



Manufacturing & Service Operations Management

Publication details, including instructions for authors and subscription information:
<http://pubsonline.informs.org>

MSOM Society Student Paper Competition: Abstracts of 2023 Winners

To cite this article:

(2024) MSOM Society Student Paper Competition: Abstracts of 2023 Winners. Manufacturing & Service Operations Management 26(3):1184-1187. <https://doi.org/10.1287/msom.2024.studentabs.v26.n3>

Full terms and conditions of use: <https://pubsonline.informs.org/Publications/Librarians-Portal/PubsOnLine-Terms-and-Conditions>

This article may be used only for the purposes of research, teaching, and/or private study. Commercial use or systematic downloading (by robots or other automatic processes) is prohibited without explicit Publisher approval, unless otherwise noted. For more information, contact permissions@informs.org.

The Publisher does not warrant or guarantee the article's accuracy, completeness, merchantability, fitness for a particular purpose, or non-infringement. Descriptions of, or references to, products or publications, or inclusion of an advertisement in this article, neither constitutes nor implies a guarantee, endorsement, or support of claims made of that product, publication, or service.

Copyright © 2024, INFORMS

Please scroll down for article—it is on subsequent pages



With 12,500 members from nearly 90 countries, INFORMS is the largest international association of operations research (O.R.) and analytics professionals and students. INFORMS provides unique networking and learning opportunities for individual professionals, and organizations of all types and sizes, to better understand and use O.R. and analytics tools and methods to transform strategic visions and achieve better outcomes. For more information on INFORMS, its publications, membership, or meetings visit <http://www.informs.org>

MSOM Society Student Paper Competition: Abstracts of 2023 Winners

<https://doi.org/10.1287/msom.2024.studentabs.v26.n3>

Copyright: © 2024 INFORMS

Abstract. The journal is pleased to publish the abstracts of the six finalists of the 2023 Manufacturing and Service Operations Management Society’s student paper competition. The 2023 prize committee was chaired by Ersin Korpeoglu (UCL), Simone Marinesi (Whar-ton), and Nur Sunar (UNC). The judges were Adam Elmachtoub, Adem Orsdemir, Agni Orfanoudaki, Alper Nakkas, Amrita Kundu, Antoine Desir, Antoine Feylessoufi, Anton Ovchinnikov, Anyan Qi, Arian Aflaki, Arzum Akkas, Ashish Kabra, Auyon Siddiq, Bilal Gokpinar, Bin Hu, Bob Batt, Bora Keskin, Brent Moritz, Can Zhang, Chloe Glaeser, Cui-hong Li, Daniel Freund, Daniel Lin, David Drake, Divya Singhvi, Dongyuan Zhan, Ekaterina Astashkina, Elena Belavina, Elodie Adida, Emre Nadar, Enis Kayis, Fabian Sting, Fanyin Zheng, Fei Gao, Florin Ciocan, Francisco Castro, George Chen, Georgina Hall, Gloria Urrea, Gonzalo Romero, Guihua Wang, Guoming Lai, Heikki Peura, Hessam Bavafa, Hummy Song, Huseyin Gurkan, Ioannis Stamatopoulos, Iris Wang, Jiankun Sun, Jiayi Joey Yu, Jing Wu, Joel Wooten, John Silberholz, Jonas Oddur Jonasson, Jonathan Helm, Jose Guajardo, Junyu Cao, Kaitlin Daniels, Karen Zheng, Ken Moon, Kostas Bimpikis, Lennart Baardman, Lesley Meng, Lina Song, Luyi Yang, Mazhar Arikan, Mehmet Ayvaci, Meng Li, Mengzhenyu Zhang, Miao Bai, Michael Freeman, Mika Sumida, Ming Hu, Morvarid Rahmani, Mostafa Rezaei, Mumin Kurtulus, Nan Yang, Nazli Sonmez, Negin Golrezaei, Nektarios Oraiopoulos, Nikhil Garg, Nikos Trichakis, Nil Karacaoglu, Olga Perdikaki, Onesun Steve Yoo, Ovunc Yilmaz, Ozan Candogan, Panos Markou, Pengyi Shi, Philipp Cornelius, Qiuping Yu, Renyu Zhang, Robert Bray, Ruth Beer, Ruxian Wang, Saed Alizamir, Safak Yucel, Sanjith Gopalakrishnan, Santiago Gallino, Sarah Yini Gao, Scott Rodilitz, Sebastien Martin, Seyed Emadi, Sheng Liu, Shouqiang Wang, Siddharth Singh, Sidika Candogan, Sina Khorasani, So Yeon Chun, Somya Singhvi, Soo-Haeng Cho, Sriram Dasu, Stefanus Jasin, Stephen Leider, Suresh Muthulingam, Sytske Wijnsma, Taghi Khaniyev, Tian Chan, Tim Kraft, Tom Tan, Tugce Martagan, Vasiliki Kostamj, Velibor Mistic, Vishal Agrawal, Xiaojia Guo, Xiaoshuai Fan, Xiaoyang Long, Yannis Bellos, Yao Cui, Yehua Wei, Yiangos Papanastasiou, Yi-Chun Chen, Yinghao Zhang, Ying-Ju Chen, Yinghao Zhang, Yuan-Mao Kao, Yuexing Li, Zhaohui (Zoey) Jiang, Zhaowei She, and Zumbul Atan.

