2014 EDELMAN GALA

RECOGNIZING DISTINCTION IN APPLICATIONS OF ANALYTICS, OPERATIONS RESEARCH, AND MANAGEMENT SCIENCE

informs

2014 Edelman Gala

THE FRANZ EDELMAN AWARD
Achievement in Operations Research

THE INFORMS PRIZE
Sustained Integration of Operations Research

THE DANIEL H. WAGNER PRIZE
Excellence in Operations Research Practice

UPS GEORGE D. SMITH PRIZE
Strengthening Ties Between Academia & Industry

March 31, 2014

Boston, Massachusetts

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The Edelman Gala

2014 Franz Edelman Ceremony

Welcome, Acknowledgments, and Awards to be Presented

Glenn Wegryn, CAP, Master of Ceremonies

Summaries of 2014 Edelman Finalist Work

Alliance for Paired Donation
U.S. Centers for Disease Control

Presentation of the Wagner Prize

C. Allen Butler, Chair, 2013 Wagner Prize

Summaries of 2014 Edelman Finalist Work

The Energy Authority
Grady Health System

Presentation of the UPS George D. Smith Prize

Ranganath Nuggehalli, CAP, Chair, 2014 UPS George D. Smith Prize
Randy Stashick, Senior VP for Engineering, UPS

Summaries of 2014 Edelman Finalist Work

NBN
Twitter

Presentation of the Informs Prize

Jeff Winters, Chair, 2014 INFORMS Prize

Recognizing Members of the Franz Edelman Academy

Glenn Wegryn, CAP, Master of Ceremonies

Announcement of the 2014 Franz Edelman Award Winner

Stephen M. Robinson, President, INFORMS
Peter C. Bell, Chair, 2014 Edelman Award

Master of Ceremonies

Glenn Wegryn



Glenn Wegryn created and led Procter & Gamble's Global Analytics group that brought advanced, rigorous analytical approaches to hundreds of projects around the world. Over a 20-year time period they influenced billions of dollars in decisions for the company.

Glenn has long been active in the Edelman competition and INFORMS. In 1992-1993, his team at P&G collaborated with the University of Cincinnati's operations researchers to develop analyses of P&G's North American supply chain that generated documented savings in excess of $250 million, leading to becoming an Edelman Award finalist in 1996. In 2004, Glenn's analytics group won the INFORMS Prize and in 2006 was an Edelman finalist for their work with CombineNet on expressive bid optimization techniques, with documented savings of $300 million. Most recently, the group was a finalist in 2010 for their extensive work on inventory reduction methods complemented by innovations in multiechelon inventory planning with Optiant.

Glenn is a 10-year veteran of the INFORMS Business Roundtable, where he initiated and co-led a strategic intervention to create a better structured business plan for the group's ongoing management.

Glenn retired from P&G in 2012 and founded Analytic Impact LLC, an independent consultancy providing supply chain analysis and analytic thought leadership to organizations looking to gain the competitive advantage analytics can offer to them.

An active speaker and advocate for analytics in the boardroom, Glenn has shared his experiences at various conferences, and at CIO and CMO events. He has been an invited speaker at Fortune 500 companies as well as at the University of Cincinnati, Wayne State University, and the University of Texas at Austin. He currently serves as an advisor to the business analytics programs at the University of Cincinnati and the University of Texas.

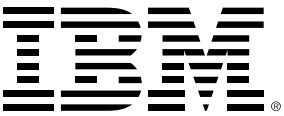
Glenn earned a BS in quantitative business analysis from Indiana University and is an INFORMS Certified Analytics Professional.

Glenn, his wife Barbara, and two teenage children live in Cincinnati. In his spare time, Glenn enjoys cars, guitars, and tiki bars.



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March 31, 2014
Boston, MA

The Operations Research Profession

Introduction

by Stephen M. Robinson, University of Wisconsin–Madison
President, INFORMS

Honoring Trailblazers in Analytics and Operations Research

Each year at the Edelman Gala, analytics professionals can take pride in witnessing the impact that their profession is having on the world. For the Edelman Award, the namesake for tonight's gala, just the financial benefits to society have exceeded $200 billion cumulatively since the inception of the competition. This is in addition to the other significant societal benefits the award has achieved by enabling people to do important things in ways that are more effective and more efficient than they were before. Someone has been paying attention—this year, *U.S. News & World Report* named the profession of "operations research analyst" as number two on its list of best business jobs. We have certainly arrived.



Sharing the stage with the Edelman Award are three other awards—the INFORMS Prize, the Daniel H. Wagner Prize, and the UPS George D. Smith Prize. Each of these prizes spotlights a different type of achievement across the INFORMS portfolio of disciplines.

With the Edelman Award, we honor this year's top six finalists. Each finalist is evaluated across multiple dimensions including qualitative and quantitative impact, technical difficulty, as well as

executive sponsorship and support. However, their unique application of operations research and analytics in their domain and its extensibility to other areas are generally the most memorable characteristics, as we'll see in the finalist presentations.

The INFORMS Prize recognizes the overall body of work by an organization. The application of analytics and O.R. to healthcare is a major growth area—in fact, there are three healthcare finalists in this year's Edelman competition—so it is fitting that the award committee for the INFORMS Prize has chosen the Mayo Clinic to be this year's recipient. I congratulate them on their accomplishments.

The Wagner Prize competition late last year recognized finalist teams from six exceptionally fine competitors, whose organizations and names appear elsewhere in this book. The winning team, working for the Yedioth Group in Israel, successfully tackled the enormous challenge faced by today's print media industry to control costs. Congratulations to the winners.



This year's finalists for the UPS George D. Smith Prize come from three accomplished academic institutions: Lehigh University, MIT's LGO Program, and the COE/MMOR Program at the University of British Columbia's Sauder School of Business. This award demonstrates the sustained commitment of INFORMS and UPS to encourage the connection between academia and industry, ensuring continued growth and innovation in our field.

Some final words of recognition: this year we're honored that John Little, who gave us Little's Law, is joining us at the conference. Next year will mark the 20th anniversary of the ORSA/TIMS organizational merger that led to the founding of INFORMS. No one was more tireless in working for the creation of INFORMS than John Little. Just as we sometimes wish happy birthday a little early, with John's presence at this 2014 conference near his Massachusetts base, we're delighted to extend to him our gratitude and appreciation for all he's done to make INFORMS such a successful organization. John, thank you!

Finally, to all of the award nominees and recipients at the Gala: please accept my heartfelt congratulations. You're an inspiration to all of us, and an example to those just entering the profession of what we expect them, in turn, to accomplish in the future. Congratulations!



Now more than ever, making sense of large, complex data sets is critical to an organization's success. Government and business organizations are increasingly looking to big data to create new opportunities and solve their most complex real-world problems. In order to move forward, organizations must be able to analyze data on a massive scale and quickly use it to provide deeper insights, create new products, and differentiate their services. The ability to compete and win in the information economy will come from powerful analytics that draw insights and value from data, and high-fidelity visualizations that present those insights in impactful, intuitive ways. Booz Allen Hamilton has pioneered an entirely new approach for the implementation of big data in the digital enterprise—a way of using technology, machine-based analytics, and human-powered analysis to create competitive and mission advantage. We leverage these analytic capabilities to help clients across the defense, intelligence, and civil government markets and commercial health, financial services, and energy and utilities industries. See our ideas in action at **boozallen.com/analytics**

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delivering results that endure

Analytics Prevents a Catastrophe

by Jaap Kwadijk, Director of Science, Deltares
Leader of the Dutch Delta Programme team

On Winning the Edelman Award



Winning the Franz Edelman Award for our study "Economically Efficient Standards to Protect the Netherlands Against Flooding" is a great achievement for several reasons. To be fair, I started to realize this for the first time only after arriving in San Antonio for the INFORMS Analytics Conference. Arriving there, I was confronted with the magnitude of the event, the history of the award, its former winners, and not in the least our competitors.

Some of our team was certainly more prepared for this greatness, but I am convinced that all of us felt this excitement. It made us very eager to absorb all the lessons we got from our coaches Peter Kolesar and Yan Papadakis. They quickly taught us how to clearly communicate the essence of our project. We really appreciate their fantastic help. I also remember their reaction when the winner was announced during the gala dinner; they realized what this was all about.

This feeling continued when I was departing the San Antonio International Airport. While I was waiting for my plane, many people, completely strangers to me, were congratulating me on winning the award. For me that was certainly a first-time experience.

Back in the Netherlands we received a personal letter of congratulations from our Minister of Infrastructure and the Environment. She was also extremely happy with the result, as she was the one asking many years ago at the very start of the study the simple question "How efficient is the Dutch flood-protection system in the long term; can't we do better?" It was also great that last November the president of INFORMS, Anne Robinson, had come to the Netherlands to hand the Franz Edelman Award to Wim Kuiken during the Dutch

National Water Congress (with around 1500 participants). Wim Kuiken is the Delta Programme Commissioner who is leading the way to prepare the Netherlands' flood-defense system for future sea-level rises and climate change.

This attention we received in the Netherlands made me realize the importance of this award for my country. All delta regions in the world are facing the threat of more flooding due to climate change and sea-level rises. About half of the global damage due to natural hazards can be attributed to floods. Hurricanes Sandy and Katrina, as well as the recent flooding in the United Kingdom, made painfully clear that this threat is not limited to economically poor countries. The flooding in Bangkok, Thailand made clear that the impact of flooding in hot spots of the global economy, due to business interruption and demand-supply interruption, may reach far beyond the region that is actually flooded. Decision makers in these deltas are convinced that they need to act. But as no one has any experience, the question how to act is difficult to answer.

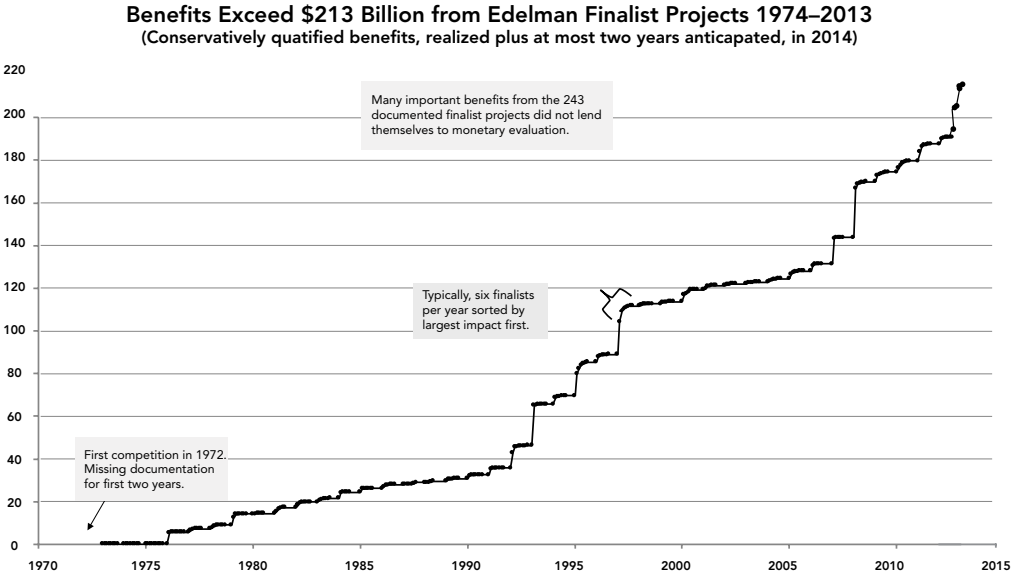
The Netherlands started to do so by establishing the Delta Programme. Obviously this program is strongly supported by research. However, as there is no empirical evidence how to test flood standards, we were basically carrying out an experiment on our own country. Winning the award is an important acknowledgement from abroad by independent observers. It convinces us that we are on the right track.

