service.

Boaz Ronen, Joseph Pliskin

The "hidden hospital"

The lecture presents a methodology that enables hospitals to significantly increase their throughput, reduce response times, and at the same time increase medical quality. By that, it can increase capacity by more than 20% with existing resources. This is the way to reveal the "hidden hospital" that exists in all hospitals.

Parallel Session WC
14:30 – 16:00, Wednesday, June 28, 2017
Odem Hall (Floor -1)

Technological Operations Management 3:
Downstream Decision Making in Innovation Efforts
Chair: Suresh Sethi

Matthew A. Douglas, Robert E. Overstreet, Benjamin T. Hazen

Management innovation diffusion in supply chains: Organizational dependence and outcomes

The success of an organization's management innovation diffusion efforts often re-lies on external agencies. Leaders must understand the role of supporting organizations in achieving innovation diffusion goals and related operational objectives. Overall, enterprise relationships can help an organization further assimilate, and ultimately incorporate, an innovation to ensure operational success.

Getulio Akabane, Claudio Melin Doná, Wagner Delmo Abreu Croce, Clayton Gerber Mangini, Fernando José Bussola

The logistics innovation into the industry 4.0 environment: A typological approach

This paper discusses logistics evolutions based on technological innovation an industry 4.0 environment including future transition models. It proposes logistics operations based on five dimensions as typological development can provide a useful approach for the integration of the various aspects of technology as a pillar in a company operation.

Dan Paulin, Lennart Malmköld, Dan Li, Pierre Johansson, Anna Malm

Technology-assisted sharing of production knowledge in industrialization processes

During the industrialization phase of an R&D process, securing inter- and intra-organizational knowledge sharing between functions and units is vital. In this contribution, we present facilitating, inhibiting and obstructing factors influencing technology-assisted knowledge sharing between manufacturing engineering and assembly. Examples from automotive and aerospace companies are present-ed.

Suresh Sethi

5 steps to supply chain coordination

Papers on supply chain coordination perform four steps: Solve the given problem; solve its centralized version; show double marginalization; obtain a coordinating contract by equating follower's response to centralized optimal. We develop a framework for multi-period supply chains by presenting a missing 5th step showing the coordinated solution to be a Feedback Stackelberg equilibrium.

Parallel Session WC
14:30 – 16:00, Wednesday, June 28, 2017
Sapir Hall (Floor -1)

Service Operations 3:
Queueing and Service Systems
Chair: Uri Yechiali

Gabi Hanukov, Tal Avinadav, Tatyana Chernonog, Uriel Spiegel,
 Uri Yechiali

Queues with inventoried service

We propose a novel approach for increasing efficiency in queueing systems where an idle server produces an inventory of ‘preliminary services’. We formulate a two-dimensional queueing-inventory stochastic system, obtain closed-form formulae for the system’s steady-state probabilities, where Catalan numbers play a roll. Economic analysis follows.

Rachel Ravid, David Perry

A new look on the shortest queue system with jockeying

A Markov system consisting of parallel servers is considered. An arriving customer joins the shortest line. If the difference between the lengths of both queues exceeds some threshold value T , a customer from the longer line, switches to the shorter one. The number of jockeying made by a customer is analyzed.

Mor Armony, Efrat Perel, Nir Perel, **Uri Yechiali**

Exact analysis for multi-server queueing systems with cross selling

Exact analysis of a multi-server Markovian queueing system with cross selling is presented. Cross selling is initiated when the number of customers in the system is below a threshold. Both Probability Generating Functions (PGFs) and Matrix Geometric (MG) methods are employed. The entries of the MG rate matrix, R , are explicitly calculated. Extreme cases are analyzed and numerical results are presented

Parallel Session WD
16:30 – 18:00, Wednesday, June 28, 2017
Bareket Hall (Floor -2)

Supply Chain Management 4:
Agriculture and Food Supply Chain Models
Chair: Polina Kurtser

Tsung-Sheng Chang, **Chieh-Tung Cheng**

Integrating production and distribution in O2O food delivery

This research deals with the problem of integrating production and distribution in O2O food delivery in a dynamic (multistage) stochastic environment. This research proposes a rolling horizon procedure to tackle this multistage problem, in which each stage is associated with a two-stage stochastic program that is solved by a heuristic.

Sebastian Steinker, **Kai Hoberg**, Ulrich W. Thonemann

The value of weather information for e-commerce operations

To improve workforce planning in the warehouses of the largest European online fashion retailer's, we integrate weather forecasts into the demand forecasting process. We find that sunshine, temperature, and rain have a significant impact on demand; particularly in the summer, on weekends, and on days with extreme weather.

Nur Ayvaz-Çavdaroğlu, Burak Kazaz, **Scott Webster**

Agricultural cooperative pricing of premium product

We consider a cooperative that purchases an agricultural product. The cooperative currently pays according to open market prices, and believes that farmers under-invest in quality. We find evidence that this is the case. We propose an alternative approach and estimate its impact on system profit.

Polina Kurtser, Yael Edan

Harvesting sequence optimization under partial initial information

Performance evaluation of an optimized harvesting sequence for a robotic harvester under partial initial information of fruits locations data will be compared to the conditions of full a-priori information. Sensitivity analyses will include evaluation of the effect of accurate target location information including false detections which increase as accuracy increases.

