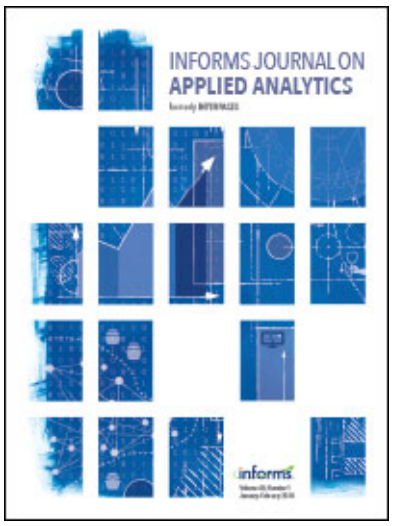

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THE FRANZ EDELMAN AWARD
Achievement in Operations Research

Introduction: 2017 Franz Edelman Award for Achievement in Operations Research and the Management Sciences

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Abstract. This special issue of *Interfaces* is devoted to the finalists of the 46th annual competition for the Franz Edelman Award for Achievement in Operations Research and the Management Sciences, the profession's most prestigious award for deployed work. As in previous years, the six finalists this year cover a wide range of industries and functions.

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

It is an honor for us to serve as special issue editor and chair, respectively, of the 46th annual international competition for the Franz Edelman Award for Achievement in Operations Research and the Management Sciences. This is a competition that brings together the best applications in operations research (OR), management science (MS), and advanced analytics. This 2017 competition was held on April 3, at the INFORMS Analytics Conference in Las Vegas, Nevada. Six finalist teams described how they applied OR and advanced analytics to solve diverse and difficult decision problems. The problem domains include collecting blood, designing products, dispatching trains, pricing rents of retirement apartments, providing incentives for off-hours deliveries, and analyzing capacity of greenfield mines.

These entries highlight not only the high-impact practical 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.

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 OR, MS, and advanced analytics practice. The award is named in honor of Franz Edelman, who established one of the earliest industrial OR/MS/analytics 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 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 to others (e.g., by reducing pollution). INFORMS presents trophies commemorating the award to the client organizations that used the finalists' work and presents medals to the finalist authors. This year, the prize money totaled $15,000, with $10,000 going to the first-place winner. More importantly, the finalists have the honor and satisfaction of knowing their work has been recognized by their peers as the best in the profession. In addition to having their efforts described in this special issue of *Interfaces*, all finalists have their presentations available at https://www.informs.org/Resource-Center/Video-Library/Edelman-Competition-Videos.

The Process

The Edelman Award process began with a call for entries in the summer of 2016. The number of people

supporting the Edelman competition is large, with more than 50 participating on the finalist selection committee.

The selection committee reviews all entrants and selects a set of semifinalists. 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 directly communicate 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, and novice verifiers are paired with experienced verifiers.

The selection committee studies and discusses the verification reports to select the 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 length.

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 Operations Research and the Management Sciences. 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 Banquet

Edelman finalists were honored at a Gala banquet on the evening of the competition.

At an Edelman Honors Reception preceding the banquet, authors of the Edelman finalist papers were designated as Franz Edelman Laureates and presented with medals in recognition of their achievements. At the banquet, organizations that were significantly involved in the OR development and application were inducted into the Franz Edelman Academy, and high-ranking representatives from these organizations were honored onstage. The culmination of the evening was the announcement of the 2017 first-place team from Holiday Retirement.

The Finalists and the Papers in This Issue

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

Holiday Retirement for *Revenue Management Delivers Significant Revenue Lift for Holiday Retirement*

Holiday Retirement (Holiday) collaborated with Prorize to develop and deploy a revenue management system that recommends rents for senior-living apartments. We believe Holiday is the first company in the senior-living industry to systematically apply revenue management principles. Holiday and Prorize used business knowledge, clustering, and decision-tree algorithms to determine pricing segments based on unit type, market (e.g., rural, metropolitan), average housing price, and median population age. They optimize prices by community and unit type (e.g., studio apartment) after normalizing for unit size, amenities, and other factors. They solve deterministic versions of their model for randomly generated conditions and use the average of those optimal solutions to recommend prices. Holiday's resulting revenue growth for new rentals is estimated at about nine percent with realized revenue gains of $88 million in the first two years of full-scale deployment.

American Red Cross for *American Red Cross Uses Analytics-Based Methods to Improve Blood Collection Operations*

About 20 percent of the blood the Red Cross collects is processed into cryoprecipitate (cryo), which has special uses. Unlike other blood products, cryo must be collected in triple (rather than double) bags and must be processed within eight hours of donation. Prior to this work, some sites were designated as cryo-collection sites for an entire day (resulting in midday shipments to meet the eight-hour window) and the determinations were made manually. Research by Georgia Tech showed that considerable savings could be achieved by having some sites designated as cryo-collection sites for only the second half of their collection window.