Related to this, winning the Franz Edelman Award is also important for the research community on flood protection in the Netherlands, and therefore for all research institutes involved in preparing our study: The Netherlands Bureau for Economic Policy Analysis, the Universities in Tilburg and Delft, the consultancy HKV, and of course my own research institute Deltares. As we are extremely well protected against floods, serious flooding is a very uncommon event in the Netherlands. Meanwhile, in the current Dutch political arena, researchers have to increase the understandability of their work, and to a larger audience. We regularly have to show not only the quality of our work, but also its value for society. Carrying out research that claims to save the Dutch society about €7 billion clearly represents a great value, but such a claim sometimes encounters a little disbelief. Winning a prize as important as the Edelman Award convinces the world at large about the quality of the research, and thus the value of the research groups involved. It illustrates loudly and clearly our importance to society.



Billions Achieved with Business Analytics

by Jeffrey M. Alden
Group Manager, GM Operations Research



Over $213 billion U.S. dollars of impact! That's impressive! Is it believable? What's behind these numbers? How were they were estimated? Is there more?

Beginning in 1974, the Edelman finalists were asked to publish their project accomplishments in the INFORMS journal *Interfaces*. By reading all 243 articles, the monetary impact was estimated under the following guidelines:

- Be objective and conservative, yet make a serious attempt to estimate cost savings and increased revenues.
- Use all past reported savings and, to be conservative, include at most two more years of anticipated impact.
- Include only one year of impact when enormous (billions, for example, in some military, utility, energy, and government projects) to downplay huge leverage of organizational size and budget.
- Ignore relative impact analysis even though, for example, doubling company revenues to $10 million for one company may be far more impressive than saving $100 million for a larger company.

These guidelines are definitely conservative and do not include many important yet difficult-to-quantify benefits. Examples of the latter include legal dispute resolution, cancer treatments, airline security, hazardous material deposition, budget allocation, epidemic disease control, organizational structure, on-time railway performance, and space shuttle heat shielding performance. For example, a CDC project to reduce fatalities in a U.S. epidemic could be conservatively (and roughly) estimated to be billions, but can we really get agreement on such an estimate to make a monetary benefit claim? Furthermore, almost all finalist papers report non-monetary benefits and frequently tout them as most important and longer lasting by establishing, for example, ongoing practices and organizational changes that improve health, safety, cooperation, decision making, and job satisfaction. Clearly, the reported monetary benefits understate the full impact of the Edelman finalist projects.

Another important indication of the influence of O.R. is the impressive breadth of applications. The Edelman finalists represent more than 100 different application areas including: air traffic, banking, broadcasting, canal operations, consumer products, express delivery, defense (Air Force, Army), education, financial (pension, investment, credit card, settlement), fire protection, forestry, healthcare (hospital, pharmaceutical, diagnosis, elderly, disease control), hotel management, energy production and distribution (coal, gas, electric, oil, nuclear), land use, manufacturing (electronics, food, paper, seeds, steel, tires, vehicles, wood), marketing, printing, sanitation, security (airport, police), tax collection, transportation (airline, highway, railway, space), treasure hunting, waste management, water (resources, quality, flow, flood), and weapons dismantlement, among others.

Finally, the O.R. impact reported here is just the "tip of the iceberg" because the Edelman competition only captures those O.R. professionals choosing to compete. Just think, the entire set of Edelman finalist authors (1024 counted) represent less than 10% of the current INFORMS membership. Undoubtedly, there is a vast number of O.R. projects with significant impact that did not compete due to confidentiality, lack of internal support to compete (e.g., no one thought of it, too busy, no management support, inadequate documentation), or the team was simply unaware of the competition.

The impact is immense. The O.R. professional can be proud of their profession—don't you like saying "billions and billions" when asked about the value of O.R.?

[1] For the US: $3B = 314M population * 5% epidemic penetration * 10% die under current practices * (1-80% fatality reduction under improved practices) * 1 epidemic per 200 years * $40K per capita income * 50% work life lost per fatality. (Discounting is ignored as income would grow with inflation.) Motivating article was: "Advancing Public Health and Medical Preparedness with Operations Research", *Interfaces*, Vol. 43, No. 1, January–February 2013, pp. 79–98. Note Figure 6. Some of these numbers are just reasonable values offered by the author.

The Franz Edelman Award

Recognizing and Rewarding Real Achievement

The Franz Edelman Award competition is administered for INFORMS by CPMS, the Practice Section of INFORMS



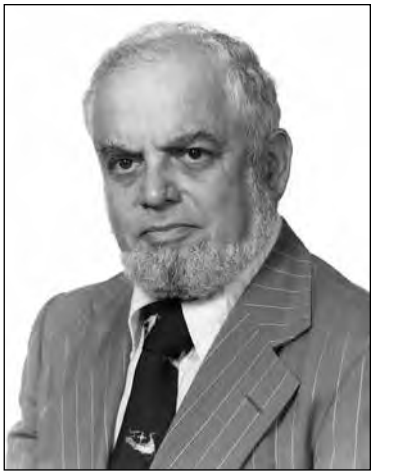
The purpose of the international Franz Edelman competition is to bring forward, recognize, and reward outstanding real-world applications of operations research, management science, and analytics.

Awarded annually to an organization that sponsored, implemented, and benefited from an operations research project, Edelman attracts competition entries worldwide from organizations large and small, profit and nonprofit, business and governmental, private and public. The common theme shared by all selected finalists is having realized substantial benefit from practical application of the advanced analytical methods of operations research.

Abstracts from papers prepared by past Edelman Award finalists are available through *Interfaces* online; full-text versions of some of those *Interfaces* papers are available in an online archive. Streaming videos and DVDs of past competition presentations—suitable for teaching, marketing, or publicizing O.R. practice successes—are available from INFORMS.

The Institute of Management Sciences (TIMS), together with its College on the Practice of Management Science (CPMS), created the award competition in 1972. In 1986, this CPMS/TIMS award was renamed in memory of Franz Edelman, one of the earliest industry practitioners of O.R. in North America. TIMS merged with the Operations Research Society of America to create INFORMS in 1995, at which time the Edelman Award became an INFORMS award.

After fleeing his native Germany in the late 1930s to escape Hitler and the Nazi regime, the young Franz Edelman found himself in England, where he was interned as an alien and sent to Canada for an interlude of lumberjacking. He received his undergraduate education at McGill University; later he earned a PhD in applied mathematics from Brown University. Franz joined the RCA Corporation as an engineer concentrating on computational topics. Initially a physical science problem solver, he rapidly came to envision the great value of computer systems that would assist with management and business operations. This insight led Franz to establish an operations research group at RCA circa 1950, one of the first such groups in a North American corporation.



Franz Edelman

Franz was well known in the O.R. profession for advocating that success in operations research requires excellence in information technology (IT)—computer software, computer hardware, and communications. Reflecting his great interest in IT, he ultimately became vice president of Business Systems and Analysis, responsible for IT, as well as O.R., at RCA. He likely would have been pleased to see our present focus on "analytics" and "business intelligence," where strong analysis combines with strong IT.

Franz retired from RCA after 30 years of service to form Edelman Associates, an O.R. consulting firm. Throughout his career, Franz's O.R. achievements, forward-looking insights, and positive influence on others made him a quintessential practitioner. The Franz Edelman Award was named in his memory because this award advances the operations research practice to which he contributed so much.



In Memoriam

H. Newton Garber



March 16, 1930–February 7, 2014
President, TIMS, 1983–1984

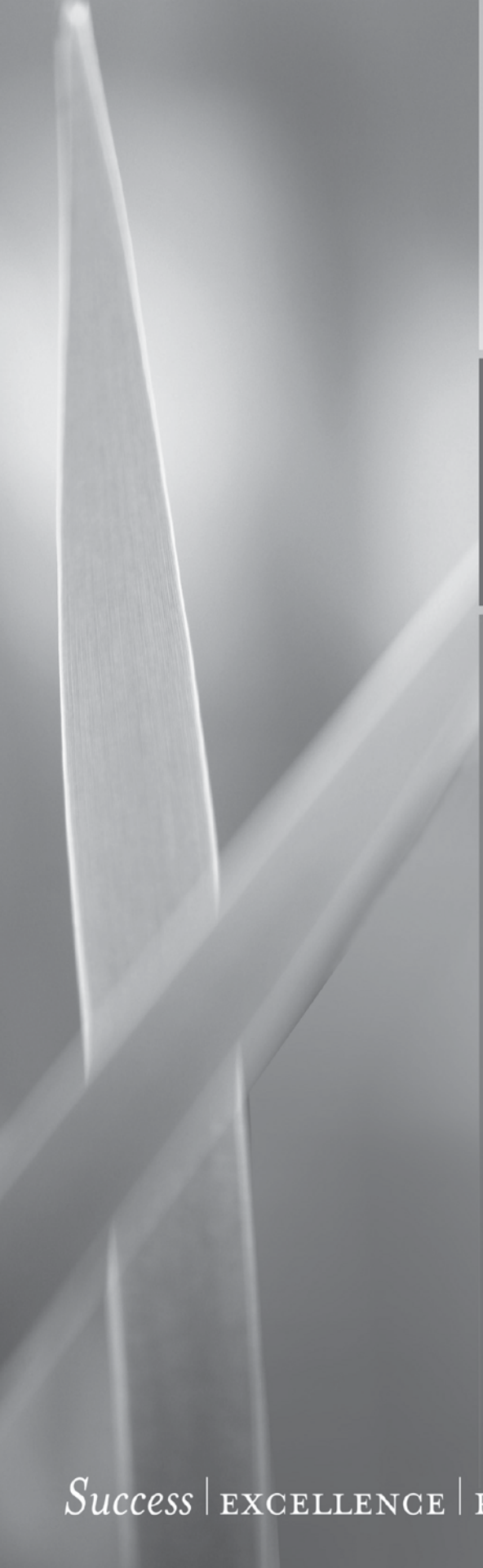
INFORMS pays tribute to the memory of "Newt" Garber for his many years of dedicated service to TIMS, ORSA, CPMS, the Roundtable, and INFORMS. On this night when the 2014 Edelman Award winner is chosen, we celebrate his faithful stewardship of the Franz Edelman Award.