The 2023 prize winners are as follows:

First Prize

Food Subsidies at the Base-of-the-Pyramid: Take-up, Substitution Effects and Nutrition
Alp Sungu, London Business School

Second Prize

Sequential Search with Acquisition Uncertainty
Cagin Uru, Duke University

Honorable Mention (in alphabetical order according to the author’s last name):

UMOTEM: Upper Bounding Method for Optimizing over Tree Ensemble Models and its Applications
Leann Thayaparan, Massachusetts Institute of Technology

The Impact of Social Nudges on User-Generated Content for Social Network Platforms
Zhiyu Zeng, Tsinghua University

Other Finalists (in alphabetical order according to the author’s last name):

Should We All Work in Sprints? How Agile Project Management Improves Performance
Tobias Lieberum, Technical University Munich

Sooner or Later? Promising Delivery Speed in Online Retail
Zhikun Lu, Emory University

Food Subsidies at the Base-of-the-Pyramid: Take-up, Substitution Effects and Nutrition

Alp Sungu

London Business School

Current affiliation: University of Pennsylvania, alpsungu@upenn.edu

Advisors: Ali Aouad and Kamalini Ramdas, London Business School

This paper studies food purchasing patterns among low-income individuals in India using objective scanner data with an aim to estimate the effects of food subsidies and improve their design. We digitally tracked the purchase histories of over 20,000 individuals by installing scanners in 39 food-selling vendors including groceries, butchers, and street food sellers in an underserved urban settlement in India. We document heavy consumption of temptation goods such as chips, chocolates, and carbonated beverages. In groceries, the share of calories coming from the purchase of packaged snacks exceeds that from the purchase of rice and wheat combined. Notably, such purchases are most prominent among parents' indicating a lack of parental control. To study how food subsidies impact shopping behavior and in turn nutrient purchases, we opened a store mimicking the Indian government's food subsidy stores and randomly assigned 1,255 individuals to a weekly rice and wheat subsidy treatment arm or to a no-subsidy control arm, for a 6-week period. Subsidy take up was 82%. We find that our in-kind subsidy induces both substitution and complementarity effects on beneficiaries' grocery transactions. The purchase of packaged snacks decreases whereas that of complementary foods—such as spices and accompaniments—increases, with no detectable change in total grocery spending or spending at other tracked food vendors. These patterns indicate a substitution from snacking out toward home-cooked meals. These effects are most prominent for working parents—suggesting lack of parental control on children's temptation goods consumption can be driven by their time investment on household production (e.g., cooking at home). We find no evidence of a negative spillover on the purchase of calories, carbohydrates, protein, fat, and several micronutrients, suggesting that nutrients delivered through our in-kind subsidy program are likely to have increased beneficiaries' nutrient intake. Finally, we explore the design of alternative, customized in-kind programs where we exogenously vary the subsidized foods. Based on estimates of the take-up rates, we uncover a trade off between the nutrient richness of different staples and their attractiveness to customers. We find that subsidizing lentils may increase the amount of proteins delivered through the program.

