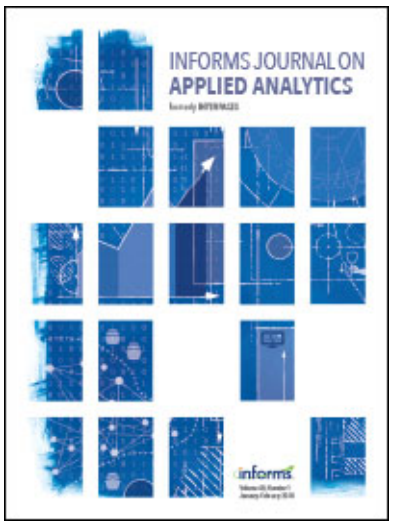

Interfaces

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

Introduction: 2012 Franz Edelman Award for Achievement in Operations Research and the Management Sciences

Stephen C. Graves, R. John Milne,

To cite this article:
Stephen C. Graves, R. John Milne, (2013) Introduction: 2012 Franz Edelman Award for Achievement in Operations Research and the Management Sciences. Interfaces 43(1):1-4. https://doi.org/10.1287/inte.1120.0673

Interfaces
Vol. 43, No. 1, January–February 2013, pp. 1–4
ISSN 0092-2102 (print) | ISSN 1526-551X (online)

http://dx.doi.org/10.1287/inte.1120.0673

Introduction: 2012 Franz Edelman Award for Achievement in Operations Research and the Management Sciences

Stephen C. Graves
Massachusetts Institute of Technology, Cambridge, Massachusetts 02139, sgraves@mit.edu
R. John Milne
Clarkson University School of Business, Potsdam, New York 13699, jmilne@clarkson.edu

This special issue of *Interfaces* is devoted to the finalists of the 41st annual competition for the Franz Edelman Award for Achievement in Operations Research and the Management Sciences, the profession's prestigious award for the practice of operations research and business analytics. As in previous years, the finalists this year cover a wide range of industries, functions, and countries around the globe.

Key words: OR practice; business analytics; OR implementation; OR success stories.

It is an honor for us to serve as chair and special issue editor, respectively, of the 41st Annual International Competition for the Franz Edelman Award for Achievement in Operations Research and the Management Sciences. This is the fifth decade of a competition that brings together the best in operations research (OR) practice. This year's competition was held on April 16, 2012 at the INFORMS Conference on Business Analytics & Operations Research in Huntington Beach, California. Six finalist teams, who had applied OR and business analytics to solve diverse and difficult problems in a wide range of industries, functions, and countries around the globe, presented their work at the competition.

A common theme in these entries is how OR has enabled their organizations to respond effectively to dramatic change. OR helped Intel and TNT Express respond to the global economic crisis of late 2008. OR helped Hewlett Packard respond to the rapid growth of e-commerce and the Carlson Rezidor Hotel Group respond to the challenges of differentiating between business and leisure travelers who increasingly book their travel from the same websites. OR helps Danaos respond to changing weather conditions while optimizing ship routings and helps the Centers for Disease Control respond to the growing threat of bioterrorism and pandemics. When major disruptions occur or might be forthcoming, wise executives turn to OR analysts for help with their complex decision problems.

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 OR modeling and analysis a part of their organization's strategic thinking and operational practice. Change management is a key component of successful OR practice, and the papers in this issue show how to bring about change to achieve remarkable results. For example, although some purists may insist upon modeling many details,

these entries illustrate how reasonable approximations can aid in model implementation and deployment without hindering success.

About the Edelman Award Competition

The Franz Edelman Award Competition is jointly sponsored by INFORMS and CPMS, the Practice Section of INFORMS. The purpose of the competition is to bring forward and recognize outstanding examples of OR/MS practice. The award is named in honor of Franz Edelman, who established one of the earliest industrial OR/MS groups in North America at RCA. He worked at RCA for over 30 years and is counted among the fathers of innovation in OR/MS.

The awards are for implemented work that has had significant, verifiable, and measurable impact. INFORMS presents trophies commemorating the award to the client organizations that used the finalists' work and presents medals and cash awards to the finalist authors. This year, the prize money totaled $15,000 with $10,000 going to the first-place 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. In addition to having their efforts described in this special issue of *Interfaces*, all finalists have their presentations made available at the INFORMS Video Learning Center website at http://www.informs.org/Find-Research-Publications/Multimedia-Books/Edelman-and-Wagner-Videos.