- Provided crucial early support to permanently establishing the Edelman Award competition

- Championed major improvements to the competition process, including verification of semi-finalists, assignment of coaches to finalists, and creation of a permanent Edelman Award videotape record

- Served as an Edelman judge for more than 30 years

- Led the effort to rename the CPMS/TIMS Award for Management Science Achievement to its present-day Franz Edelman Award



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Edelman First-Place Award Recipients

2013 Delta Programme Commissioner

"Economically Efficient Flood Standards to Protect the Netherlands Against Flooding"

Protection against flooding is a vital issue in the Netherlands because 55% of the country is susceptible to flood risk. The Dutch Water Act sets down flood protection standards for the country's dike ring areas. In 2008, the Second Delta Committee advised the government to increase the protection standard of all dike ring areas by a factor of 10. To form a scientific basis, the company Deltares was asked to determine economically efficient flood protection standards. A cost-benefit model was developed to derive the optimal investment strategy for each dike ring area. State-of-the-art mixed integer nonlinear programming techniques were used to find optimal strategies. In conclusion, it was only necessary to increase protection standards for three regions. The O.R. approach resulted in a significant increase in protection for these regions, where two-thirds of all improvements were concentrated. These O.R. methods saved €8 billion in investment costs.

2012 TNT Express

"Supply Chain–Wide Optimization at TNT Express"

The application of O.R. improved decision-making quality at TNT Express. TNT's global optimization (GO) program initiative led to the development of optimization solutions to assist the operating units of TNT Express and improve their package delivery in road and air networks. TNT Express established communities of practice, where internal and external subject matter experts meet three times a year. TNT Express created a unique two-year learning environment, the GO Academy, where TNT Express employees are taught the principles, use, and deployment of optimization techniques. As a result of these combined initiatives, O.R. is now an effective part of the core values at TNT Express. Over a seven year period, TNT Express used these O.R. methods to save €207 million.

2011 MISO

"Midwest Independent Transmission System Operator Applies Operations Research to Energy and Ancillary Services Markets, Unlocking Billions in Savings"

MISO used O.R. to design and launch its energy and ancillary services markets. For many years, the U.S. power industry consisted of utilities that focused locally. During the 1990s, the Federal Energy Regulatory Commission (FERC), a power industry regulator at the national level, pushed the industry to reduce individual utilities' market power and to drive more efficiency through the formation of regional transmission organizations (RTOs). In 2001, the FERC approved MISO as the nation's first RTO. Driven by the goal of minimizing delivered energy costs in a reliable fashion, MISO leveraged advances in computing capabilities and O.R. algorithms to launch its original energy market on April 1, 2005, and its upgraded energy and ancillary services markets on January 6, 2009. The MISO region realized between $2.1 and $3 billion in cumulative savings from 2007 through 2010 and anticipates an additional $6.1 to $8.1 billion of value through 2020.

2010 Indeval

"Mexican Financial Markets Benefit from Novel Application of Operations Research"

Indeval, the Mexican Central Securities Depository for all financial securities, manages Dalí, the securities settlement system (SSS) that settles securities operations averaging over $250 billion daily, more than 70% of the value settled in the Mexican payments system. In 2005, Indeval and its partners began implementing Dalí, a safer, more reliable, and more efficient SSS. The core of Dalí is an operations research-based engine that is executed automatically and offers a continuous and secure operation, ensuring that settlement is irreversible. Now many transactions that would remain pending if processed individually are settled together, thus reducing liquidity requirements dramatically—by 52% in cash and 26% in securities. Indeval's SSS enhances and strengthens Mexico's financial infrastructure.

2009 Hewlett-Packard

"HP Transforms Product Portfolio Management with Operations Research"

Working with Strategic Management Solutions, HP developed two powerful operations research-based tools for product variety management that together address the diverse needs of HP's businesses throughout their products' lifecycles. The first is a framework for evaluating the projected complexity-adjusted return on investment (ROI) for each proposed new product prior to its creation using a complexity ROI calculator. Once products have been launched and a sales history is available, HP applies a second OR tool called revenue coverage optimization. These tools led to hundreds of millions of dollars in bottom-line savings for HP, as well as a streamlined product offering, improved execution, faster delivery performance, lower overhead, and increased customer satisfaction and market share.

2008 Netherlands Railways

"The New Dutch Timetable: The O.R. Revolution"

By 2006, the volume of traffic on the Dutch passenger railway network had increased significantly; more and larger trains had been scheduled without changing the structure of the timetable, thus overloading the system and causing consumer nightmares. Operations researchers working with Netherlands Railways constructed an improved timetable. As a result, the percentage of trains arriving within three minutes of the scheduled time increased, commuter satisfaction improved, and the number of passengers grew. In 2007, this resulted in an additional annual profit of €40 million (approximately $60 million).

2007 Memorial Sloan-Kettering Cancer Center

"Operations Research Advances Cancer Therapeutics"

A key researcher from the Georgia Institute of Technology worked with Memorial Sloan-Kettering Cancer Center to substantially reduce the effects of treating prostate and breast cancer with radiation. The system saved an estimated $459 million per year on prostate cancer alone. Quality of life was improved by delivering less radiation to healthy organs.

2006 Warner Robins Air Logistics Center

"Warner Robins Air Logistics Center Streamlines Aircraft Repair and Overhaul"

At a time of war, the U.S. Air Force maintenance hub reduced its repair time for C-5 Galaxy transports from 360 to 250 days using lean initiatives, then further improved its turnaround time to just 160 days with Critical Chain Project Management, an O.R. technique. The work saves American taxpayers $50 million a year and decreases the demand to truck materiel through the Iraqi combat zone, saving lives as well.

2005 General Motors

"Increasing Production Throughput at General Motors"

Using operations research to achieve one of its signature benefits—greater efficiency—GM has saved over $2 billion through improved productivity at 30 assembly plants in 10 countries.

2004 Motorola, Inc.

"Reinventing the Supplier Negotiation Process at Motorola"

Combining O.R.-aided methods such as innovative

bidding, online negotiations, and scenario-based optimization analysis, Motorola launched a comprehensive system to support the company's sourcing process.

2003 Canadian Pacific Railway

"Perfecting the Scheduled Railroad: Model-Driven Operating Plan Development"

Adoption of a newly optimized fixed-schedule railroad approach, including associated benefits from infrastructure and locomotive fleet investment and business process improvements, trimmed costs by CAD $300 million.

2002 Continental Airlines

"A New Era for Crew Recovery at Continental Airlines"

A globally optimized crew recovery solution deals successfully with several high-profile events such as the December 2000 and March 2001 Nor'easter snowstorms, the June 2001 Houston flood, and the September 11th terrorist attack. Throughout, Continental recovered from each event in record time and generated overall benefits worth tens of millions of dollars.

2001 Merrill Lynch, Inc.

"Pricing Analysis for Merrill Lynch Integrated Choice"

In early 1999 two models showed that revenue at risk for Merrill Lynch, due to the advent of electronic trading and the commoditization of trading, ranged from $200 million to $1 billion. As of September 2000, the Integrated Choice strategy helped client assets reach $93 billion in the new offer. During the first nine months of 2000, net new assets totaled $11 billion and the number of accounts increased 72%.

2000 Jeppesen Sanderson, Inc.

"Flexible Planning and Technology Management at Jeppesen Sanderson, Inc."

Jeppesen Sanderson's customer service level began to deteriorate when a growing product line of more than 100,000 charts overwhelmed its production system. The company developed a suite of optimization-based decision support tools that improved planning in each production area and revealed the value of OR/MS to Jeppesen managers. Jeppesen is now fully committed to O.R., with O.R.-based decision support systems spreading to all areas of the company, and realized cost reductions of $3 million.

1999 IBM

"Extended Enterprise Supply Chain Management at IBM Personal Systems Group and Other Divisions"

AMT consists of an optimization engine, a simulator, and a series of data extraction modules. It is used to study a wide range of issues, including inventory budgets, turnover objectives, customer service-level targets, effects of new product introduction, and supply chain scenario analyses.

1998 Bosques Arauco, S.A.

One of the largest Chilean forest firms, Bosques Arauco employs optimization systems designed by a team from the University of Chile. The impact of these systems has been organizational and financial, with Bosques Arauco reporting a total saving of $5 million over a total annual timber production of $140 million.

1997 Societé Nationale des Chemins de Fer Français (SNCF) and Sabre Decision Technologies

The national railroad of France, Societé Nationale des Chemins de Fer Français (SNCF), and Sabre Decision Technologies teamed up to address the problem of train capacity allocation. The implementation of Rail Plus, composed of a Workset manager and modules on profitability, feasibility, capacity allocation, and routing, is credited with an overall profit increase of 3%–5%, reductions in manpower and schedule development time, and improvements in planning and scenario evaluation.

1996 South African National Defense Force (SANDF)

A joint Deloitte & Touche and SANDF team created models to determine the size and shape of SANDF. The project resulted in Force design savings of more than 22%.

1995 Harris Corporation/Semiconductor Sector

IMPReSS, a linear programming-based production-planning system, produces plans for six major product lines encompassing over 18,000 individual products, enabling Harris to achieve 95% on-time delivery on commitments made since 1992.

1994 Tata Iron & Steel Company, Ltd.

An optimization-based model was designed in 1985–1986 for guiding marketing strategies in Tata's product mix area; the model is now used throughout the company. Since 1986, the model has contributed a cumulative benefit of $73 million in increased profits.

1993 AT&T

Over 400 Call Processing Simulator (CAPS) studies increased 800-number revenues by more than $1 billion in a $5 billion market. One reorganization yielded an 8% increase in calls completed, at annual savings of over $24 million in customer operating costs, with an increase of $2 million in AT&T revenue in 1992, $3 million in 1993, and a projected $7 million per year for each following year.

1992 New Haven Health Department

To combat the spread of HIV/AIDS via needle sharing among New Haven's drug injectors, a legal needle exchange program was implemented. A new data collection and analysis was developed that provided the needed parameters for mathematical models. Results suggest that the program has reduced HIV/AIDS incidence by 33%.



1991 American Airlines

1990 Health Care Financing Administration

1989 ABB Electric, Inc.

1988 City of San Francisco Police Department

1987 Syntex Laboratories, Inc.

1986 Southland Corporation (CITGO Petroleum Corporation Subsidiary)

1985 Weyerhaeuser Company

1984 (dual) Blue Bell, Inc.

1984 (dual) The Netherlands Rijkswaterstaat and the RAND Corporation

1983 Air Products and Chemicals, Inc.

1982 Arizona Department of Transportation

1981 ANR Freight System

1980 Kelly-Springfield Tire Company

1979 The Greater New York Blood Program

1978 Cahill May Roberts, Ltd.

1977 Syncrude Canada, Ltd.

1976 American Telephone & Telegraph

1975 Xerox Corporation

1974 Canadian National Energy Board

1973 The Babcock & Wilcox Company

1972 The Pillsbury Corporation

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The Finest Step Forward: The Franz Edelman Award Competition Process

by Peter C. Bell, Ivey Business School at Western University
2014 Franz Edelman Chair

Are You Ready for the Contest of Your Life?