Parallel Session WD
16:30 – 18:00, Wednesday, June 28, 2017
Shoham Hall (Floor -1)

Behavioral Operations Management 1:
Behavioral Aspects of Operations Management
Chair: Alex Coman

Galit Yom-Tov, Anat Rafaeli, Daniel Altman, Shelly Ashtar, Galia Bar, Monika Westphal, David Spivak, Michael Natapov, Neta Barkay, Ofer Ron

Emotion in text-based customer service: Using automatic emotion detection to identify trends and relationships

Using a lexicon-based engine, tailored for customer service chat interactions, we present customer emotion patterns in service interactions. We report comparisons of customer emotion in different types of service industries, and the relationship between customer emotion and accepted indices of customer service quality. Managerial implications will be discussed.

Daniel Altman, Shelly Ashtar, Galit Yom-Tov, **Anat Rafaeli**

Text-based customer service: Using big data to connect customer emotion to service operations

We analyze chat-based service interactions to investigate the concept of emotional load. We show that customer emotion affects employee behavior. In particular, the tendency to take unscheduled breaks, and the length of these breaks. Moreover, we show that customer emotion affects employee efficiency (service time), and discuss managerial implications.

Sriram Dasu, Richard Chase, Alexandra Brunner Sperdin

Service psychology and encounter design: A research agenda

We submit that a set of psychological factors shape customer perceptions, describe how such factors are linked to the flow of an encounter, and identify re-search questions related to them. We are proposing a research agenda for service operations that links behavioral sciences and service encounter design.

Michael Naor, **Alex Coman**

Offshore responsiveness: Theory of constraints innovates customer services

Offshore services should diminish reliance on automatic voice recognition technologies, which detracts executive attention from customer complaints about issues such as miss-communication, time-zone differences, and national culture. Companies should complement the usage of TOC practices to improve key performance indicators by establishing career promotion paths for customer service representatives.

Parallel Session WD
16:30 – 18:00, Wednesday, June 28, 2017
Inbar Hall (Floor -1)

Service Operations 9:
Service and Security
Chair: Jesper Normann Asmussen

Young H. Chun

Airport security screening procedure with two-stage inspection plans

Because of inspection errors, some non-defective items may be classified as defective and some defective items may not be detected during a round of inspection process. We consider the problem of estimating the defective rate and the two types of inspection error and apply it to the airport security screening procedure

Mali Sher

Traffic police enforcement cameras as a supply chain management project

From 2012, the new automatic traffic enforcement cameras started to operate in Israel. It is a Public-Private-Project and involved several government offices and private companies. Some supply chain methods were applied for better flow between the different units in the process. The result is better service and more deterrence.

Rajan Batta, Ramon Auad

Location-coverage models for preventing attacks on interurban transportation networks

The model dynamically locates patrol units, subject to movement and location constraints. It considers a probability of not being able to attend to an attack, due to a distance factor. Three measures are considered: total vehicle coverage; inequity; network coverage. These are applied to a case study in Northern Israel.

Jesper Normann Asmussen, Brian Vejrum Wæhrens

Transforming global supply chain towards increased resilience – A case of complex-engineered products

Faced by increasing volatility and uncertainty, the resilience of global supply chains becomes increasingly important. The transition process towards increased resilience is however poorly understood. This research, investigates the transformation of a global supply chain of complex-engineered products, towards increased resilience. Enablers and barriers for the transformation is discussed.

Parallel Session WD
16:30 – 18:00, Wednesday, June 28, 2017
Odem Hall (Floor -1)

Technological Operations Management 4:
New Directions for Learning from and Prevention of Errors
in Organizations
Chair: Ping Ji

Miyuan Shan, **Fangyu Ye**

The innovative research on the enterprise management model of China quality award companies

In this paper, we analyze the Enterprise Management Model of companies who have won China Quality Awards. We study on the corresponding theories of these management models and explore how these theories help companies to succeed. Furthermore, we provide practical guidance for other companies to be more competitive.

Noa Nissinboim, Eitan Naveh

Process standardization and error reduction: A revisit from a choice approach

This study aims at advancing our understanding of the conditions under which standardization is associated with error reduction. Specifically, we identify a particular condition, referred to as employees' choice, which is associated with standardization.

Zhanna Novikov, Eitan Naveh, Zhike Lei

Individual differences and team errors: Is there a better team configuration?

The attempt to eliminate and to learn from errors leads to inconsistent approach to errors, and may even result in more errors. To balance between error elimination and learning from errors, we suggest a multi-level perspective taking into consideration the characteristics of individuals within a team and team climate.

Ping Ji

Quantifying Kano's model and integrating it with QFD

Quality Function Deployment (QFD) is widely used in product design. But QFD analysis has difficulties of understanding customer requirements accurately. On the other hand, Kano's model can classify customer requirements better. However, Kano's model itself is a qualitative tool. So, this research quantifies Kano's model first. Then, a way to integrate the quantified model with QFD is presented.

Parallel Session WD
16:30 – 18:00, Wednesday, June 28, 2017
Sapir Hall (Floor -1)

Service Operations 4:
Pricing, Scheduling and Risks in Service Systems
Chair: Kangbok Lee

Liron Ravner, **Noam Shamir**

Pricing strategy, capacity level and collusion in a market with delay sensitivity

We study price collusion between two firms providing service to delay-sensitive customers using a discounted repeated game. The equilibrium is fully characterized along with specific conditions for the minimal discount factor that enables collusion. The effect of service value on the firm's revenue and ability to collude is further analyzed.

