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THE FRANZ EDELMAN AWARD
Achievement in Operations Research

Introduction: 2024 Franz Edelman Award for Achievement in Advanced Analytics, Operations Research, and Management Science

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Abstract. This special issue of the *INFORMS Journal on Applied Analytics* (formerly *Interfaces*) is devoted to the finalists of the 2024 annual competition for the Franz Edelman Award for Achievement in Advanced Analytics, Operations Research, and Management Science, the profession's most prestigious award for deployed work. As in previous years, the finalists this year cover a wide range of industries and functions.

Keywords: OR practice • business analytics • OR implementation • OR success stories • Edelman Award

It is an honor for us to serve as chair and special-issue editor, respectively, of the 2024 annual international competition for the Franz Edelman Award for Achievement in Advanced Analytics, Operations Research, and Management Science. The 2024 competition was held on April 15, 2024 at the INFORMS Analytics Conference in Orlando, Florida. Six finalist teams described how they applied operations research (OR) and advanced analytics to solve diverse and difficult decision problems. The problem domains include forecasting and revenue management in passenger ferry industry, predictive control for continuous steel annealing operations, data-driven inventory management for special buys in retail, optimized nationwide taxi ride planning to increase mobility for elderly and disabled citizens, large-scale supply chain network optimization, and real-time flight rescheduling facing disruptions.

These entries highlight not only the high-impact models the proponents have created but also the remarkable and diverse ways these proponents have made advanced analytics modeling and analysis a part of strategic thinking and operational practice at their organizations. The finalist teams represented six different countries—Germany, the United States, China, Denmark, India, and the Netherlands.

About the Edelman Award Competition

The Franz Edelman Award competition is jointly sponsored by INFORMS and the INFORMS Section on Practice. The purpose of the competition is to bring forward and recognize outstanding examples of

advanced analytics, OR, and management science (MS) practice. The award is named in honor of Franz Edelman, who established one of the earliest industrial analytics and OR/MS groups in North America at RCA. He worked at RCA for more than 30 years and is counted among the fathers of innovation in analytics and OR/MS.

The Edelman finalist awards are for implemented work that has had significant, verifiable, and measurable impact. The impact may be beneficial to the organization winning the award (e.g., by increasing its revenues or reducing its costs) or to others (e.g., by improving their customer service or reducing overall environmental impact). This year, the prize money totaled \$15,000, with \$10,000 going to the winner. More important, the finalists have the honor and satisfaction of knowing their work has been recognized by their peers as the best in the profession. All finalists, except for American Airlines, have their efforts described in this special issue of the *INFORMS Journal on Applied Analytics*. Unfortunately, the American Airlines team did not provide a paper in time for this special issue, but is expected to complete a paper, which will be published in a future regular issue.

The Process

The Edelman Award process begins with a call for entries in the summer prior to the scheduled competition date (in 2023 for this competition). The selection committee reviews all entrants and selects a set of semi-finalists. Verifiers then work behind the scenes to

validate the claims made by each semifinalist and to convey this information to the rest of the selection committee. Verification is performed by a mix of practice-oriented academics and full-time practitioners. The verifiers communicate directly with the entrant's team, the users of the work, and client management. Support from client executives is important. Verification is a crucial element of the competition because it ensures that only the highest-achieving OR/MS and advanced analytics work makes it to the Edelman Award finals. All verifiers are provided with written guidelines and sample verification reports.

The selection committee studies and discusses the verification reports to select six finalists. Coaches are assigned to each finalist team; these coaches help the finalists improve their papers and presentations for the competition. Typically, multiple iterations of paper and presentation drafts are required to clearly convey the work to a general INFORMS readership and audience within a limited number of pages and presentation lengths.

Judges study the papers, listen to the presentations, and then discuss the finalists' accomplishments until they reach a decision on which finalist is most deserving of the Franz Edelman Award for Achievement in Advanced Analytics, Operations Research, and Management Science. Relevant factors include the overall impact and value of the application, the level of technical innovation, the difficulty of the obstacles surmounted, and the work's portability to other application contexts.

The Finalists and the Papers in This Issue

Here is a summary of the finalists listed in the sequence in which their papers appear in this special issue.

Molsslinjen for *Data-Driven at Sea: Forecasting and Revenue Management at Molsslinjen*

Denmark-based Molsslinjen is one of the largest passenger ferry operators in the world, operating an extensive fleet of fast-moving catamaran ferries that transport passengers and vehicles across nine routes. As part of its efforts to digitalize and transform operations, Molsslinjen collaborated with Halfspace, a data, analytics and AI company based in Copenhagen, to develop a sophisticated forecasting and revenue management toolbox. Unlike in a typical airline or hotel setting, passenger ferry operators face the unique challenge of packing vehicles of varying sizes quickly and efficiently into the ferry's cargo area, often with less than 30 minutes before departure, while also accounting for the spatial weight distribution of the ferry. The toolbox leverages machine learning and predictive analytics

to forecast the number and types of passengers and vehicles up to a year in advance, with continuous adjustments until departure to support both advance planning and real-time decision making by operators. It also incorporates data-driven dynamic pricing strategies that optimize ticket sales across multiple fare categories by modeling price elasticity and upsell potential from low fare to standard fare. Implemented across Molsslinjen's operations since 2020, this solution has resulted in annual savings of \$2.6–3.2 million, totaling \$5 million by December 2023, a significant reduction in delayed departures and average departure delays, and a 3% reduction in fuel costs and emissions.