Every year the Franz Edelman Award process begins with a call for entries in early September. Organizations are asked to provide a three-page summary of a completed practical operations research (O.R.) application and describe results that had significant, verifiable, and, preferably, quantifiable impact on the performance of the client organization.

Typically, more than two dozen entries are received and reviewed by the Franz Edelman Award Committee. The committee consists of about three dozen experienced O.R. practitioners and academics from diverse organizations such as AT&T, Bank of America, Cisco, General Electric, HP, Intel, IBM, Lancaster University, MIT, Purdue University, SAS, Southwest Airlines, University of Dayton, and the Ivey School of Business. Semifinalists are selected in early November, and the further selection of finalists is completed by mid-December.

The committee names as semifinalists a dozen or more entries that have a reasonable chance of becoming finalists if the verification process supports the entries' claims. To this end, each of the semifinalists is assigned a team of verifiers who work with the relevant stakeholders to validate the details and claims made by their assigned entry.



The verifiers' role is to completely comprehend the O.R. work presented in the assigned entry summary, as well as its potential impact, and to convey this information to the rest of the selection committee. The verifiers communicate directly with the entrant's O.R. team, the users of the work, and client management. Verification is a crucial element of the competition because it ensures that only the highest-quality O.R. 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 more experienced verifiers.

From this group of semifinalists, the Edelman Award Committee then selects the five or six best entries to advance to the finals. Each finalist must begin the preparation of a journal-quality paper and a 40-minute presentation. Each of the finalist teams is assigned a team of experienced coaches to advise them throughout the process. The coaches' major responsibility is to ensure that the team's paper and presentation convey the work clearly to a general operations research audience.

Two months prior to the spring INFORMS Conference on Business Analytics and Operations Research, finalist papers are distributed to the judges. The judges study each of the papers and, shortly thereafter, discuss among themselves. Each finalist is assigned a focal point judge who conveys feedback from the judging committee to the finalist's coaches. This feedback helps to identify areas in which the finalist's presentation might be improved.

On the day of the competition, each team gives a 40-minute presentation, followed by a 10- to 15-minute period of questioning by the judges. After the presentations are complete, the judges sequester themselves until they reach a decision on which of the finalists best exemplifies the ideals and standards of the Franz Edelman Award for Achievement in Operations Research. Relevant factors include the total impact of the project in both quantitative and qualitative terms, the novelty and portability of the technical solution, the importance of the application, and the quality and effectiveness of the implementation.

Following the competition, the finalists will work with the special editor of the January/February issue of *Interfaces* to prepare their papers for publication. All finalists are invited to reprise their work at a session of the INFORMS Annual Meeting in the fall, with the first-place team giving a keynote address. All of the finalists' presentations become available from INFORMS via streaming video online.

The Verification Process & The 2014 Verifiers

The Edelman Award Committee wishes to thank the following individuals for their dedication and service as verifiers for this year's Edelman Award.

Each of the semifinalists is assigned a verifier who works behind the scenes, often with an assistant verifier, to validate the claims made by their entry. A verifier's primary role is to understand an applicant's O.R. work and its impact in detail, and to then convey this to the rest of the committee, both orally and in a written report. Verification is a crucial element of the competition since it ensures that only the highest-quality O.R. and analytics work with verified impact makes it to the Edelman Award finals.

Verifiers and Assistant Verifiers

- Susan Albin, Rutgers University
- Carrie Beam, Carrie Beam Consulting
- John R. Birge, University of Chicago
- E. Andrew Boyd, University of Houston
- Bruce Bukiet, New Jersey Institute of Technology
- J. Antonio Carbajal, Turner Broadcasting System, Inc.
- Luz Adriana Caudillo Fuentes
- Yonghong Chen, MISO
- Alfred Degbotse, IBM
- Pooja Dewan, BNSF Railway
- Chris Fry, Strategic Management Solutions
- Sidney Hess
- Mingguo Hong, MISO
- Shailendra Jain, HP
- Peter Kolesar, Columbia University
- Qingwei Li, Eastman Chemical Co.
- Irvin Lustig, CAP, IBM
- Ioannis Papadakis, Dun & Bradstreet
- Pelin Pekgun, University of South Carolina
- Anne Robinson, Verizon Wireless
- Randall S. Robinson
- Mark Squillante, IBM Thomas J. Watson Research Center
- Michael Trick, Carnegie Mellon University
- Andrés Weintraub, Universidad de Chile

The Coaching and Judging Process & The 2014 Coaches and Judges

The Edelman Award Committee wishes to thank the following individuals for their dedication and service as coaches and judges for this year's Edelman Award.

The major role of the coach is to ensure each team's paper and presentation convey the work in a manner that may be well understood by a general operations research audience. Often a coach is paired with an assistant coach who lends another perspective to the process.

The judges must work together, evaluating the evidence to determine which finalist is most deserving of the Franz Edelman Award for Achievement in Operations Research. The award is for implemented work that has had significant, verified, and preferably quantified impact.

Coaches and Assistant Coaches

- Carrie Beam, Carrie Beam Consulting
- John R. Birge, University of Chicago
- J. Antonio Carbajal, Turner Broadcasting
- Yonghong Chen, MISO
- Ken Fordyce, Arkieva
- Chris Fry, Strategic Management Solutions
- Sidney Hess
- Peter Kolesar, Columbia University
- Irvin Lustig, CAP, IBM
- Pelin Pekgun, University of South Carolina
- Randall S. Robinson
- Donald Rosenfield, MIT

Judges

- Peter C. Bell, Chair, Ivey Business School at Western University
- Srinivas Bollapragada, General Electric
- Debra Elkins, Dept. of Homeland Security
- Don Kleinmutz, Kleinmutz Associates
- Russell Labe, CAP, Bank of America
- R. John Milne, Clarkson University
- Patricia Neri, SAS Institute
- Leon Schwartz, Informed Decisions Group
- Michael A. Trick, Carnegie Mellon University

The Edelman Laureates

The men and women who author Edelman finalist papers are deemed Franz Edelman Laureates.

Authors of finalist papers are recognized with this distinction, and each is formally presented with the Franz Edelman Medal.

Laureates are recognized for their significant contribution to work that each year is selected as representative of the best applications in the world of analytical support for decision making.

The Laureate recognition is distinct and separate from membership in the Franz Edelman Academy.



The Edelman Academy

Each year, a limited number of organizations may be inducted as members of the Franz Edelman Academy.

The primary client organization, or beneficiary of the finalist work, is inducted into the Academy at the annual Edelman Award Ceremony.

In addition, organizations that played a major role in the work, and therefore deserve academy membership, may also be inducted. The most common example would be an organization that provided the professionals who did the majority of the analytical work.

The membership of the Franz Edelman Academy represents 43 years of extraordinary contributions to society through the innovative application of operations research.

Nothing But the Best:

The 2014 Franz Edelman Finalists

Introduced in the pages that follow are the six finalists for the 2014 Franz Edelman Award.

Over the past several months these teams have demonstrated to the judges that their work is among the finest examples of operations research practice in the world. One of these organizations will be recognized as the best in class, the first-place recipient of the 2014 Franz Edelman Award.

Each finalist's work is described here in a shortened summary. Full papers will be published in the January/February 2015 issue of Interfaces*, the INFORMS journal dedicated to improving the practical application of operations research and the management sciences in today's organizations and industries.*

The Finalists for the 2014 Franz Edelman Award Are:

Alliance for Paired Donation

U.S. Centers for Disease Control

The Energy Authority

Grady Health System

NBN

Twitter

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2014 Edelman Competitors

by Barry List, INFORMS

Go with the Flow

As analytics and operations research become more widely accepted by organizations (witness *U.S. News and World Report* naming "operations research analyst" as number two on its list of best business jobs in the United States), the finalists for the 2014 Franz Edelman Award demonstrate the tremendous contribution that their analysis makes to organizations as varied as a social media giant, three important medical programs, an expanding telecommunications company, and a critical regional energy provider. Their work improves flow—the flow of patients, electricity, social media "followers," vaccines, transplantations, and data.

The exciting, volatile business of social media is littered with the forgotten names of start-ups and once successful companies that couldn't zero in on features that would electrify users or just keep up with the head-spinning competition. Twitter today is among the top handful of social media that are recognized around the world—240 million people with Twitter handles generate 400 million tweets a day—and they have kept the tweets flowing using operations research and analytics. "Who should I follow?" is not just an individual choice; it is a question, when magnified, that keeps Twitter users involved and entranced. Twitter has developed a recommendation service answering the question, "Who should I follow?" using O.R. to generate names that users commonly see in a box on their Twitter pages. To quote the team, "Building the system involved challenges deciding the best recommendation algorithms, analyzing the large amounts of data, efficient implementation and fine-tuning, operational planning, and constant feedback-based improvement." The results of this modeling contribute roughly 12.5% of new people being followed. Of course, Twitter is a business that generates revenue, and persuading Twitter users to follow promoted products has contributed substantially to the social media giant's $1 billion annual revenue.

Controlling the spread of disease is a critical public health function. Americans who grew up in the 1950s may surmise that, with the development decades ago of vaccines like the Salk vaccine, polio is a thing of the past. Alas, the experience of the United States and Western Europe is not universal. Recognizing the continued presence of polio in the world, the U.S. Centers for Disease Control (CDC) commits $100 million every year for activities by the Global Polio Eradication Initiative to eradicate polio. Fielding a worldwide campaign requires crucial decisions, so the CDC, in partnership with Kid Risk, developed sophisticated models to assess potential choices touching on global risks, benefits, and costs of various

polio eradication policy choices. Modeling to solve these kinds of complex problems has helped the CDC and public health organizations rapidly respond to news of polio outbreaks. The modelers were able to determine that the limited dollars needed for a massive task would indeed be sufficient to prevent what was once characterized as infantile paralysis, as well as save lives. The team's work is expected to bring as much as $50 billion in benefits over the next 20 years.

Water is a source of energy. When scarce, water demands for agriculture, home, and industry require careful decisions. The Energy Authority, a nonprofit in the Pacific Northwest, is committed to the flow of energy and water, so it created an Optimizer software application for the Bonneville Power Agency, a division of the U.S. Department of Energy. The Optimizer allows The Energy Authority to simulate the competing needs of endangered fish species that need water to flow into their habitat, farmers, recreational users, and officials charged with flood control. And, since solutions sometimes are demanded with short notice, it has reduced its running time to only three minutes. Now TEA Optimizer can generate close to 200 options per hour for six dams and project those plans over a 10-day period—it can generate a total of a quarter million variables. The Optimizer won't just save scarce resources and balance interests. Over the life of its contract, it is expected to generate $720 million in savings and revenue for taxpayers.