Sequential Search with Acquisition Uncertainty

Cagin Uru

Fuqua School of Business, Duke University, cagin.uru@duke.edu

Advisor: David B. Brown, Fuqua School of Business, Duke University

We study a variation of the classical Pandora's problem in which a decision maker (DM) sequentially explores alternatives from a given set and learns their values while trying to acquire the best alternative. The variations in the model we study are (i) alternatives randomly become unavailable during exploration and (ii) the DM's ability to acquire a remaining alternative is uncertain and depends on a chosen offer price. Such acquisition uncertainties arise in many applications, including housing search, hiring problems, and e-commerce, but greatly complicate the search problem in that optimal policies retain all previously explored alternative values as part of the problem state, as opposed to only the highest explored value as in Pandora's rule. We study Lagrangian relaxations and develop a class of greedy threshold policies that explore alternatives in a static sequence and make offers only on the most recently explored alternative, provided its value exceeds a given threshold. We show how to compute these policies using a greedy algorithm whose worst-case run-time scales linearly (up to logarithmic factors) in the number of alternative types. We show that our policies (a) are asymptotically optimal in high multiplicity regimes with many alternatives and (b) obtain at least $1 - 1/e \approx 63.2\%$ of the optimal value under a broad set of conditions. Our central insight is that despite the complexity that the acquisition uncertainties create, simple greedy policies based on fixed sequencing and a single threshold value enjoy strong performance guarantees. Extensive numerical examples support this theory: we illustrate our policies on a variation of Pandora's problem with disappearing alternatives and housing search on models calibrated on data from the online brokerage Redfin. In these examples, our policies significantly outperform policies based on Pandora's rule.

UMOTEM: Upper Bounding Method for Optimizing over Tree Ensemble Models and its Applications

Leann Thayaparan

Massachusetts Institute of Technology, lpgt@mit.edu

Advisor: Georgia Perakis, Massachusetts Institute of Technology

Problem definition: Significant growth in data availability has made the use of machine learning tools core

to forecasting and planning. However, when decision makers are provided with trained machine learning models, often these models are difficult to then optimize over. Specifically, our work found that a Random Forest best fit the retail sales data set from Oracle Retail but when tree-based models, such as Random Forest or XGBoost, are used in optimization formulations they then require an exponential number of binary decision variables. This makes optimizing decisions based on the demand forecast intractable. **Methodology/results:** We propose UMOTEM (Upper Bounding Method for Optimizing over Tree Ensemble Models), an algorithm for optimizing an objective function that is determined by a tree ensemble model. The algorithm optimizes to narrow the region of decision variables to an approximate region of optimality. It does this by iteratively optimizing as it moves down the trees in the forest, at each step only using information available at that depth of the tree. This improves the problem's complexity, with the number of binary variables scaling only linearly and in terms of tractability, quickly outpacing the exponential growth of the alternative mixed-integer optimization formulations. We prove an expected optimality gap guarantee bound but also demonstrate computationally that our algorithm can capture over 90% of optimality on publicly available data sets. We show that the method is general and can be used in a variety of settings. **Managerial implications:** Through work with Oracle Retail, we show how UMOTEM can be crucial to improving decision-making processes. For Oracle Retail's fashion client, the problem of demand prediction is complex enough that most models struggle with forecast accuracy. While random forest improves forecasting accuracy, it is then difficult to use the model when making other decisions. From pricing decisions to promotion schedule to inventory management there are several optimization problems that are dependent on the demand forecast. The scale of the problem means that most existing exact formulations cannot solve it in any meaningful amount of time. However, UMOTEM can solve the problem for several time periods while incorporating necessary business constraints. We demonstrate that UMOTEM's optimized discount policy is able to improve revenue by 12–13% over the original policy.

The Impact of Social Nudges on User-Generated Content for Social Network Platforms

Zhiyu Zeng

Tsinghua University, ceng-zy13@tsinghua.org.cn

Coauthors: Hengchen Dai, University of California, Los Angeles; Dennis J. Zhang, Washington University in St. Louis; Heng Zhang, Arizona State University; Renyu Zhang, Chinese University of Hong Kong; Zhiwei Xu,

