



*Twelfth Annual Workshop on
Supply Chain and Logistics*

June 1, 2018

Bilkent University
Department of Industrial Engineering
Ankara, Turkey

Program Schedule

- 08:30-09:00: Registration and breakfast
- 09:00-09:10: Opening remarks
- 09:10-10:10: “Multistage stochastic lot sizing problem with nervousness considerations”
Esra Koca, Sabancı University
Discussant: Özlem Çavuş, Bilkent University
- 10:10-10:30: Coffee break
- 10:30-11:30: “Providing development aid for health to the moderately well-off: a bi-level program”
Alec Morton, University of Strathclyde
Discussant: Mehmet Rüştü Taner, TED University
- 11:30-11:50: Coffee break
- 11:50-12:50: Editors’ panel
- Abdullah Daşcı – Area Editor, Computers & OR
- Francisco Saldanha da Gama – Editor in Chief, Computers & OR
- Alec Morton – Associate Editor, IISE Transactions, OR Spectrum
- Stefan Nickel – Editor in Chief, OR for Health Care
- Hande Yaman – Associate Editor, INFORMS Journal on Computing, RAIRO
- 12:50-13:40: Lunch break
- 13:40-14:40: “The day after optimal: operations research and modern logistics”
Stefan Nickel, Karlsruhe Institute of Technology
Discussant: Abdullah Daşcı, Sabancı University
- 14:40-15:00: Coffee break
- 15:00-16:00: “Service location for unit demand customers: dealing with stochasticity”
Francisco Saldanha da Gama, University of Lisbon
Discussant: Sibel Salman, Koç University
- 16:00-16:20: Coffee break
- 16:20-16:50: Practice session
“Inventory placement under storage capacity constraints and a dynamic fulfillment policy”
Onur Özkök, Amazon
- 17:00-19:00: Closing cocktail (Rector’s Residence - Building 49)

Multistage stochastic lot sizing problem with nervousness considerations

Esra Koca, Sabancı University

Abstract: We consider the multistage stochastic lot sizing problem with controllable processing times under nervousness considerations. We assume that the processing times can be reduced in return for extra cost (compression cost). We generalize the static and static-dynamic uncertainty strategies to eliminate setup oriented nervousness and control quantity oriented nervousness. We restrict the quantity oriented nervousness by introducing a new concept called promised production amounts, and considering new range constraints and a nervousness cost function. We formulate the problem as a second-order cone mixed integer program. We observe the continuous mixing set substructure in our formulation that arises due the controllable processing times. We reformulate the problem by using an extended formulation for the continuous mixing set and solve the problem by a branch-and-cut approach. The computational experiments indicate that the reformulation reduces the root gaps and this helps to solve the problem in less computation times. Moreover, in our computational experiments we investigate the impact of new restrictions, specifically the additional cost of eliminating the setup oriented nervousness, on the total costs and the system nervousness. Our computational results clearly indicate that we could significantly reduce the nervousness costs and generate more stable production schedules with a relatively small increase in the total cost.

Esra Koca is an assistant professor at the Industrial Engineering Program of Sabancı University since 2015. She received her BS, MS and PhD degrees in Industrial Engineering at Bilkent University. Her research interests include development of efficient solution methods for mixed-integer programming problems that arise in production, procurement and transportation systems. Her current research focuses on the green lot sizing problem and the day-ahead electricity market clearing problem.

Discussant: Özlem Çavuş is currently an assistant professor of Industrial Engineering at Bilkent University. She received her BS and MS degrees in Industrial Engineering from Boğaziçi University in 2004 and 2007, respectively, and PhD degree in Operations Research from Rutgers Center for Operations Research (RUTCOR) at Rutgers University in 2012. Her research interests include stochastic optimization, risk-averse optimization and Markov decision processes.

Providing development aid for health to the moderately well-off: a bi-level program

Alec Morton, University of Strathclyde

Abstract: In recent years, donors such as the Bill and Melinda Gates Foundation have made an enormous contribution to the reduction of the global burden of disease. It has been argued that such donors should prioritise interventions based on their cost-effectiveness, that is to say, the ratio of costs to benefits. Against this, we argue that the donor should fund not the most cost-effective interventions, but rather interventions which are just cost-ineffective for the country, thus encouraging the country to contribute its own domestic resources to the fight against disease. We demonstrate that our proposed algorithm can be justified within the context of a model of the problem as a leader-follower game, in which a donor chooses to subsidise interventions which are implemented by a country. We argue that the decision rule we propose provides a basis for the allocation of aid money which is efficient, fair and sustainable.

Alec Morton has degrees from the University of Manchester and the University of Strathclyde. He has worked for Singapore Airlines, the National University of Singapore, and the London School of Economics, has held visiting positions at Carnegie Mellon University in Pittsburgh, Aalto University in Helsinki, and the University of Science and Technology of China (USTC) in Hefei, and has been on secondment at the National Audit Office. His main interests are in decision analysis and health economics, and he is one of the developers of the STAR toolkit sponsored by the Health Foundation. He is a member of the International Decision Support Initiative and the Health Service Research Center of USTC.