As reporter Elisabeth Rosenthal has written in *The New York Times*, emergency rooms are not only a contributor to the high cost of healthcare in America but a bottleneck where lines and waits delay critical care. Emergency rooms are not intended to deliver routine healthcare but many poor American families use emergency departments that way. An O.R. team drawn from Grady Memorial Hospital, Georgia Tech, and partners saw patient and workflow as natural subjects of analysis using O.R. and analytics techniques. They developed a decision support system to help reduce emergency room waits. The system incorporates optimization, machine learning, and simulation. It reduced waiting time by a whopping 70% and length of stay by nearly a third. Impressively, it reduced ER readmissions by 28%. Information derived from the model helped the hospital administration design an alternative care facility, significantly less expensive than the ER, that allowed 32% fewer patients to clog the flow of critical care patients, instead receiving appropriate treatment in a less costly setting.

For over a decade, operations researchers have been proposing more and more solutions to a health problem that requires finesse to save lives: how can a potential kidney donor "do a deal" to insure that an intended recipient, who is not a match, receives a kidney from a matched donor? The Alliance for Paired Donation developed a model that worked for recipients, first rocketing to fame in 2007 with a chain of 10 kidney transplantations generated by a single donor. To quote *The New England Journal of Medicine*, "A flexible, integer-programming optimization algorithm…identifies the non-mutually exclusive transplantations that result in the greatest sum of points when chains and exchanges that allow for more than two transplantations at a time are used, in contrast to algorithms that focus on two-way exchanges." The Alliance, in essence, has found a way to swap kidneys and save more lives. It has also pioneered a new way of using altruistic donors so that the transplants no longer have to take place at the same time.



With the help of O.R. and analytics, and its partner Biarri, Australia is constructing the largest high-speed broadband network anywhere. The people of Australia, aware of the importance to consumers and business of a wired world, want their government to keep their telecommunications flowing as fast as any country in the developed world. O.R. and analytics have an important role in achieving the goal of reaching 93% of the 13 million premises in Australia over the next decade. Designing a vast network can be costly. Tackling a problem of keeping the routes in a network short, thereby reducing cost, is the bread and butter of O.R. analysts and analytics experts. NBN divided its network into more than 4,000 fiber serving area modules (FSAM), each meant to supply fiber optics to the equivalent of a small city. Operations researchers at Biarri created a network flow mixed-integer program to tackle the challenge. By creating multiple trees that span the network, they minimized the cost of cables, components, and labor for each FSAM. With a projected total savings of $2.2 billion covering all aspects of the project, NBN can report to Australian taxpayers that they are reducing the burden of expansion and making it possible for data to flow at the fastest speed possible.

Congratulations to our 2014 Edelman finalists. They have shown how important analytics and O.R. can be to industries as disparate as healthcare, energy generation, social media, and telecommunications. And they have kept the good work flowing.



Alliance for Paired Donation

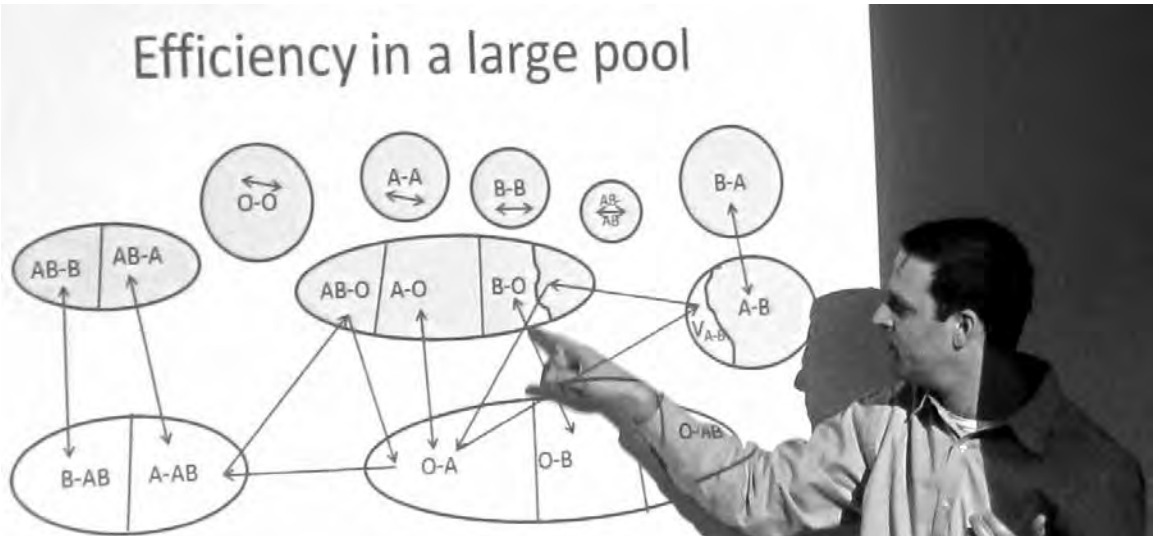
Kidneys and the Alliance for Paired Donation

Project Summary

Approximately 100,000 patients with end stage renal disease (ESRD) are currently on the waiting list in the United States for a deceased donor kidney transplant. Fewer than 11,000 of these patients will receive one of these kidneys in 2014; about 4,000 patients will die this year while waiting; and another 2,500 will be removed from the waiting list because they will become too sick to be viable candidates for a transplant. Indeed, this is a growing problem because the length of the waiting list increases by about 7,000 patients every year. About 6,000 patients will receive a living donor's kidney this year, and more than 500 of these living kidney transplants will be the result of kidney exchange, also called kidney paired donation.

Kidney exchange allows potential living donors whose kidney is incompatible with their intended recipient to nevertheless donate a kidney so that their recipient receives a compatible one from another donor. This is done by exchange between two or more incompatible patient-donor pairs. Non-directed living donors who decide to donate without having a particular intended recipient can also initiate a chain of transplants involving multiple incompatible pairs. Between 2000-2006, fewer than 170 kidney exchanges were performed in the United States.

The Alliance for Paired Donation (APD) is a small non-profit organization that organizes multihospital kidney exchanges. It adopted integer programming to identify optimal sets of disjoint exchanges. Until 2007, cycles and chains were implemented simultaneously, meaning that a three-way exchange required six operating rooms and six surgical teams (for three nephrectomies and three transplants). The reason that all surgeries in a cyclic exchange among patient-donor pairs are conducted simultaneously is because a broken link had the potential to impose a tragic cost on one of the pairs.



In 2007, the Alliance for Paired Donation was the first kidney exchange organization to introduce non-simultaneous (and hence potentially long) chains. Chains can be conducted so that every patient receives a kidney no later than his intended donor donates a kidney. Following the first non-simultaneous chain that included 16 transplants, further sophisticated integer programming techniques were developed to optimize within the new, rich set of exchanges.

Overcoming political opposition and skepticism, the new approach has also been adopted by other leading exchange programs. The Alliance for Paired Donation has saved more than 220 lives through its kidney exchange program, with more than 75% of these achieved through long non-simultaneous chains. Transplanting a single patient saves Medicare more than $270,000 over five years.

The technology and methods pioneered by APD have been adopted by other transplant exchanges, resulting in thousands of lives already saved, with the promise of increasing impact in coming years. The percentage of transplants from non-simultaneous chains has already reached more than 6% of the total number of transplants from live donors (including directed living donors) in the last year, and substantially increasing the number of the very highly sensitized transplanted patients.

Operations research and market design have played a crucial role in increasing the number of transplants, both in the Alliance for Paired Donation and in the other leading exchange programs.





Organizational Overview

The **Alliance for Paired Donation (APD)** is a non-profit organization founded in 2006 by Dr. Michael Rees, that provides kidney paired donation matching services to transplant centers in more than 30 states. It recently conducted its first international exchange. The APD reports to a board of directors and employs seven people.





U.S. Centers for Disease Control

Eradicating Polio Using Better Decision Models

Project Summary

The U.S. Centers for Disease Control and Prevention (CDC) is the world's largest national public health government organization, with an annual budget of over $11 billion. The CDC works 24/7 to save lives and protect people from health threats. As a spearheading partner of the Global Polio Eradication Initiative (GPEI), the CDC annually contributes more than $100 million of its budget and significant human resources to polio eradication activities for which it maintains high standards for developing evidence-based policies and expectations of cost-effective use of its resources.

In 2001, the CDC launched a collaboration with Kid Risk, Inc. to use a range of operations research and management science tools combined with the best available scientific evidence and field knowledge to develop integrated analytical models for the evaluation of the global risks, benefits, and costs of polio eradication policy choices. For example, as world leaders began to consider the end game that would follow the successful eradication of wild polioviruses (WPVs), questions emerged that demanded rigorous answers, such as, "What vaccine (if any) should countries use after WPV eradication?" and "What risks will need to be managed to achieve and maintain a world free of polio?"

The team systematically developed each of the components required to support integrated analytic models, including clarifying the policy options using a decision analytic approach, developing a dynamic disease model for polioviruses using a system dynamics approach, and characterizing the risks and costs of the options with sensitivity analyses. By providing both analytical structure and a synthesis of the existing evidence, the team effectively engaged a wide range of stakeholders with diverse perspectives and values. The ability of the team to help decision makers visualize and quantify the expected impacts of their options encouraged effective dialogue and shared understanding of critical issues and uncertainties.

The analytical results from the collaboration significantly furthered polio eradication in many ways, including more rapid response to outbreaks and reaffirmation that pursuing eradication



instead of control is the "best buy" to prevent cases of paralysis and to save lives and money. The results also supported global policies to coordinate global cessation of the use of oral poliovirus vaccines after successful WPV eradication and awareness of the challenging dynamics associated with ending the use of a live virus vaccine. At a time of increased skepticism about the potential for achieving polio eradication in India, the collaboration demonstrated through modeling that success depended on the degree to which India intensified its immunization efforts to increase population immunity and the problems associated with a wavering commitment. Remarkably, the Government of India successfully stopped endemic WPV transmission in early 2011, and recently celebrated three years of polio-free status.

Finally, the collaboration estimated $40–50 billion of net benefits by 2035 associated with the GPEI. Recognition of polio eradication as a major program in need of stable financing helped support a fundraising effort in 2013 that raised $4 billion from donors to finish the job. The team foresees increased integration of operations research and management science tools to perform simultaneous probabilistic and dynamic modeling for other complex global health challenges, including other vaccine-preventable diseases like measles and rubella.









Organizational Overview

The **U.S. Centers for Disease Control and Prevention (CDC)** (www.cdc.gov) works 24/7 to protect Americans from health, safety, and security threats, both foreign and domestic. As part of the U.S. Department of Health and Human Services, the CDC serves as the primary federal agency for conducting and supporting health protection activities in the United States. The CDC is a spearheading partner of the Global Polio Eradication Initiative and a leader in laboratory and epidemiological science. Consistent with its mission, CDC bridges science with policy, and supports, collects, and uses evidence to advance scientific knowledge and improve health decisions.

Kid Risk, Inc. (www.kidrisk.org) focuses on improving children's lives by understanding, characterizing, and communicating about risks that children face using the best available evidence and analytical models. Kid Risk strives to empower policy makers, parents, kids, and others to make better decisions for children, and recognizes that managing risks and resources well represents the key to realizing the best possible futures for everyone. Kid Risk, Inc. researchers focus on bringing a diverse set of operations research and management science tools to high-stakes challenges that involve risks to children.