Tsinghua University; Zuo-Jun Max Shen, University of California, Berkeley

Advisor: Zuo-Jun Max Shen, University of California, Berkeley

Content-sharing social network platforms rely heavily on user-generated content to attract users and advertisers, but they have limited authority over content provision. We develop an intervention that leverages social interactions between users to stimulate content production. We study *social nudges*, whereby users connected with a content provider on a platform encourage that provider to supply more content. We conducted a randomized field experiment ($N = 993,676$) on a video-sharing social network platform where treatment providers could receive messages from other users encouraging them to produce more, but control providers could not. We find that social nudges not only immediately boosted video supply by 13.21% without changing video quality but also increased the number of nudges providers sent to others by 15.57%. Such production-boosting and diffusion effects, although declining over time, lasted beyond the day of receiving nudges and were amplified when nudge senders and recipients had stronger ties. We replicate these results in a second experiment. To estimate the overall production boost over the entire network and guide platforms to utilize social nudges, we combine the experimental data with a social network model that captures the diffusion and over-time effects of social nudges. We showcase the importance of considering the network effects when estimating the impact of social nudges and optimizing platform operations regarding social nudges. Our research highlights the value of leveraging co-user influence for platforms and provides guidance for future research to incorporate the diffusion of an intervention into the estimation of its impacts within a social network.'

Should We All Work in Sprints? How Agile Project Management Improves Performance

Tobias Lieberum

Technical University of Munich, Germany, tobias.lieberum@tum.de

Advisor: Rainer Kolisch, Technical University of Munich, Germany

Problem definition: Agile project management, in particular Scrum, is enjoying increased use in practice despite only scant scientific validation. This article explores how agile project management impacts project performance and execution. We compare the effects of agile sprints—short-term project phases characterized by time-boxed progression from one sprint to the next

and self-imposed, phase-specific output goals—with those of traditional project management. **Methodology/results:** We decompose the two sprint elements of time-boxed progression and self-imposed, phase-specific output goals as factors in a 2×2 experimental design. We then conceptualize project execution as a simple real-effort task and conduct a controlled laboratory study. For a given duration, participants perform better with time-boxed progression as, without it, that is, with flexible progression, they spend too much time on early project phases at the expense of later ones. We refer to this effect as “progression fallacy” and show how it differs from well-known behavioral effects that cause project delays. Introducing self-imposed, phase-specific output goals in combination with time-boxed progression, as proposed by Scrum, does not significantly improve performance when compared with time-boxed progression alone. However, the combination of self-imposed, phase-specific output goals and flexible progression, as is common in traditional project management, amplifies the progression fallacy with the result that goal setting has a negative performance effect. In two control treatments, we show that the progression fallacy is robust to planning and progression prompts despite some mitigation. **Managerial implications:** This study contributes evidence of higher project performance when working in agile sprints, which mitigate behavioral flaws present in traditional project management. Not only do these behavioral insights apply to project management, they are also relevant in the broader context of task completion.

Sooner or Later? Promising Delivery Speed in Online Retail

Zhikun Lu

Goizueta Business School, Emory University, zhikun.lu@emory.edu

Coauthors: Ruomeng Cui, Goizueta Business School, Emory University, ruomeng.cui@emory.edu; Tianshu Sun,

Cheung Kong Graduate School of Business, tianshusun@ckgsb.edu.cn; Joseph M. Golden, PerfectRec.com, jgolden9@gmail.com

Advisors: Ruomeng Cui (Goizueta Business School, Emory University) and Tianshu Sun (Cheung Kong Graduate School of Business)

Problem definition: Online retailers have to provide customers with an estimate of how fast an order can be delivered before they decide to make the purchase. Retailers can strategically adjust this delivery speed promise online without changing offline infrastructure, and doing so may fundamentally impact business outcomes. It can influence consumers’ purchasing decisions and post-purchase experiences, often in the opposite direction. On the one hand, an aggressive (i.e., faster) delivery estimate could ensure that more customers meet their deadlines and thus may increase their purchases ex ante. On the other hand, an aggressive estimate tends to overpromise, potentially leading to a longer than expected wait time, which can lower customer satisfaction and increase product returns ex post. In this research, we estimate the causal effect of retailers’ delivery speed promise on customer behaviors and business performance. **Methodology/results:** Collaborating with Collage.com, an online retailer that sells customized photo products across the United States, we exogenously varied the disclosed delivery speed estimates online while keeping the physical delivery speed unchanged. Using the difference-in-differences identification strategy, we find that a faster promise increases sales and profits, but it also increases product returns and reduces customer retention. In addition, we propose a data-driven model that uses the estimated parameters to optimize delivery promises to maximize customer lifetime value. **Managerial implications:** Our findings provide managerial insights and a data-driven policy that retailers can leverage to optimize and customize their delivery promises.