Using insights from a dynamic programming analysis, the authors developed a greedy algorithm that they imbedded into an Excel decision support system (DSS) to recommend which collection sites in the Red Cross Southern Region to designate as cyro-collection sites for a full day or for only the second half of a day. Implementation of the DSS in the region resulted in a 40 percent reduction in the per-unit collection cost of cryo and an improvement from about 50–87 percent in meeting weekly cryo targets. The Red Cross has also implemented the DSS in its St. Louis region and is rolling it out to its other 10 U.S. regions.

Barco for *Barco Implements Platform-Based Product Development in its Healthcare Division*

The number of products in Barco's healthcare division was growing by about 10 percent a year. To reduce the high cost of product-variety proliferation, Barco instituted common platforms from which a set of products could be produced. Working with Barco, researchers from Vlerick Business School developed an optimization model (and an efficient solution method) to determine the number of platforms to develop, the elements in each platform, and the products to derive from each platform. They considered the relevant costs of many departments and organizations, such as marketing, sales, research and development, operations, and supply chain. The commonality resulting from the platforms enabled Barco to introduce twice as many variants using the same resources, while decreasing development lead times by almost 50 percent. The annual total cost reduction has exceeded 5 million euros.

BHP for *Discrete-Event Simulation Modeling Unlocks Value for the Jansen Potash Project*

In conjunction with Amec Foster Wheeler, BHP developed a discrete-event simulation (DES) model of a proposed mining operation for potash, which is used in fertilizers. Their DES model has a vast scope: from the mine through ore processing, distribution, and sales. Their model has detailed time and operation granularity and utilizes agent-based decision making, forecasting, inventory theory, capacity analysis, and reliability and maintenance considerations. They used this model to evaluate design decisions involving capacities, critical-equipment redundancies, storages, and bypasses. The resulting decisions led to potential additional production that added $500 million to the net present value of the mining operation.

GE and Norfolk Southern for *A Novel Movement Planner System for Dispatching Trains*

General Electric Company (GE) partnered with Norfolk Southern Railroad (NS) to create and implement an algorithm and system to facilitate the dispatching of trains. Dispatchers are responsible for planning all activities associated with moving trains; examples include directing a train to move into a siding to enable another train to pass it, and determining locations at which trains crew must be changed. Information used in the dispatching includes trains status, schedules, and priorities, track and crew characteristics, and other information. Previously at NS, dispatching decisions were made manually based on a myopic view of the rail network. Now the dispatching algorithm runs every two minutes and considers a broader view of the network and a configurable objective function. The algorithm uses a combination of heuristic methods, local optimization, and backtracking to evaluate choices in developing a dispatch plan for the next eight hours. As a result of using the system, NS reduced the time trains spend waiting in sidings and thus increased the average speed of its trains by two miles per hour. This translates into annual cost savings of about $400 million and results in other benefits for GE and NS. GE is implementing the system at other railroads.

New York City Department of Transportation for *The New York City Off-Hour Delivery Program: A Business and Community-Friendly Sustainability Program*

Traffic during the daytime in New York City is intense, and the trucks that deliver supplies to local businesses contribute significantly to the congestion. To mitigate this problem, the city's Department of Transportation worked with Rensselaer Polytechnic Institute to design and institute a program that would shift some deliveries to the off-hours between 7 P.M. and 6 A.M. This program required cooperation among the city, the carriers, and the receivers of the supplies. The team built a simulation model that considers behavioral aspects of the participants, and ran iterations of the model using various policy options and parameters. The most effective policies included a one-time

financial incentive from the city (to induce recipients to install equipment needed for unassisted delivery), shipping discounts from the carriers to the receivers, and a program to target small businesses in the accommodations and food sector. Elements of the simulation include discrete-choice modeling and heuristics that solve vehicle routing problems. The result has been a 45 percent reduction in operating costs and parking fines for the carriers, more reliable deliveries and other efficiencies for the receivers, more positive experiences for customers and other community members, annual economic benefits exceeding $20 million per year, and an annual net reduction of 2.5 million tons of CO_2. The project is an example of how private-public-academic partnerships can address problems where stakeholders have different objectives.

Conclusion

The Edelman finalist papers make this issue of *Interfaces* 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 in 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 the 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.

Acknowledgments

Selection committee members, verifiers, coaches, judges, and the Edelman Gala Committee all deserve thanks for the significant effort they put into making the Franz Edelman competition a success. With more than 50 people on the Edelman finalist selection committee, naming them all would be difficult, but we thank them for making the competition a success, noting especially the hard work of the verifiers, coaches, judges, and the Edelman Award Gala Committee.

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