Alec has been active in the INFORMS Decision Analysis Society and the OR Society. He is on the Editorial Board of Decision Analysis and is an Associate Editor for the EURO Journal on Decision Processes, the Transactions of the Institute of Industrial Engineers, and OR Spectrum. Past consulting clients include the National Audit Office, the Department of Health, the Environment Agency, the Nuclear Decommissioning Authority and the Global Fund to Fight AIDS, Tuberculosis & Malaria. His papers have won awards from the International Society for Pharmacoeconomics and Outcomes Research and the Society for Risk Analysis. His book Portfolio Decision Analysis with Jeff Keisler and Ahti Salo won the INFORMS Decision Analysis Society publication award in 2013 and his paper "CUT: A Multicriteria Approach for Concavifiable Preferences" (with Nikos Argyris and Jose Figueira) was a finalist for the same prize in 2016.

Discussant: Mehmet Rüstü Taner is currently an associate professor of Industrial Engineering at TED University. He received his BS degree in Industrial Engineering from Middle East Technical University in 1996. He earned his MS and PhD degrees also in Industrial Engineering with a minor in Operations Research from North Carolina State University in 1998 and 2001, respectively. Before joining TED University, he was a faculty member at Rensselaer Polytechnic Institute between 2002 and 2003, and at Bilkent University between 2003 and 2012. His research interests lie in the area of design, analysis and optimization of production systems with a primary focus on scheduling and logistics problems. He is a member of INFORMS and YAD.

Editors' Panel

Abdullah Daşcı	Sabancı University – Area Editor, Computers & OR
Francisco Saldanha da Gama	University of Lisbon – Editor in Chief, Computers & OR
Alec Morton	University of Strathclyde – Associate Editor, IISE Transactions, OR Spectrum
Stefan Nickel	Karlsruhe Institute of Technology – Editor in Chief, OR for Health Care
Hande Yaman	Bilkent University – Associate Editor, INFORMS Journal on Computing, RAIRO

The day after optimal: operations research and modern logistics

Stefan Nickel, Karlsruhe Institute of Technology

Abstract: Operations Researchers support Supply Chain Management and Supply Chain Planning by developing adequate mathematical optimization models and providing suitable solution procedures. In this talk we discuss what adequate could mean. Therefore, we may ask several questions concerning “optimality” in Supply Chain Planning under causal and temporal uncertainty: What is an optimal solution? When is it optimal? For how long is it optimal? How should the design of a supply chain be changed when conditions and requirements ask for new structures? In particular, we discuss new approaches to Supply Chain Planning in order to give an optimal transformation from an initial solution over multiple periods to a desired one rather than just specifying an optimal snapshot solution. Time and uncertainty

are the factors triggering the whole discussion. In particular, several flaws often found when dealing with these factors result in so-called “time traps”. We look at the impact of recent technological developments like the Internet of Things or Industry 4.0 on operational supply chain planning and control, and we show how online optimization can help to cope with real-time challenges. Moreover, we re-coin the concept of risk in the realm of Supply Chain Planning. Here the question is how to measure supply chain specific risks and how to incorporate them “adequately” into Operations Research models.

Stefan Nickel is a full professor at the Karlsruhe Institute of Technology – KIT (Germany) and one of the directors of the Institute of Operations Research. He obtained his PhD in mathematics at the Technical University of Kaiserslautern (Germany) in 1995. From 1995 to 2003 he was assistant and associate professor in mathematics at the Technical University of Kaiserslautern. After a full professor position at the Saarland University (Chair of Operations Research and Logistics) from 2003 to 2009, he joined the Karlsruhe Institute of Technology as the Chair in Discrete Optimization and Logistics in April 2009. Since 2014 he is the dean of the Department of Economics and Management at KIT. Stefan Nickel was also member of the scientific advisory board as well as of the management board of the Fraunhofer Institute for Applied Mathematics (ITWM) in Kaiserslautern from 2004-2016. Since 2011 he additionally holds the positions of one of the directors of the Karlsruhe Service Research Institute (KSRI) and of the Research Center for Computer Science (FZI). From 2006-2015 he was editor-in-chief of Computers & Operations Research and is still consulting editor. Moreover, he is editor-in-chief of Operations Research for Health Care. He has coordinated the Health Care working group within the German OR society (GOR) and has been the president of GOR from 2013-2014. Stefan Nickel has authored or co-authored 5 books as well as more than 100 scientific articles in his research areas Locational Analysis, Supply Chain Management, Health Care Logistics, and Online Optimization. He has been awarded the EURO prize for the best EJOR review paper (2012) and the Elsevier prize for the EJOR top cited article 2007-2011. In addition he conducted several industry projects with well-known companies such as BASF, Lufthansa, Miele, or SAP.

Discussant: Abdullah Daşcı is associate professor of Operations Management at the School of Management of Sabancı University. He obtained BS and MS degrees in Industrial Engineering from Bilkent University and PhD in Management from McGill University. Prior to Sabancı, he taught at York University, University of North Carolina at Charlotte, and University of Alberta. His research interests include location

theory and supply chain management. His work has appeared in leading management science journals such as *Operations Research*, *IIE Transactions*, and *European Journal of Operational Research*. He is currently an area editor of *Computers and Operations Research*.