ALDI SÜD Germany for *Data-Driven Inventory Control and Integrated Employee Involvement for Special Buys at ALDI SÜD Germany*

ALDI SÜD Germany, a subsidiary of the ALDI SOUTH Group, initiated the "Data-Driven Special Buys" project in response to pandemic-related supply chain disruptions, evolving market demands, and increased competition. The special buys product range includes 50 categories of seasonal products with an eight-week shelf life, which must be ordered a year in advance due to long supply chains, with no options for replenishment, backordering, or holding excess inventory. The project aimed to optimize the product life cycles of special buys through centralized data-driven inventory management, based on advanced analytics and OR, combined with increased responsibility among store employees. Key components of the solution include multiperiod mixed-integer optimization models for national order quantity decisions, classification methods for store-level allocation, proprietary algorithms for just-in-time reallocation across stores, and a multiperiod dynamic programming model and its stochastic variant for markdown optimization. Additionally, a smartphone application enables all employees to participate in suggesting and evaluating new products. The project's proprietary solutions have streamlined operations for 40,000 store employees, saving millions of working hours in labor costs and reducing markdown and disposal losses by 29%, resulting in annual savings of several million euros in Germany.

McDonald's China for *McDonald's China Adopts Operations Research for Network Design*

McDonald's, a leading food service provider with over 40,000 restaurants worldwide, aims to expand its footprint in China from 4,000 restaurants in 2021 to 10,000 by 2028. This ambitious growth, combined with the geographical diversity of its locations, has created

significant logistical challenges for McDonald's China and its logistics partner Xiahui Logistics, in ensuring efficient and cost-effective supply chain operations tailored to the needs of each location. To address these challenges, McDonald's China partnered with Optimization Analytics Technology (OAT) to develop a large-scale supply chain network design (SCND) solution based on mixed-integer linear programming models. This solution optimizes key decisions related to facility locations, sizes, and product flows across the network, enabling McDonald's to adapt its supply chain to the scale and complexity of the Chinese market. Size-reduction techniques were applied to manage the model's large scale, allowing the analysis of hundreds of scenarios to identify optimal strategies. Since its implementation in June 2022, the SCND solution has achieved an expected total mileage reduction of approximately 28.5 million ton-kilometers, resulting in a 10.6% reduction in CO₂ emissions and average annual savings of \$8.9 million.

Tata Steel Limited for Optimization of Continuous Steel Annealing Operations Using Model Predictive Control at Tata Steel, India

Tata Steel, one of the world's largest and most geographically diverse steel producers, is focused on retaining its leadership position in the Indian automotive steel market, which has been experiencing significant growth in both demand volume and the variety of steel specifications. To support this objective, Tata Steel embarked on a digital transformation effort with the application of advanced analytics and optimization to its manufacturing processes and supply chain. One key area of focus has been improving the quality and efficiency in its continuous annealing process, a critical heat treatment applied to cold-rolled steel strips to achieve specific temperatures and ensure mechanical property standards. This process is inherently complex due to factors such as slow furnace temperature dynamics, time delays, and variable steel mass flow rates. To address these challenges, Tata Steel collaborated with the Indian Institute of Technology Bombay to develop a model predictive control (MPC)-based solution tailored for the continuous annealing process. The MPC system employs a dynamic model that incorporates data from perturbation trials and historical process information to generate optimal furnace setpoints, enabling smooth temperature transitions during steel grade changes while meeting operational constraints. Since its full-scale implementation in January 2023, this solution has increased the proportion of annealed products meeting the premium quality band from 30% to 49% and reduced specific fuel consumption per ton of steel by 8%, resulting in

estimated annual savings of \$2.5 million and a reduction of 10,000 tons in CO₂ emissions.

Transvision for Optimizing Mobility for Elderly and Disabled Dutch Citizens Using Taxis

Each year, approximately 200,000 elderly and disabled citizens in the Netherlands rely on subsidized long-distance taxi services coordinated by Transvision. Meeting the mobility needs of this vulnerable group, which involves planning up to 15,000 daily rides across multiple subcontractors, presented a complex logistics challenge, because taxi drivers frequently had to travel far outside their usual operating areas and often return without passengers. To address these inefficiencies, Transvision partnered with CQM and Geodan to develop an optimization solution that consolidates these taxi rides into efficient routes, incorporating a fairness mechanism to ensure an equitable distribution of rides among subcontractors. This solution leverages OR techniques, simulated annealing heuristic, and parallel processing to manage large-scale data, ensuring effective coordination across dozens of subcontractors while adapting to challenges such as regulatory changes and COVID-19 measures. Since its implementation in January 2020, this solution has improved service quality, with increased punctuality and a 50% increase in passenger satisfaction. Additionally, it has reduced driving distances by over 15 million kilometers annually and generated combined financial savings of 60 million euros for all stakeholders from 2019 to 2023, with an additional 30 million euros in projected savings for 2024 and 2025.

Conclusion

The Edelman finalists' papers make this issue of the journal special for both practitioners and academics. Practitioners can benefit in at least four ways. First, they will find better ways of accomplishing their work using advanced analytics models in a diverse group of organizations in both the private and public sectors. Second, they will find better ways to advocate their ideas to others within their organizations by pointing out the impact of adopting analytics modeling. Third, they will learn how to bring about change in an organization to make OR-based modeling and analysis an integral part of its culture. Finally, they can be inspired to tackle challenging problems and make the modeling choices necessary for their effective solution and deployment.

Academics will find validation of the advanced methodology they teach and will be able to demonstrate what can be achieved with OR/MS and advanced analytics. Furthermore, these examples illustrate how model customization is often required to suit the problem context.

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