Jing Dong, **Ohad Perry**

A queueing model for internal wards

We propose a queueing model that takes into account the most salient features of patient-flow dynamics in internal wards. We characterize the maximal throughput, and employ a fluid model to approximate the non-stationary dynamics. The fluid model is shown to possess a unique stable periodic equilibrium, facilitating long-run analysis.

Yuqian Xu, Lingjiong Zhu, **Michael Pinedo**

Operational risk management: Preventative vs. corrective control

We consider a stochastic control framework to analyze the impact of shocks caused by operational risks on a financial firm's value process. We study capital investments in the infrastructure of the firm aiming at mitigating the impact of operational risk events. We analyze investment strategies with preventative and corrective controls.

Xiaojuan Jiang, An Zhang, Yong Chen, Guangting Chen, **Kangbok Lee**

An improved algorithm for the two-stage production scheduling with an outsourcing option

We consider a two-stage production scheduling problem with an outsourcing option to minimize the sum of the makespan and the total outsourcing cost where each operation can be independently outsourced. We prove the tight worst case performance ratio of a known algorithm and we propose an improved approximation algorithm.

Parallel Session ThA
8:30 – 10:00, Thursday, June 29, 2017
Bareket Hall (Floor -2)

Supply Chain Management 5:
Advanced Topics in Supply Chain Management
Chair: Noam Goldberg

Shiry Varem, Hussein Naseraldin, Aharon Ben-Tal

The integrated lateral transshipments and routing problem in a single-commodity supply chain

We tackle the integrated problem of lateral transshipments and routing. By addressing simultaneously the mutual effect of the route and the transshipments, we minimize the system's total cost of inventory and transportation. We take a robust approach to deal with uncertainty aspects in the problem.

Tal Avinadav, Tatyana Chernonog

Setting price and advertising level in a supply chain of perishable products under asymmetric information

We study the interaction between a manufacturer-leader and a retailer who use a wholesale price contract. The retailer knows the demand function, whereas the manufacturer has an estimation of it. Three contracts are investigated, in which responsibility for investing in advertising is borne by the manufacturer, the retailer, or both.

Pelin G. Canbolat

Bounded rationality in clearing systems

This work considers a clearing system where customers arrive according to a Poisson process, and decide to join or to balk in a boundedly rational manner. It first characterizes customer utility and system revenue for fixed price, then finds the revenue-maximizing price, and discusses the effects of bounded rationality.

Nir Halman, Giacomo Nannicini

Fully polynomial time approximation schemes for the continuous nonlinear newsvendor problem

We prove that continuous nonlinear newsvendor problem (CNNV) does not admit relative-error approximation. To circumvent this hardness result, we develop an approximation scheme that has arbitrarily-small additive and multiplicative error at the same time, while requiring a running time polynomial in the input size and the error parameters.

Parallel Session ThA
8:30 – 10:00, Thursday, June 29, 2017
Shoham Hall (Floor -1)

Sustainable Operations 1:
Environmental Sustainability in Manufacturing Supply Chains
Chair: Ülkü Gürler

Torben Schaefer, Maximiliano Udenio, Jan C. Fransoo

Assessing water risk in manufacturing supply chains

We assess the water risk associated with a manufacturing firm's upstream supply chain. We identify physical and amplifying water risks, and use a Monte Carlo Analytic Hierarchy Process Methodology to aggregate and score the water risks associated to suppliers based on location.

Emre Berk, Onurcan Ayas

Technology improvement decisions for a multi-input manufacturer under carbon emissions regulations

We consider a manufacturer whose production process uses multiple inputs with certain carbon footprints in deterministic demand settings. The manufacturer may invest in technology to improve process productivity. We study the optimal improvement decisions under commonly used emissions regulations. We provide the optimal solution structure and share illustrative examples.

Başak Erman, Nesim Erkip, Ülkü Gürler

Integrated manufacturing and transportation policies for a supply chain with carbon costs under stochastic lead time

Reduction in carbon emissions gained importance in recent years as sensitivity on environmental issues has increased. In this research we analyze a two-echelon supply chain with multi-modes of transportation and stochastic lead time under carbon taxation. With these considerations, we searched for the optimal production interval and number of dispatches.

Ülkü Gürler, Emre Berk, Ramez Kian

A production planning problem with carbon emission restrictions

We consider a deterministic finite horizon production planning problem with a nonlinear production function in which lost sales are allowed. The problem is considered under the sustainability regulations which must be adhered. A mixed integer quadratic reformulation approach is proposed as a solution method and the problem is solved under several carbon cap policies. A sensitivity analysis of the cost, emissions and demand loss are conducted.

Parallel Session ThA
8:30 – 10:00, Thursday, June 29, 2017
Inbar Hall (Floor -1)

Healthcare Operations Management 4:
Providing Waiting Time Information in Healthcare Systems
– Theory and Practice
Chair: Galit Yom-Tov

Arik Senderovich, Matthias Weidlich, Avigdor Gal

Feature learning for accurate time prediction in congested healthcare systems

Time prediction is an essential component of decision making in healthcare. To achieve accurate time prediction, clinical patient features must be combined with cross-patient information. We introduce the model of congestion graphs that are mined from data logs of healthcare information systems. We evaluate the approach on two real-world datasets.