The Process

The Edelman Award process began with a call for abstracts in early September of 2011. The number of people supporting the Edelman competition is large, with more than 40 participating on the finalist selection committee. To name 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.

The selection committee reviews all entrants and first 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. The verifier communicates directly with the entrant's OR team, the users of the work, and client management. Verification is a crucial element of the competition because it ensures that only the highest-achieving OR 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 verifiers this year were Susan Albin, Sudhansu Baksi, Cynthia Barnhart, Carrie Beam, Peter Bell, John Birge, Srinivas Bollapragada, Yonghong Chen, Gavin DeNyse, Mingguo Hong, Ananth Iyer, Shailendra Jain, Peter Kolesar, Russ Labe, Grace Lin, Yingdong Lu, John Milne, Yanni Papadakis, Atul Rangarajan, Graham Rand, Anne Robinson, Randy Robinson, Mark Squillante, Michael Trick, and Andres Weintraub.

The selection committee studies and discusses the verification reports to select the six finalists. Coaches are assigned to each finalist and help the finalists to improve their papers and presentations for the competition. The coaches this year were Carrie Beam, Peter Bell, John Birge, Jeremie Gallien, Yoshi Ikura, Grace Lin, Yanni Papadakis, Atul Rangarajan, Randy Robinson, Doug Samuelson, Rajesh Tyagi, and Andres Weintraub.

Judges study the papers, listen to the presentations, and then discuss the finalists' accomplishments until they reach a decision on which finalist best exemplifies the ideals and standards of the Franz Edelman Award. 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 judging panel consisted of Susan Albin, Cynthia Barnhart, Srinivas Bollapragada (chair), Andy Boyd, Tony Brigandi, Peter Kolesar, Russ Labe, John Milne, and Mike Trick. Steve Graves recused himself from being a judge because of a conflict of interest with one of the finalists.

The Banquet

This was the seventh year that the Edelman finalists were honored at a gala banquet on the evening of the competition. The Edelman Gala Committee, which Ann Bixby chaired, comprised Jeff Alden, Allen Butler, Pooja Dewan, Mike Gorman, Steve Graves, Russ Labe, Jack Levis, Randy Robinson, Bob Smith, and INFORMS staff members Gary Bennett, Cheryl Clark,

Terry Cryan, Jonathan Gonzalez, Mary Leszczynski, Barry List, and Melissa Moore. Graham Rand was the master of ceremonies.

At the banquet, authors of Edelman finalist papers were designated as *Franz Edelman Laureates* and presented with medals in recognition of their achievement. Organizations that were significantly involved in the development and application of the OR were inducted into the *Franz Edelman Academy*, and high-ranking representatives from these organizations were honored on stage. The culmination of the evening was the announcement of the 2012 first-place team from *TNT Express*.

The Finalists and the Papers in This Issue

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

TNT Express, the winners of the 2012 Edelman Award, for *Supply Chain–Wide Optimization at TNT Express*

TNT Express delivers packages worldwide and is the largest express delivery company in Europe. It uses a suite of OR tools to deliver the packages efficiently through its air and road network from the point of package pickup to final delivery. Because of the large scale, the delivery problem is decomposed and a combination of heuristic algorithms and optimization methods are used to address the subproblems. When the worldwide financial crisis of 2008 caused an abrupt drop in volumes, TNT Express built a model that enabled it to reconfigure its network to reduce costs with minimal impact on customer service. This reconfiguration entailed adding one new airport to the network, while decommissioning 12 of the 59 current airports. The many countries to which TNT Express provides service required the company to consider different languages, cultures, regulations, and business practices. To address the organizational and implementation challenges, it established communities of practice in which company business experts meet three times per year for two-to-three-day meetings with suppliers and academic experts to share best practices. TNT Express also established a global optimization (GO) academy to teach employees the principles, use, and deployment of optimization techniques. The GO academy training program consists of six three-day training modules conducted over two years, interspersed with small group assignments, and a capstone project based on a real problem faced by TNT Express. As a result, it achieved over 200 million euros in cost savings from 2008–2011 and reduced CO_2 emissions by 283 million kilograms.