The Energy Authority

Providing Critical Hydroelectric Generation with a Water Routing Optimizer

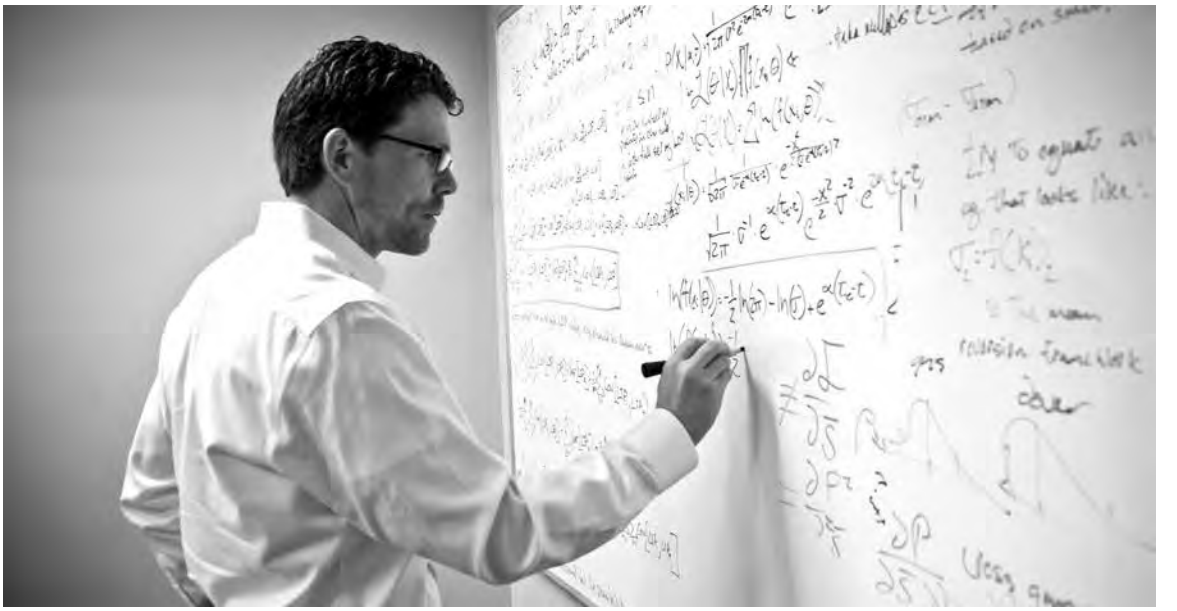
Project Summary

The threat of global climate change has led to an increase in the world's demand for clean, renewable energy resources. Consequently, wind- and solar-powered generators are being added to the electric grid at unprecedented rates. Along with their many benefits, the intermittent availability of power from these resources creates challenges for electric grid operators who must ensure stability of the system to maintain electric reliability, even when the wind is not blowing or the sun is not shining. Until large-scale electricity storage systems are commercially viable, grid operators and utilities will need to maximize the flexibility of other generation resources to absorb the impact of wind and solar generation on the system and quickly produce more electricity when these renewable resources are not available.

Hydroelectric generation resources are well-suited for this task. They produce clean, efficient electricity without emitting CO_2 or harmful byproducts. Many hydroelectric generators can also respond quickly to the demands of the electric grid, increasing or decreasing their level of electric output in seconds to respond to changes caused by intermittent resources.

In the Pacific Northwest, the Bonneville Power Administration (BPA), a division of the U.S. Department of Energy, controls the Federal Columbia River Power System (FCRPS), which consists of 31 dams in Washington, Oregon, and Idaho, totaling 20,460 megawatts of hydroelectric generation capacity. Many community-owned public utility districts (PUDs) in the region receive a "slice" of the actual output from this federal hydrosystem through long-term power contracts with BPA, giving them flexibility and responsibility to manage their portions within certain constraints.

The Energy Authority (TEA) is a nonprofit corporation dedicated to managing the risks and optimizing the assets of community-owned electric utilities across the United States. TEA created the TEA Optimizer software application specifically for the PUDs in the Pacific Northwest who want to derive the maximum amount of flexibility and value from their slices



of the federal hydrosystem. Optimizing this system is no simple task: there are a wide variety of demands placed on the river system that have to be simulated in the software solution. These include water demands for agriculture, endangered fish species, recreation, and flood control as well as physical demands on hydroelectric generation equipment and the river itself.

To optimize a hydrosystem as complex as the FCRPS and be usable in real-world business situations, the TEA Optimizer had to be fast, flexible, and give actionable information to power traders and schedulers. By applying operations research methods, TEA was able to perform a linear optimization on a set of nonlinear functions to derive a unique set of results within the constraints of the problem. In less than three minutes, the TEA Optimizer calculates 176 different hydrodynamic and electrical constraints from six dispatchable dams for each hour over a 10-day period (over 250,000 variables).

The TEA Optimizer will allow community-owned utilities to save an estimated $720 million over the life of the BPA slice contract through reduced costs of resource integration and power supply management infrastructure, and increased revenue through optimizing hydro output for sale in the wholesale power market.









Organizational Overview

The Energy Authority, Inc. is a strategic partner of choice for public power. Through the customized application of portfolio management, energy trading, power supply management, and natural gas trading services, TEA is currently collaborating with more than 40 public power utilities nationwide to help them optimize the value of their electric generation and load portfolios in wholesale energy markets in a manner that is consistent with each utility's unique risk tolerances and public power values. Established in 1997, TEA is a nonprofit corporation headquartered in Jacksonville, Florida, with offices in Seattle (Bellevue), Washington, and Portland, Oregon.

Grady Health System

Improving Emergency Department Workflow and Patient Care

Project Summary

Over the past two decades, emergency department (ED) crowding and delays have become serious issues for hospitals and health systems in the United States. ED visits grew by more than two million per year, characterized both by patients who were older and sicker thus requiring more complex, time-consuming workups and treatments, and by non-urgent patients who use the ED in place of primary care facilities.

In 2012 hospitals reported more than 40% non-urgent patient visits contributing to long waiting times, decreases in quality and timeliness of care, and decreases in patient satisfaction. Numerous reports have questioned the ability of U.S. emergency departments to handle an increasing demand for emergency services.

Hospitals continue to face many difficult challenges such as workforce shortages, limited hospital capacity to meet the needs of patients, prolonged ED waiting times, including lengthy door-to-provider times, and prolonged boarding of patients in the ED after the decision has been made to admit them to the hospital (tying up resources and potentially compromising ongoing care). In addition, federal and state regulations have been imposed that demand more efficiency and accountability, placing further pressure on an already fragile system.

Working with one of the largest safety-net hospitals in the country—Grady Health System—the operations research team devised a new ED decision-support system that combines machine learning, simulation, and optimization to address the complex challenges facing EDs. The decision support system allows healthcare users to optimize workflow globally, taking into account the uncertainties of incoming patient diseases and associated care, thereby significantly reducing the length of stay and waiting time of patients. This is achieved without changing physical layout or increasing any resources, focusing instead on process consolidation, operations tracking, and staffing.

First implemented at Grady Memorial Hospital, the system helped reduce average length of stay by roughly 30% and the associated average waiting time by 70%. By repurposing existing resources, the hospital established a care management observation unit leading to a reduction of 28% in ED readmissions. Insights also led to an investment in an alternative care facility thus removing more than 32% of the


BUCKLEY
LA TONYA
SICU
Aspen



non-urgent-care cases from the ED. With these improvements, the hospital enhanced its financial standing and achieved its targeted goal of an average ED length of stay close to seven hours. ED efficiency improved throughput by more than 19% and reduced the number of patients who left without being seen by over 30%.

For high-acuity patients, the "golden hours of treatment" impact whether an individual can lead a normal productive life, or is disabled or dies because of delay of critical care. Thus, improved timeliness and service quality directly translate to improved quality of life for patients, and can even make a difference in whether a patient is treated and released, or is admitted to the hospital. The ED efficiencies at Grady led to a 10% reduction in ED-to-hospital admissions.

The financial impacts of the ED efficiencies at Grady include a $7.5 million yearly savings in penalties due to a reduction in revisits. The alternative care facility for non-urgent conditions reduces ED costs by $21.6 million and results in $12.5 million in revenue. Expansion of trauma care and efficiency results in $19.1 million in revenue; the reduction in left-without-being-seen patients leads to $96.6 million in revenue. For a critical safety-net hospital with $1.5 billion of annual economic impact, only 8% of which results from private insurance, these financial gains have a tremendous impact on maintaining financial healthiness.

ED efficiencies also have a broader impact on healthcare spending.

The system developed allows healthcare managers to adapt the model as the ED environment and operations evolve so as to achieve continual performance improvement. The underlying model, which is generalizable, has been tested and implemented successfully at seven EDs and in other hospital units.



Organizational Overview

Grady Health System is one of the largest safety-net health systems in the United States. Grady consists of the 953-bed Grady Memorial Hospital, six neighborhood health centers, Crestview Health & Rehabilitation Center, and Children's Healthcare of Atlanta at Hughes Spalding, which is operated as a Children's affiliate.

Grady has one of the premier level I trauma centers in the Atlanta metropolitan area and serves as the 911 ambulance provider for the city of Atlanta. Grady's American Burn Association/American College of Surgeons verified burn center is one of only two in the state, and the Marcus Stroke and Neuroscience Center is a Joint Commission-designated Advanced Comprehensive Stroke Center.

In 2012 and 2013, *Hospitals & Health Networks* magazine named Grady one of the country's most wired health systems. Grady's Heart Failure Clinic received the 2013 Gage Award for Improving Quality from America's Essential Hospitals.

Georgia Institute of Technology provides an innovative intellectual environment with nearly 1,000 full-time instructional faculty and more than 21,500 undergraduate and graduate students.

The university is a national and international leader in scientific and technological research and education. Over the past decade, overall research expenditures increased 89% to $689 million in 2012, while federal research expenditures increased 138%. Georgia Tech continues to rank among the top ten in research expenditures among universities without a medical school. In addition, Georgia Tech has an estimated $3 billion annual impact on the metro Atlanta economy, according to a 2011 study.

Georgia Tech is consistently the only technological university ranked in *U.S. News & World Report's* listing of America's top ten public universities. In addition, Georgia Tech's College of Engineering is consistently ranked in the nation's top five by *U.S. News*.




FIBRE

NBN

Operations Research Saves Billions for the World's Largest Broadband Project

Project Summary

Australia is building the largest high-speed broadband network in the world. The National Broadband Network (NBN) is the largest and most expensive infrastructure project ever undertaken by an Australian government. The NBN is important because it will help keep Australia ahead in an increasingly online world.

The NBN mandate is to reach all Australians regardless of where they live. Covering an area around 80% of the size of the United States, the NBN will cover almost 13 million premises. Fiber connections will be made to 93% of these premises. The remaining hard-to-reach places across the expanse of Australia will be connected through wireless or satellite technologies. The project will take 10 years to complete with an initial capital cost of $37.4 billion.