Nitzan Carmeli, Galit Yom-Tov, Avishai Mandelbaum

Delay prediction in healthcare systems

Healthcare systems are complex queueing networks involving multiple resource and patient types, highly variable and long waits, and a time-varying environment. We aim to develop real-time estimators for wait-time distributions in such complex networks. We focus on queueing theory predictors, based on individual patient's data and the total system state.

Maayan Efrat, Avi Parush

Personalized information to patients in the emergency department – User-centered design and testing

The design and test of a mobile application informing waiting patients in the ED emphasized simplicity and trust. It focused on users' understanding of the displayed current and subsequent steps, estimated times, and overall process. Test participants understood the process and preferred range time estimates rather than specific times.

Dorit Efrat Treister, Hadar Moriah, Anat Rafaeli

Why am I waiting? The role of information in curtailing aggression

In two field studies in hospital Emergency Departments we show that providing information about organizational procedures can buffer aggression in queues. However, this effect may backfire depending on the duration of the wait, leading to higher aggression. We discuss when and how information should be provided to curtail aggression.

Parallel Session ThA
8:30 – 10:00, Thursday, June 29, 2017
Odem Hall (Floor -1)

Supply Chain Management 9:
Forecasting and Inventory Management
Chair: Avi Giloni

Assaf Avrahami, Avinoam Tzimerman, **Yale T. Herer**, Avraham Shtub

Inventory inaccuracies and operating alternatives

Most supply chain models assume perfect information, in reality this is rarely the case. We examine inaccuracies in the monitoring of inventory levels which are the result of one of three events: shrinkage, misplacement and wrong-scanning. We explore four different information scenarios that operationally take these errors into consideration.

Alon Dourban, Liron Yedidsion

Optimal policy for the multi-period inventory problem with mean reverting price and setup cost

We study a finite multi-period inventory problem for items with stochastic mean reverting price, and periodic setup cost. We suggest an algorithm for minimizing expected total cost, which constructs a set of threshold functions that define the optimal purchasing price. The thresholds dynamics are analyzed with respect to their parameters.

Vladimir Kovtun, **Avi Giloni**, Clifford Hurvich

The value of sharing disaggregated information in supply chains

Consider a two-stage supply chain where the retailer observes two ARMA demand streams. We determine the value of the retailer sharing its demand processes and any additional value from sharing the shocks from those processes. We determine the supplier's mean-squared forecast error under no sharing, process sharing, and shock sharing.

Parallel Session ThA
8:30 – 10:00, Thursday, June 29, 2017
Sapir Hall (Floor -1)

Service Operations 5:
Innovation: Strategy, Operation, and Technology
Chair: Benjamin Yen

Qingquan Liu, **Zhong Ning**

The impact of technology mergers and acquisitions on the innovation performance of precision medical companies

In 2015, China and USA tried to enhance the strategic importance of precision medical industry that technology mergers and acquisitions (M&A) is an effective source to acquire external knowledge. In China, technology M&A is not only a channel of external knowledge sources, but also has become a tool for the tunneling of shareholders.

Jian Ni, Xiaomei Zhang, Lap Keung Chu

Financing product innovation when there is information asymmetry about operations management of the firm

This study is concerned with the financing problem of a product innovation project that aims to improve the product quality, given that there is information asymmetry about the operations management of the firm between the firm owner (entrepreneur) and the investor.

Huai-Che Hong, **Bertrand M.T. Lin**, Chi-Chun Lo

Scheduling with conflict constraints

We consider scheduling problems where job conflicts arise due to limited resource availability. The specific problem setting is given with the presence of fixed job sequences on the machines. We analyze the time complexity as well as propose dynamic programming algorithms.

Benjamin Yen, Culture Wang

Cache-enabled web navigation

The performance of Web navigation is one of critical factors for success of e-commerce. The paper proposes an approach of elastic radiation-based cache management to consolidate navigation and information access by taking into account both Web structure properties and navigation patterns.

Parallel Session ThB
10:30 – 12:00, Thursday, June 29, 2017
Bareket Hall (Floor -2)

Supply Chain Management 6:
Incentives and Competition in Multi-Player Supply Chains
Chair: Frieda Granot

Dror Hermel, Daniel Granot, Elena Katok, Mahesh Nagarajan

Bargaining in supply chains with a single pivotal player

We set-forth a bargaining based SC profit allocation mechanism, for a SC with a single pivotal and numerous non-pivotal agents, using a novel approach to identify the disagreement outcome. The allocation has appealing properties, under different communication settings. We discuss the results of lab experiments based on our theoretical model.

Sanjith Gopalakrishnan, **Daniel Granot**, Frieda Granot, Greys Sosic, Hailong Cui

Incentives and emission responsibility allocation in supply chains

We use cooperative game theory methodology to derive a scheme for allocating the responsibilities of the total GHG emissions in a supply chain to the firms therein which is transparent, easy to compute, lends itself to insightful axiomatic characterizations, and incentivize suppliers to exert, in some sense, optimal abating efforts.

Morris A. Cohen, Shiliang Cui, Fei Gao

Performance, Reliability or Time-to-Market?

We introduce a stylized model for product design of trade-offs between product performance, product reliability and product time-to-market that includes pricing, strategic consumers, an outside option/product, and observable product performance and unobservable product reliability. The resulting rational expectations equilibrium explores the impact of government regulations for reliability and price.