Carlson Rezidor Hotel Group for *Carlson Rezidor Hotel Group Maximizes Revenue Through Improved Demand Management and Price Optimization*

The Carlson Rezidor Hotel Group (CRGH) collaborated with JDA Software Group to apply an innovative revenue management solution. A key challenge in the hotel industry in recent years has been how to price rooms, given that a hotel will have less than 100 percent occupancy on many nights no matter how low the price. CRGH formulates and solves a large-scale (but separable) network optimization problem to determine hotel room rates based on price elasticity of demand, competitor rates, remaining room inventory availability, demand forecasts (created using multiple linear regression), and business rules. The resulting model is a quadratic programming formulation that is solved using CPLEX. A simulation is run following the optimization to quantify the expected benefits of using the recommended prices. Compliant hotels have improved revenue 2–4 percent versus noncompliant hotels.

Danaos for *Optimizing Ship Routing to Maximize Fleet Revenue at Danaos*

Each year, Danaos' ships transport millions of containers, sail millions of miles, and approach thousands of ports. Danaos developed the Operations Research In Ship MAnagement (ORISMA) toolkit, which integrates financial data, hydrodynamic models, weather conditions, and marketing forecasts to determine the optimal paths and speeds for its ships' voyages. ORISMA maximizes fleet-wide profits by exploiting holistic opportunities, such as traveling at faster-than-lowest-fuel-cost speeds or carrying low freight when the destination port promises opportunities for highly profitable subsequent voyages. Dynamic programming is the heart of the solution method. Danaos has saved a few million dollars for its own fleet. Furthermore, the application has been used for routing many more ships by its customers.

Hewlett Packard (HP) for *Hewlett Packard: Delivering Profitable Growth for HPDirect.com Using Operations Research*

HP uses advanced analytics to increase direct sales through its e-commerce website. It uses multiple linear regression to identify key drivers of online traffic and integrate these with ARIMA forecasting models to enhance its marketing plans and budget allocations. A linear programming model recommends a marketing budget allocation based on Monte-Carlo simulation results and other parameters. HP uses discriminant function analysis, Bayesian modeling, and Markov chain methods to determine which products to market to which customers, when to do so, and through which marketing channel (e.g., email versus printed advertising). Finally, ARIMA and regression are combined to forecast orders for the warehouse. Applying these methods has resulted in an additional $117 million in sales over the three-year period from 2009 to 2011.

Intel for *Optimizing Capital Investment Decisions at Intel Corporation*

Intel Corporation invests over $5 billion annually on manufacturing equipment. Because of the long equipment lead times and the challenge of demand forecasting in the semiconductor business, Intel purchases from key suppliers options that provide it the right to have some equipment delivered at much faster-than-normal lead times. OR helps Intel decide how to structure these options during contract negotiations, how many to purchase, and how many to execute. Intel uses a martingale model of demand forecast evolution, entailing a mean evolution process and a forecast error evolution process. Stochastic programming helps determine how many options to exercise and is invoked within a Monte Carlo simulation to determine how many options to buy. This dual lead-time mode of operations has resulted in hundreds of millions of dollars in cost savings and at least $2 billion in revenue upside.

Centers for Disease Control (CDC) for *Advancing Public Health and Medical Preparedness with Operations Research*

The Centers for Disease Control (CDC), a US federal agency, advises state and city governments on the prevention and control of diseases. Its paper addresses the mass dispensing of medications in response to a sudden outbreak of disease or bioterrorism. A two-stage integer program determines the number and location of regional mass-dispensing facilities both optimally and with rapid near-optimal heuristics. Optimization and simulation are intertwined in the design and staffing of individual dispensing facilities. In addition to modeling the flow of patients through the facilities, the spread of disease is modeled to enable emergency planners to work with epidemiologists to limit infections occurring within the dispensing facility. Studies and drill exercises indicate that using the OR system can increase productivity from 175 to over 1,000 percent. The system has a user base of over 6,500 public health and emergency directors, covering 70 percent of the 3,000+ US counties and more than 1,800 US cities.

Conclusion

The Edelman finalists' papers make this issue of *Interfaces* truly special for both practitioners and academics. Practitioners can benefit in at least four ways. First, they will find better ways of doing things using OR/MS models in a diverse group of organizations in both the private and public sectors. Second, they will find better ways to sell their ideas to others in their organizations by pointing out the impact from adopting OR/MS 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. Fourth, 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 models they teach and will be able to demonstrate what can be achieved with OR/MS. They can discuss with their students the specific change management issues that make all the difference between an application that is potentially useful and one that has realized benefits. The change management issues can include how an application (or a series of applications) was sold, how potential users were convinced, and how the application(s) were deployed in multiple locations and with people from multiple functions.

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. We thank Alice Mack, the manuscript editor of *Interfaces*, and the INFORMS staff who helped with many aspects of the process.