In 2009 the Australian government established NBN Co, a government owned corporation, to build the NBN. NBN Co has divided the design and construction tasks into more than 4,100 fiber serving area modules (FSAMs). A FSAM serves fiber to a maximum of 3200 premises, which equates to the size of a small suburb in an Australian city. Over the 10 year design and construction period, on average, one FSAM will be designed and constructed every day.

Early in the project, NBN leaders realised that there was extraordinary potential to use the power of operations research to optimize the enormous design and construction task posed by the roll out. NBN Co contacted Biarri, an Australian commercial mathematics company founded in 2009, to provide the O.R. expertise to develop the optimization tools.



To meet NBN Co's need, Biarri created FOND (Fiber Optic Network Design), a network flow mixed integer program that creates multiple trees spanning the demand network. This formulation minimizes the cost of components, cables, and labour within a FSAM, subject to a variety of constraints. This formulation

- maximizes the use of existing infrastructure to minimize construction costs;
- avoids costly new infrastructure installation by intelligent and often unintuitive reuse of newly installed infrastructure; and
- ensures full network architecture compliance for all designs produced.

Using a commercial solver, this formulation solves in less than five minutes for a typical FSAM.

To date, over 500 FSAM initial designs have been completed using the optimization methods developed by Biarri. This has saved an estimated $30 million in construction costs, with the planning time per module reduced from 145 to 16 days.

The construction savings from these FSAMs alone is estimated at $250 million. As the rate of design and construction of the more than 4,000 FSAMs increases, the savings of the optimization tool is forecast to be $325 million per annum, with $300 million saved in construction costs and $25 million saved in design costs. Over the lifetime of the project this will amount to $2.2 billion in avoided costs.



Organizational Overview

Established in 2009, **NBN Co** is an Australian Government Business Enterprise, represented by two Shareholder Ministers: the Minister for Finance and Deregulation and the Minister for Broadband, Communications and the Digital Economy. NBN Co will design, build, and operate a new National Broadband Network to provide high-speed broadband access to all Australian premises. NBN Co's goals are simple—deliver Australia's first national wholesale-only, open-access broadband network to all Australians, from those living in cities to people located in extremely remote places.

Most homes and businesses will receive an upgraded fixed line connection, but because Australia is so large, NBN Co is also using fixed wireless and satellite technologies to connect some remaining remote locations.

Biarri is a small Australian-owned and operated start-up that was established in 2009 to help businesses operate more efficiently. After years of working for large multinationals focusing on advanced planning and scheduling solutions, the founders identified a gap in the marketplace: the power of analytics was often limited to large companies with enterprise resourse planning (ERP) systems. They recognized that mathematics is only powerful if it is usable; thus they began to develop an agile approach to deliver custom software as a service (SaaS) solutions using the latest operations research methodologies.

By focusing on powerful mathematics, coupled with clean design and a strong user experience, Biarri tackles complex business issues and engineers simplicity. Successful businesses require making smart, daring choices—decisions based on valuable insights and data gleaned from algorithmic spelunking and executed with the confidence that comes from really doing the math. Biarri works with clients to complete the advanced calculations and deliver results so that its clients can get on with making profitable business decisions.

Within the last five years, Biarri has developed a wide range of operations research intellectual property and delivers SaaS analytics tools to a number of industries including, rail, mining and energy, healthcare, agriculture, retail, industrial, and supply chain clients. Moreover, it has spun off Biarri Networks as a subsidiary focusing specifically on the telecommunications industry; there are a number of other joint ventures in place to cultivate the power of operations research in a commercial sense.



Twitter

The 'Who-to-Follow' System at Twitter: Strategy, Algorithms, and Revenue Impact

Project Summary

Twitter is a social and information network remarkably simple in concept: a user "follows" other users to subscribe to their tweets: 140-character messages that can contain embedded media or links, which may be received on a variety of platforms (e.g., the twitter.com website, mobile clients on iPhones and Android devices, etc.). The vibrancy of the service, whether informing users of relevant breaking news or connecting them to communities of interest, derives from its users—more than 240 million of them, collectively posting over 400 million tweets every day (as of early 2013). Therefore, maintaining and expanding the active user population is a top priority for Twitter.

One important way to sustain and grow Twitter is to help users, both existing and new, discover connections. This is the goal of the "Who-to-Follow" product—the Twitter user recommendation service. In the current interface, the Who-to-Follow box is prominently featured in the left rail of the Web page, as well as in many other contexts across multiple platforms. This box suggests additional Twitter accounts that the user may wish to follow. The recommendations are highly personalized to the user. Building the system involved challenges deciding the best recommendation algorithms, analyzing the large amounts of data, efficient implementation and fine-tuning, operational planning, and constant feedback-based improvement. O.R. and analytics techniques were key to this effort.

This product has had significant direct impact on Twitter's growth and the quality of user engagement. It is directly responsible for more than 1/8 of the new friendships on Twitter's network, even without taking into account that Twitter is a viral network, and any new friendships lead to further discovery. Equally important, it has been a major driver of revenue. Twitter's Promoted Products (where a user is shown extra accounts to follow or shown extra tweets from paying advertisers) are incorporated into the platform without disrupting or detracting from the user experience and are designed to be as compelling and useful to users as organic content on the Twitter platform.



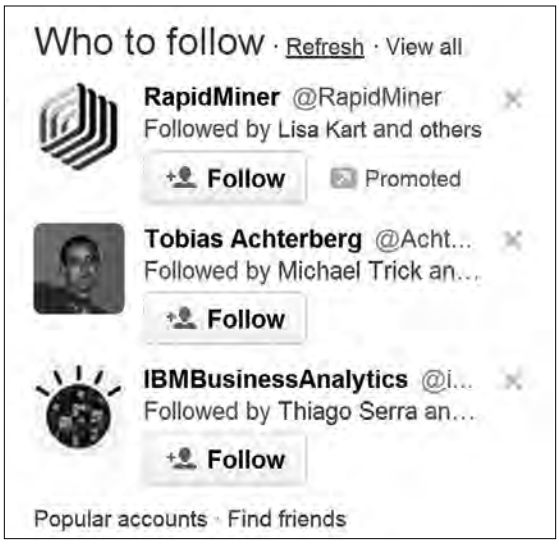


Twitter's S1 filing to become a publicly traded company mentions that "promoted accounts appear in the same format and place as accounts suggested by our Who-to-Follow recommendation engine." Hence this revenue source was directly enabled by the Who-to-Follow system. In addition, both Promoted Accounts and Promoted Tweets initially used the Who-to-Follow system for user targeting. This is a substantial contribution to two out of three Promoted Products from Twitter (the third is Promoted Trends). These Promoted Products form a substantial majority of Twitter's revenue, which is close to $1 billion a year (based on the most recent quarterly report).

In the words of Kevin Weil, Vice President of Revenue Products, and Alex Roetter, Vice President of Engineering at Twitter, "The Who-to-Follow system was crucial, in a fundamental way, for the Promoted Accounts product, and the Promoted Tweets product also initially used the Who-to-Follow system's targeting."

To quote Adam Messinger, Twitter's Chief Technical Officer, "The Who-to-Follow system is a perfect example of a product that brings together operational, algorithmic, and business thinking. The architecture and algorithms behind the system are at the leading edge of research and they have had a foundational impact on the growth of Twitter's business."







Organizational Overview

Twitter's mission is to give everyone the power to create and share ideas and information instantly and without barriers. Twitter points to usage of 241 million monthly active users, 500 million tweets sent per day, with 76% of Twitter active users on mobile, 77% of accounts outside the United States, and Twitter supporting more than 35 languages. Twitter's Vine mobile video service serves more than 40 million users. The company, which was incorporated in 2007, employs 2,700 employees—50% of whom are engineers—in offices around the world.

Call for 2015

Franz Edelman Award Applications

Call for 2015 Applications

THE FRANZ EDELMAN AWARD

44th Annual International Competition for Achievement in Operations Research

A $15,000 Competition with a $10,000 First Prize
Call for Success Stories

INFORMS and CPMS, the Practice Section of INFORMS, are pleased to announce the 44th International Competition for the Franz Edelman Award for Achievement in Operations Research. The competition will take place at the 2015 INFORMS Conference on Business Analytics and Operations Research in Huntington Beach, California.

Any work done in recent years is eligible, unless it has already been described by a Franz Edelman Award finalist. Previous publication of the work does not disqualify it. Anyone is eligible for the competition except a member of the 2015 judging panel.

The purpose of the competition is to recognize and reward outstanding examples of O.R. in practice. The prize is awarded for implemented work, not for a submitted paper or for the presentation describing the work. The client organization that used the winning work receives a prize citation; the authors receive a cash award. In addition, finalist organizations become members of the Franz Edelman Academy; authors receive the Franz Edelman Medal and are officially recognized as Laureates.

To submit, provide a three-page summary of your achievement and a 60-word abstract, plus the name, address, phone number, and affiliation of each author by Wednesday, October 15, 2014.

Complete instructions will be announced online at **www.informs.org/edelman**.

Each finalist group will give an oral presentation of their work on April 13, 2015 during the Analytics Conference in Huntington Beach.

See you at the 2015 Franz Edelman Award Competition!
www.informs.org/edelman

The Wagner Prize:

Excellence in Operations Research Practice

2013 Winner
The Daniel H. Wagner Prize
for Excellence in Operations Research Practice



The first place winners are Assaf Avrahami, Yedioth Group, Israel; Yale Herer, Technion–Israel Institute of Technology; and Retsef Levi, Massachusetts Institute of Technology.

Their paper, "Matching Supply and Demand via Delayed 2-Phase Distribution at Yedioth Group - Models, Algorithms and IT," describes the analysis performed and the novel methods used to reduce the cost of delivering print magazines at a time when the news industry is facing ever increasing competition from the Internet and social media.

This project has led to fundamental changes in the way Yedioth Group, the largest media group in Israel, distributes print magazines and newspapers. The team developed and implemented decision support tools, which were enabled through an EDI (electronic data interchange) system, and in the future will be enabled with a specialized RFID technological solution. The underlying idea is to use real-time information on the sales at retail outlets to enable pooling of inventory in the network. In particular, this information is leveraged to implement an additional resupply period in the middle of the week, delaying the distribution of some magazines until after partial sales data is obtained. The system is modeled as a two-stage stochastic optimization problem, and it is shown that the resulting cost is jointly convex in the decision variables. However, this approach gives rise to a multidimensional dynamic program. By formulating the second stage subproblem as a linear program (LP), an innovative stochastic gradient-based optimization algorithm can be applied that finds the optimal solution in a matter of seconds. The changes resulting from this collaboration generated major cost savings at Yedioth—both from a reduction in magazine production levels and return levels. These savings were achieved while maintaining the same sales levels.

The Daniel H. Wagner Prize for Excellence in Operations Research Practice

2013 Finalists

The final component of the 2013 Wagner Prize competition took place at the INFORMS Annual Meeting in Minneapolis, Minnesota. There, six teams gave presentations to a CPMS judging committee seeking to demonstrate that the quality and coherence of their analysis in a real-world application qualified them to win this prestigious award for outstanding practice of operations research and advanced analytics.