Baozhuang Niu, Jiawei Li, **Jie Zhang**, Hsing K. Cheng, Yinliang Tan

Strategic analysis of dual sourcing and dual channel with an unreliable alternative supplier

We investigate the dual sourcing decision of the OEM in the presence of a competitive supplier and a non-competitive but non-reliable supplier. We find that the OEM always prefers engaging the additional non-competitive supplier although it experiences the yield uncertainty problem. Interestingly, the non-competitive supplier may not have incentives to further improve its production technology once it reaches a threshold

Parallel Session ThB
10:30 – 12:00, Thursday, June 29, 2017
Shoham Hall (Floor -1)

Sustainable Operations 2:
Energy Related Operations
Chair: Ozge Islegen

Baris Ata, **Asligul Serasu Duran**, Ozge Islegen

An analysis of demand response programs in the wholesale electricity market

This project explores the impact of the participation and compensation of demand response (DR) providers in the wholesale electricity market on electricity prices and social welfare. We model equilibrium for generators and DR providers. Then, we analyze the changes in the equilibrium due to varying compensation rates of DR providers.

Slava Shubin, Gad Rabinowitz, Shabtai Isaac

Optimal design of energy efficient building clusters

A model will be presented for identification of the optimal life cycle cost configuration of Renewable Energy and HVAC systems for different sizes, types and climates of near Zero Energy building clusters. The model was developed based on real life case studies across the European Union.

Clara Inés Pardo Martínez, Kelly Murillo

On energy efficiency of eight European countries in the manufacturing area

Data envelopment analysis and Multidirectional Efficiency analysis are used to study the comparative performance of energy efficiency in the European manufacturing sectors taking into account energy intensive and non-energy intensive sectors between 2008-2013. The results indicate that the great majority of countries and sectors analyzed show a decrease in the CO2 emissions.

Baris Ata, Asligul Serasu Duran, **Ozge Islegen**

An analysis of time-based pricing in electricity supply chains

We empirically evaluate the impact of time-based tariffs on the retail electricity market. We find that optimal time-based tariffs reduce peak demand, but don't change consumers' bills significantly. Time-of-use tariffs with predetermined rates can capture most benefits of real-time prices. The environmental impacts depend on the electricity market under study.

Parallel Session ThB
10:30 – 12:00, Wednesday, June 28, 2017
Inbar Hall (Floor -1)

Healthcare Operations Management 5:
Public Health Preparedness: Answering (Largely
Unanswerable) Questions with Operations Research
Chair and Speaker: Margaret L. Brandeau

Public health security – achieved by effectively preventing, detecting, and responding to events that affect public health such as bioterrorism, disasters, and naturally occurring disease outbreaks – is a key aspect of national security. However, effective public health preparedness depends on answering largely unanswerable questions. For example: What is the chance of a bioterror attack in the United States in the next five years? What is the chance of an anthrax attack? What might be the location and magnitude of such an attack? This talk describes how OR-based analyses can provide insight into complex public health preparedness planning problems – and thus support good decisions.

Parallel Session ThB
10:30 – 12:00, Thursday, June 29, 2017
Odem Hall (Floor -1)

Supply Chain Management 10:
Optimization in Manufacturing
Chair: Yossiri Adulyasak

Tali Freed, Kenneth Doerr, Lawrence Sze, Rui Wang, Bryce Taylor,
Scott Malatesta

Optimization of RFID system coverage in a manufacturing environment

We develop an economic model to estimate the value of covering of a marginal unit of space in an RFID implementation. From this model we develop bounds for the optimal number of antennas. We examine these bounds against the floorplans of a number of real-world production facilities, a proposed test-bed.

Hila Hindi Ling, Hillel Bar-Gera

Interaction delay in M/M/C/N and the impact of buffers on harbor quay-crane operations

Reducing average processing time per unit (APT) of loading/ unloading operations is one of the most important objectives in container terminals. The main measure used in the analysis is the relative interaction delay, defined as the ratio between APT and its lower bound examined both by M/M/C/N and simulation models.

Maayan Eyal, Israel Tirkel

Production line performance with partial machine availability and imperfect quality

This work develops analytical models to study the effects of partial availability and imperfect quality on the degradation of throughput along the production line. It considers unlimited and limited buffers, analyses common performance measures and prioritizes the resolution of bottlenecks, exhibiting that unlimited buffers case bounds cases with limited buffers.

Yossiri Adulyasak, Eric Prescott-Gagnon, Thierry Moison

An optimization method for inventory management with multiple products and group service levels

We present a general approach for inventory optimization under group service levels that can be used with nonparametric demand function estimates. This problem is modeled as a coupled Markov decision process. A decomposition procedure is applied to efficiently determine a set of policies that satisfies the global service level targets.

Parallel Session ThB
10:30 – 12:00, Thursday, June 29, 2017
Sapir Hall (Floor -1)

Service Operations 6:
Service and Transportation
Chair: Dvir Shabtay

Claudia Bongiovanni, **Mor Kaspi**, Nikolas Geroliminis

The electric autonomous dial-a-ride problem

We formulate the electric autonomous dial-a-ride problem (e-ADARP), which integrates the characteristics of autonomous vehicles, battery management aspects and classic Dial-a-Ride features. We devise a branch-and-cut algorithm with new valid inequalities derived from e-ADARP properties. Real data from Uber Technologies Inc. in San Francisco is employed for testing purposes.