Service location for unit demand customers: dealing with stochasticity

Francisco Saldanha da Gama, University of Lisbon

Abstract: This talk focuses on a two-stage stochastic discrete service location problem involving a finite set of potential locations for the service units and a set of unit demand customers. Each service unit is capacitated in terms of the number of customers it can serve. A here-and-now decision is to be made concerning the units to select and the (single) allocation of the customers to them. Since this decision is made prior to knowing which customers are in fact calling for being served, a service unit may end up facing a demand higher than its capacity. In this case, a recourse action is required that is assumed to be associated with outsourcing. Two strategies are studied: in the first one—server outsourcing—extra capacity is acquired for those service units running out of capacity; in the second one—customer outsourcing—an external service provider is considered for fulfilling the missing capacity. The goal of the problem is to minimize the total setup cost for the service units plus the expected service and outsourcing costs.

Modeling aspects and solution procedures that have been studied for the problem are discussed. A distinction is made between the homogeneous and the non-homogeneous cases. In the former setting, all customers have the same probability of requesting the service. This allows deriving compact mathematical programming formulations for the problem that can be tackled by an off-the-shelf optimization solver for obtaining an optimal solution to instances of realistic size. In the latter, one must resort to approximations since the recourse function becomes intractable even for toy instances of the problem.

Francisco Saldanha da Gama is professor of Operations Research at the Department of Statistics and Operations Research at the Faculty of Science, University of Lisbon, where he received his PhD in 2002. He has extensively published papers in scientific international journals mostly in the areas of location theory, supply chain management, logistics and combinatorial optimization. Together with Teresa Melo and Stefan Nickel, he has been awarded the EURO prize for the best EJOR review paper (2012) and the Elsevier prize for the EJOR top cited article 2007-2011 (2012), both with the paper entitled "Facility location and supply chain management: a review". He is member of various international scientific organizations such as the EURO

Working Group on Location Analysis of which he is one the past coordinators. Currently, he is the Editor-in-Chief of Computers & Operations Research.

Discussant: Sibel Salman is an associate professor at the Industrial Engineering Department of the College of Engineering at Koç University in İstanbul, Turkey. Prior to joining Koç University, she held a faculty position at the Krannert School of Management, Purdue University, USA for three years. She got her PhD in Operations Research from Carnegie Mellon University, USA. During her doctoral studies she was awarded a Fulbright scholarship, the William Larimer Mellon Foundation doctoral fellowship and the IBM Fellowship. She received the first prize in the Annual INFORMS Case competition in 2002 and the Career award from TÜBİTAK (Turkish Science and Technology Council) in 2006. She received the IBM Shared University Research Award in 2007 and the international IBM Faculty Award for her work in Disaster Logistics in 2012. She has published in the areas of disaster logistics, supply chain management, retail operations management, telecommunication network design, production scheduling and design of algorithms. She has over 30 journal publications. She has been/is in the editorial board of Computers and Operations Research, and Production and Operations Management journals. She is the co-founder and a member of the EURO Working Group on Humanitarian Operations.

Practice Session

Inventory placement under storage capacity constraints and a dynamic fulfillment policy

Onur Özkök, Amazon

Abstract: We investigate how to distribute inventory for multiple products among multiple capacity-constrained warehouses serving multiple regions, when demand is fulfilled by a shipping-cost-minimizing policy at real-time. We develop a fast algorithm to distribute the inventory. We present results showing how consideration of the fulfillment policy changes product distribution across warehouses.

Onur Özkök is a senior research scientist in Amazon's Inventory Planning and Control (IPC) team. Onur got his PhD in Operations Research from Bilkent University in 2010, having previously received MS and BS in Industrial Engineering from Bilkent University and Middle East Technical University, respectively. Onur's main research interests include supply chain management, survivable network design, and polyhedral theory. He published four journal articles and filed seven patents (one approved).

Prior to joining Amazon, he worked in spare parts planning department at a semi-conductor manufacturer. At Amazon, he has been part of the central research team for IPC Buying Systems, and has worked on buying, selection, simulation, and removal problems for almost six years. He currently works in Inventory Placement team. During his tenure at Amazon, Onur developed algorithms for capacity control and buying, and he built a research team for simulation. He is currently focused on placement, inventory protection and balancing problems.

Organization Committee

Çağın Ararat: cararat@bilkent.edu.tr

Özlem Karsu: ozlemkarsu@bilkent.edu.tr

Ayşe Selin Kocaman: selin.kocaman@bilkent.edu.tr

Firdevs Ulus: firdevs@bilkent.edu.tr

Bahar Yetiş Kara: bkara@bilkent.edu.tr



Bilkent University
Department of Industrial Engineering
TR-06800 Bilkent, Ankara, Turkey
Phone : +90-312-290-1262
Fax : +90-312-266-4054
Email : akturk@bilkent.edu.tr

www.ie.bilkent.edu.tr