Edison Avraham, Eugene Khmel'nitsky, Tal Raviv

The decentralized field service routing problem

We study the single-machine scheduling problem of minimizing the total completion time. Each instance includes two distinct scenarios of processing times, resulting in two different objective values for each solution. We present a PTAS for the problem of finding the Pareto-optimal set with regards to the two objectives.

Tsung-Sheng Chang, **Chia-Yi Chiu**

Sea-air simultaneous system and service network designs

Sea-air transport services allow customers to more cost-effectively and quickly manage their supply chains. However, it is quite challenging to simultaneously design sea-air system and service networks. Hence, this research tackles this complicated network design problem by first mathematically modeling the problem, and then proposing efficient heuristics for its solution.

Haya Brama, Elad Shufan, Hagai Ilani, Tal Grinshpoun

Efficiency issues of the fixed route dial-a-ride problem

A Fixed-Route Dial-a-Ride Problem (FRDARP) is a demand responsive transportation solution that consists of a fixed set of terminals and a fixed route. A dynamic programming approach yields a polynomial solution to FRDARP, yet the polynomial's degree is high. We study efficiency improvements that aim at reducing the algorithm's runtime.

Parallel Session ThC
14:30 – 16:00, Thursday, June 29, 2017
Bareket Hall (Floor -2)

Supply Chain Management 7:
Social and Financial Considerations in Supply Chains
Chair: Gad Allon

Benjamin Melamed, Weiwei Chen, Dale Rogers

Equilibrium rate analysis of cash conversion systems

We apply Equilibrium Rate Analysis (ERA) to analyze cash conversion systems modeled as a closed Markovian networks whose product and cash units circulate among inventory, treasury and receivables nodes. The attendant financial metrics of equilibrium net profit rate and rate of return are computed as well as cash-to-cash cycle statistics.

Prina Feldman, Yiangos Papanastasiou, Ella Segev

Social learning and the design of new experience goods

This paper studies the implications of social learning (SL) on a monopolist firm's choice of product price and design when consumers are forward looking social learners, and may choose to strategically delay their purchase in anticipation of product reviews. We show that in the presence of SL, the firm opts for a design of lower expected quality.

Yossi Aviv, Noam Shamir

Financial cross-ownership and information dissemination in a supply-chain

Financial cross-ownership describes a situation in which one company invests in its rival. We study the effect of this investment on the production decisions and information acquisition policy in a supply-chain comprised of two competing retailers and sourcing from a mutual supplier. We show that financial cross-ownership provides stronger incentives to acquire demand information -- an outcome that can also increase the consumer surplus.

Gad Allon

Managing service systems in the presence of social networks

We study the optimal service differentiation policy for service organizations in the presence of social networks. We characterize the optimal resource allocation policy and demonstrate that the value of knowing the structure of the social network depends on the correlation between customers' economic and social values.

Parallel Session ThC
14:30 – 16:00, Thursday, June 29, 2017
Shoham Hall (Floor -1)

Sustainable Operations 3:
Environmental Management and Supply Chain Strategies
Chair: Yael Perlman

Gal Raz, Gilvan Souza

Recycling as a strategic supply source

We investigate how recycling can be used as a strategic source of supply in the presence of competition and a volatile component market. We study the economic and environmental impact of the manufacturers' decision to recycle their products and the implications for customers, competitors, and society.

Fidel Torres Delgado, Sandra Milena Ruiz Marín

A methodological framework for planning and evaluating GHG mitigation actions in industrial logistical operations

This paper develops a methodological framework that allows any company to measure logistics carbon footprint. By estimating mitigation scenarios based on projected economic growth, the procedure improves the identification of appropriate GHG mitigation measures and facilitates planning and control of GHG emissions in logistics processes. A case study is proposed

Yaacov Ozinci, Yael Perlman, Sara Westrich

Can organic and conventional products with different utilities and shelf-lives co-exist?

We consider pricing decisions of agri-food retailers offering organic versions and conventional versions of a single agricultural product. The two versions differ in shelf lives and utility. Notably, under some conditions it is not profitable for a centralized retailer to offer both products, yet two competing retailers can still profit.

Su-Yol Lee, Soo-Hyun Lee, Ji-Hyun Lee

Decarbonized operations management in response to climate change and performance: Lessons from the Korean emission trading scheme (ETS)

In response to climate change, companies are facing several challenges to decarbonize their operations and supply chains. This study explores carbon-conscious operations management practices and their consequences in terms of operational and emission reduction performance. The results based on survey with 197 carbon-intensive firms in South Korea present meaningful implications.

Parallel Session ThC
14:30 – 16:00, Thursday, June 29, 2017
Inbar Hall (Floor -1)

**Healthcare Operations Management 6:
Scheduling and Information in Healthcare Systems**
Chair: Liya Wang

Lijun Ma, Frank Chen, Weili Xue

Timing and quantity decisions in the influenza vaccine supply chain

We consider an influenza vaccination supply chain with one manufacturer and a central government. Using a game-theoretical framework, we show that without government intervention, the self-interested manufacturer and individuals will lead to later vaccination and larger production quantity. The on-going research is to consider incentives to align the interests.

Neal Master, **Nick Bambos**

Scheduling patients with deteriorating health states under emergency

We consider a model for a crisis scenario (e.g. earthquake) where health care resources are over-saturated and patients with rapidly deteriorating health states need to be scheduled for medical attention/treatment. We first investigate the optimal scheduling policy under deterministic functions of patient health deterioration and stochastic times for medical attention/treatment. The objective is to minimize the collective deterioration of the patient group.

Ilya Levner, **Avi Herbon**, Sharon Hovav

Value chain in healthcare supply chain using logistics and health benefit aspects

We study nation-wide influenza vaccination programs using the cost-benefit analysis and taking into account the infection rates, material flows, shortage cost, treatment and medications costs as well as non-standard logistic constraints. We suggest a new mixed integer programming optimization model aimed to minimize the total costs including population protection aspects.

Qiang Zhang, **Liya Wang**, Chunxia Lu

Research on medical information sharing of medical consortium in China based on evolutionary game theory

We established an evolutionary game model between hospitals and governments and studied the equilibrium states. We found that reducing the risk cost of information sharing, standardizing and improving the information quality, providing attractive rewards and promulgating proper punishment policies are key factors in promoting the medical information sharing.

Parallel Session ThC
14:30 – 16:00, Thursday, June 29, 2017
Odem Hall (Floor -1)

**Supply Chain Management 11:
Contemporary Topics and Directions in Operations
Management**
Chair: Kohei Mishima

Benjamin Buetfering, Mohammad Hemen Piri, Hendrik Van Landeghem, Birger Raa

A lean capability maturity model integrated in ETO environments – the state-of-the-art and a requirement analysis

There is a lack of scientific research about capability maturity model integrated (CMMI) for Lean in the ETO production environment. The purpose of this paper is to demonstrate the state-of-the-art as well as to develop a requirement analysis for a CMMI in the ETO lean context.

Jaydeep Balakrishnan, Chun Hung Cheng, Kenneth C.K. Mak

An analysis of international trends in authorship in OSCM journals

We examine the trends in authorship in five major journals that tend to publish operations and supply chain management related articles. Specifically, we examine the degree of globalization in the authorship in these journals. This will give a picture of the status of international knowledge creation academically in the field.

Rich Metters

Religion and operations management

Some operational processes must be changed to accommodate the religion of the workers or customers. Examples will be provided of shift scheduling, transportation issues, and location decisions.

Kohei Mishima

The automobile industry in the East African Community

East African Community (EAC) automotive industry seems to develop in the near future. But there are problems, (1) limitations of each small market, (2) geographical limitations, (3) late comer. We conduct a study on supply chain management of MNEs which try to tap the EAC market and start manufacturing locally.

Parallel Session ThC
14:30 – 16:00, Thursday, June 29, 2017
Sapir Hall (Floor -1)

Service Operations 7:
Transportation Service Operations
Chair: Yuval Hadas

Shlomo Beychok, Hillel Bar-Gera, Tal Raviv, Gad Rabinowitz

Share a ride to the train station using a demand-responsive feeder service

Consider a demand-responsive feeder service that brings passengers to a train station. An optimization model assigns several passengers to each vehicle, and ensures they arrive in time for the train. The objective is to minimize overall travel times, while reducing fuel consumption, traffic, and parking costs.

Eyal Tenzer, **Tal Raviv**

A crowdsourced physical internet for small parcels delivery

We present a novel logistic process for delivering parcels. Parcels are carried by occasional carriers through a network of automatic service points that are used as a pickup, drop-off and intermediate transfer points. An algorithm to route the parcels is introduced, and the applicability of the process is demonstrated using realistic data.

Alon Bloch, Michal Tzur

The hubs location problem in crowd-sourced delivery systems

We consider new crowd-sourced systems that use occasional couriers to deliver packages. Each package may be transferred by several couriers, distributed and collected at service points. We address the problem of selecting the set of service points. This choice will affect the capacity and the operational costs of the system.

Yuval Cohen, Erel Avinery, Dov Hoffman

Framework for personal rapid transit feasibility studies

Personal Rapid Transit (PRT) is a concept that utilizes the height dimension along urban arteries, and reduces the traffic congestion. This paper provides for the first time a framework for the technological, operational, social and financial feasibility analysis of a PRT system. This framework developed while studying the Skytran system.

Parallel Session ThD
16:30 – 18:00, Thursday, June 29, 2017
Bareket Hall (Floor -2)

Supply Chain Management 8:
Inventory Management
Chair: Jan Fransoo

Tao Lu, Ying-Ju Chen, Jan C. Fransoo, Chung-Yee Lee

Shipping to heterogeneous customers with competing carriers

We consider a shipper selling a perishable product to heterogeneous customers in a destination market. The product can be shipped via two competing carriers with distinct speeds. Our analysis reveals a trade-off between the benefits from differentiation and competition. Dual-mode shipping can therefore be inferior to restricting to a single mode.

Ton G. de Kok

(s,S)-policies and newsvendor equations under non-stationary demand

We consider single item inventory management under non-stationary stochastic demand. We show that an optimized (s,S) policy outperforms Wagner-Whitin and Silver-Meal under rolling scheduling in most cases. For optimization we exploit the Newsvendor equation that is shown to hold under very mild conditions, including non-stationary demand.

Marko Jakšič, Peter Trkman

Additive manufacturing as an alternative supply option in spare parts inventory management

We study a dual sourcing spare parts production/inventory problem with the following sourcing options: a relatively inflexible conventional supplier ordering in large batches with long replenishment lead time, and a flexible alternative, potentially capacity limited, supplier relying on additive manufacturing technology.

Jiwen Ge, Dorothee Honhon, **Jan C. Fransoo**, Lei Zhao

Supplying to mom and pop: Traditional retail channel selection in megacities

Nanostores are small independent retailers in the developing world. CPG manufacturers can choose to deliver to nanostores either directly - visiting thousands of stores - or via wholesalers - saving on distribution cost but forfeiting opportunities to develop demand. We develop an analytical model to derive the optimal channel policy.

Parallel Session ThD
16:30 – 18:00, Thursday, June 29, 2017
Inbar Hall (Floor -1)

Service Operations 10:
Social Issues and Multiple Agents in Service Systems
Chair: Eran Hanany

Charles S. Tapiero, Konstantin Kogan

Multi agent financial pricing: Consumption and supplies

This paper defines a financial and multi-agent framework to traditional economic demands and supplies and their prices in production and services. We consider first a two-period multi-agent financial Cournot-Stackelberg game extended to multivariate stochastic multi-agent differential Games. Explicit quantitative results are obtained providing a financial framework to POMS.

Shoshana Anily, Moshe Haviv

The price of anarchy in loss systems

The price of anarchy (PoA) measures the loss of social inefficiency due to customers behaving selfishly. We bound the PoA in parallel M/M/1/1 loss systems when each server has its own service rate and its own service completion reward. The decision is how to route the customers among the servers.

Mohammad Fazel-Zarandi, **Ed Kaplan**

Ohm's law approximations for the FCFS stochastic matching model

The FCFS stochastic matching model developed from Kaplan (1984)'s work modeling public housing assignments. This model was solved by Adan and Weiss (2012), but the solution is quite complicated. We develop Ohm's Law approximations that sometimes reduce to exact results, and via simulation are shown to be highly accurate.

Yossi Bukchin, **Eran Hanany**, Eugene Khmelnitsky

Bucket brigade with stochastic worker pace

With stochastic worker speeds, the Bucket Brigade (BB) production system can improve the throughput rate compared to parallel workers, despite the fact that no blockage or starvation may occur in the latter. When the workers can pass each other, the system always outperforms parallel workers and significantly improves upon BB.

Parallel Session ThD
16:30 – 18:00, Thursday, June 29, 2017
Odem Hall (Floor -1)

Supply Chain Management 12:
Retail Operations
Chair: Elliot Rabinovich

Yangyang Xie, Lei Xie, Meng Lu, Houmin Yan

Performance-price-ratio-utility-based customer choice model: Market equilibrium analysis and empirical study

We consider a market where customers make purchase decisions based on a product's performance-price ratio utility. We characterize the customer choice behavior and the pricing game equilibrium between retailers in such a market. Moreover, we calibrate the model with data obtained from the China TV market.

Leonardo Epstein, Ignacio Inostroza-Quezada

The effects of retail promotions on store traffic: Models with inter-arrival customer data

Customer traffic is a performance measure of retail promotions. We develop an approach that uses inter-arrival times, successful promotions shorten them. Then builds a baseline predicting inter-arrival times during the promotion conditional on the promotion not occurring, and then compares them with the observed inter-arrival times during the promotion.

Anitesh Barua, **Genaro J. Gutiérrez**, Changseung Yoo

Horizontal channel complementarities in a vertically segmented online advertising supply chain

We explore empirically intra-channel and inter-channel interactions in the digital advertising supply chain. We analyze the impact pricing models on campaign performance and quantify inter-channel synergies. Our results enhance the current economic self-rationalization of advertising agencies to include the value derived from cross-channel information integration, and better decision making.

Elliot Rabinovich, Rui Sousa, Sungho Park

Pricing fulfillment in omnichannel grocery retailing through tailored and generalized policies involving in-store service operations

We will share the results of a field study in omnichannel grocery retailing. The study examines the design of fulfillment pricing policies based on customer valuations and costs of in-store service operations. The results contrast the effectiveness of using tailored versus generalized pricing policies for the provision of these services.

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Parallel Session ThD
16:30 – 18:00, Thursday, June 29, 2017
Sapir Hall (Floor -1)

Service Operations 8:
Service and Activity Scheduling/Selection
Chair: Arpan Rijal

Chen Attias, Robert Krauthgamer, Retsef Levi, **Yaron Shaposhnik**

Selection problems with testing

We study the problem of selecting one of many alternatives (e.g., projects or suppliers) whose valuations are random and can be tested (for some cost) to reveal their exact value. We derive a simple near-optimal priority rule for maximizing the expected value of the selected alternative minus the testing costs.

Yossi Luzon, Eugene Khmelnitsky

Scheduling an additive manufacturing process

The term Additive Manufacturing (AM) is used to describe the most recent manufacturing process technologies e.g., 3D printing. We will address the problem of scheduling an AM process. The formalization of two main measures of a given schedule is developed and proved for the search of an optimal schedule.

Noemie Balouka, Avraham Shtub, Izack Cohen

Extending the multimode resource-constrained project scheduling problem by including value considerations

We present a project management model that balances time, cost and value. This research extends the multimode resource-constrained project scheduling problem by including value and by using a robust optimization approach. Through an illustrative example, we demonstrate how the approach enables finding the efficient frontier of solutions.

Arpan Rijal, Marco Bijvank, René de Koster

Integrated cross-dock scheduling and assignment

At cross-docks, scheduling of trucks for processing and assignment to dock-doors are the main decision problems. As each of the problems is known to be NP-hard, they are solved sequentially. We investigate the integrated version of the problem and demonstrate the potential value of integrating both decisions.



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