All finalists' presentations can be viewed in the INFORMS Video Learning Center by scanning the QR code to the left. A special issue of *Interfaces* will publish the winning paper along with those of the other five finalists:

Eva K. Lee, Fan Yuan, Ruilin Zhou, Saloua Lahlou, Georgia Institute of Technology; Ellie Post, Michael D. Wright, Grady Health System; Hany Y. Atallah, Leon L. Haley, Grady Health System and Emory University School of Medicine:
"Modeling and Optimizing Emergency Department Workflow"

Burcu B. Keskin, Ibrahim Capar, Nickolas Freeman, Charles Sox, University of Alabama:
"An Integrated Load Planning Algorithm for Outbound Logistics Optimization"

Daniele Vigo, University of Bologna; Beatrice Beleggia, Sandro Bosso, Giuseppe D'Aleo, Gruppo HERA; Claudio Caremi, Angelo Gordini, OPTiT:
"SPRINT: Optimization of Staff Management for Desk Customer Relations Services at HERA"

Segev Wasserkrug, Alexey Tsitkin, Alexander Zadorojniy, IBM Research, Haifa, Israel:
"Relieving Pressure: Optimizing Water Distribution Pressure Management at Valley of the Moon Water District"

Stephan Westphal, University of Goettingen:
"Scheduling the German Basketball League"

The Daniel H. Wagner Prize for Excellence in Operations Research Practice

A History

The Wagner Prize is awarded annually in honor of the late Dr. Daniel H. Wagner. During his years as president and principal owner of Daniel H. Wagner Associates, Dr. Wagner brought many high-quality mathematicians into the operations research community. This led to significant advances in the firm's fields of endeavor and delivery of significant applications to the Navy, Coast Guard, and other clients. Many of the applications are still in service today.

Dr. Wagner earned his PhD in mathematics from Brown University in 1951. His dissertation, "On Free Products of Groups," was published in the *Transactions of the American Mathematical Society* in 1957. Dr. Wagner joined the Navy's Operations Evaluation Group at the Pentagon, working on operations research for naval warfare. He worked there until 1956, with a one-year leave of absence for postdoctoral research on free algebras at MIT. Dr. Wagner then joined Burroughs Research Center, where he directed a group of mathematicians performing analysis for the development of digital computers.

In 1957, Dr. Wagner and John D. Kettelle formed the partnership of Kettelle and Wagner, which was dissolved in 1963. That same year, he formed a new company, Daniel H. Wagner Associates, Inc. This company applied itself to cutting edge work in the mathematics of naval tactics, especially antisubmarine warfare, detection theory, and search planning.

After retirement from the firm he founded, Dr. Wagner held various teaching and research positions with the U.S. Naval Postgraduate School and the U.S. Naval Academy.

Dr. Wagner was a member of INFORMS/ORSA for more than 40 years. He passed away in March 1997.

2013 Wagner Prize Committee

C. Allen Butler, Daniel H. Wagner Associates, Inc., Chair
Susan L. Albin, Rutgers University
William J. Browning, Applied Mathematics, Inc.
Manoj Chari, SAS Institute
Joseph H. Discenza, SmartCrane, LLC
Uday S. Rao, University of Cincinnati
Randall S. Robinson
Lawrence D. Stone, Metron, Inc.

Call for 2014

The Wagner Prize Applications

Call for 2014 Abstracts

THE DANIEL H. WAGNER PRIZE

Excellence in Operations Research Practice

Deadline Midnight May 1, 2014

The Wagner Prize is given to the authors of a previously unpublished paper detailing a real-world, provably successful application of operations research or advanced analytics that required innovative mathematical development, a unique new algorithm, or a series of coherent O.R. advances.

The application process begins with a one- to two-page abstract, written verification of application success, and a commitment, if selected as a finalist, to give a 30-minute oral presentation at the INFORMS Annual Meeting in San Francisco, California, and, if selected as a winner, to reprise the presentation at the spring Analytics Conference in Huntington Beach, California. The finalist papers are published in a special issue of *Interfaces*.

Submissions can be made to the Wagner Prize Chair, Dr. C. Allen Butler, at WagnerPrize@informs.org. For more details on the application process, please visit www.informs.org/wagnerprize.

The prize amount for 2014 is $1,000.

CPMS thanks the firms of Metron, Inc., Daniel H. Wagner Associates, Inc., and Applied Mathematics, Inc., for the generous endowments that enable the funding of this prize.

See you at the 2014 Wagner Prize competition!
www.informs.org/wagnerprize

25
Years of CPLEX

STRENGTH

1000+
Operations Research Experts

IN NUMBERS



Infinite Possibilities

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Congratulations to the 2014 Finalists for the Franz Edelman Award.

This prestigious honor recognizes outstanding examples of innovative operations research that improves organizations—and changes peoples' lives. IBM is honored to support these innovative organizations in their quest to achieve new heights in operations research, and also proud that more finalists use IBM ILOG® CPLEX™ Optimization Studio than any other optimization product.

Together with the advanced analytics and the consulting expertise of IBM Research and Global Business Services®, IBM's industry-leading ILOG Decision Optimization technology is allowing businesses to take the guesswork out of decision making.

More than 1,300 corporations and government organizations are using IBM ILOG Decision Optimization solutions to bridge the gap between analytics and execution with prescribed recommendations that improve operational effectiveness, revolutionizing all stages of the commerce lifecycle. Delivering significant cost savings, increasing business results, creating life-changing benefits—these corporations and organizations are making it happen, with help from IBM.



Learn more at **www.ibm.com/optimize**

The UPS
George D. Smith Prize

The UPS George D. Smith Prize



The UPS George D. Smith Prize is awarded to an academic department or program for effective and innovative preparation of students to be good practitioners of operations research, management science, or analytics. It is accompanied by a $10,000 cash award.

The prize committee is pleased to announce the finalists for 2014, (in alphabetical order):

- Lehigh University, Enterprise System Center and Department of Industrial and Systems Engineering
- Massachusetts Institute of Technology, Leaders for Global Operations Program
- University of British Columbia, Centre for Operations Excellence and the Master of Management in Operations Research program at the Sauder School of Business

The UPS George D. Smith Prize is an exciting new award created in the spirit of strengthening ties between industry and the schools of higher education that graduate young practitioners of operations research.

The UPS George D. Smith Prize is named in honor of the late UPS chief executive officer who was a patron of operations researchers at the leading Fortune 500 corporation. George D. Smith was the second CEO of UPS, holding the position from 1962–1972. He joined UPS as an accountant in 1925 and at some point in his long and illustrious career held almost every functional title within the company.

While his background was steeped in finance, George Smith had a keen engineering mind. In the late 1940s, after learning about operations research, George Smith realized that intuition alone would not be enough to help UPS master the many issues it faced as it grew in size from a regional to nationwide carrier.

George Smith recognized O.R. as an engineering approach to making decisions, and started advocating the use of operations research concepts in UPS. Quantitative analysis became the bedrock on which UPS engineering function was built. Because of George's vision, UPS now employs thousands of engineers whose focus is efficiency, sustainability, and service.

He was a strong believer in investing in our younger generation. For him, nurturing them was the key to sustained prosperity. This prize embodies George Smith's beliefs: to recognize the importance of operations research in practice, and ensure that our younger generation gets proper exposure to its value, and in turn benefit society.

The UPS George D. Smith Prize

About this year's competition & 2014 Finalists

Since the first days of operations research there has been highly divergent opinions about how effectively our universities are preparing students to be effective practitioners. From the perspective of the committee charged with administering the UPS George D. Smith Prize this year, there is strong evidence that overall our universities are doing very well in this area.

The Prize Committee members feel confident that there will be a truly outstanding winner this year and for many years to come. It was hard but rewarding work to choose the finalists. Selecting the winner from the finalists will also be very difficult.

Seeing the diversity, quality, and innovation of these entries has given the committee a unique and encouraging picture of how well we, as a profession, are preparing future practitioners. Please look at the following pages for additional information about the finalists. We will announce the winner tonight. Plan to attend the special presentation at the conference on Tuesday in which the winning team members will describe their program in more detail. All of us will undoubtedly learn something about how to better prepare practitioners, and also experience a taste of the many reasons that the committee is so excited about the overall state of academic practitioner training.

UPS George D. Smith Prize Winners

2013
Naval Postgraduate School

2012
University of Michigan, Tauber Institute for Global Operations

The 2014 UPS George D. Smith Prize Committee:

Ranganath Nuggehalli, CAP, UPS, Chair
Donald R. (Bob) Smith, Monmouth University
Susan Albin, Rutgers University
Lawrence Seiford, University of Michigan
Don Kleinmuntz, Kleinmuntz Associates
Stefan Karisch, Jeppesen
Robin Louge, IBM

Lehigh University
Enterprise System Center (ESC) & Dept. of Industrial & Systems Engineering (ISE)

Lehigh University's program utilizes the combined expertise of its Department of Industrial and Systems Engineering (ISE) and Enterprise Systems Center (ESC) to prepare students at all educational levels to become effective practitioners of operations research, management science, and analytics. The program builds on a foundation of basic courses, beginning with an analytics case study in the sophomore year, and includes a wide variety of advanced courses. A network of company partnerships provides support for student experiential learning linked to funded industry projects. Often, students work on various projects during their tenure at Lehigh.

Lehigh University employs a system called "layered mentoring," combining relationship managers, consultants, and senior fellows from the ESC, as well as faculty, to guide teams of undergraduate and graduate students. Mentors provide well-rounded practical and rigorous theoretical guidance in the application of operations research techniques during project work. Internships are also supported; however, Lehigh's mentoring methodology has been highly effective, especially with undergraduates. The ESC has worked with more than 425 companies on more than 1,100 projects, engaging an estimated 3,000 students.

The ISE has a substantially renewed undergraduate program and eight graduate programs. The majority of these offerings have a strong operations research focus with most graduates entering the field as practitioners and some as researchers. Lehigh has developed and launched new practice-oriented degrees including health systems engineering, and a new online program in management science and engineering. Over a dozen new courses have been recently created. In 2013, the reported undergraduate enrollment level was 162 students. The current total enrollment at the graduate level is 261 students.

A new SAS-sponsored advanced analytics laboratory was established in 2013 in the Enterprise Systems Center. It incorporates an open concept analytics research and industry project work area where all levels of participants interact freely (undergraduates, graduate students, mentors, faculty, and industry partners). In addition, a project work station and instructional development area is used to design and rapidly pilot new educational content. For 2014, a third area, the redesigned collaboratory, will support practitioner development for a range of student group sizes, from small to medium sized classes. Students are able to interact via teleconference with industrial partners, as well as observe, evaluate, and participate in project team presentations given remotely.

Lehigh's program contains a number of additional innovations nurturing young practitioner development. It includes a focus on communication and leadership skills, with an optional minor in engineering leadership, along with several courses on leadership development. In addition, programs to integrate the education of students who have prior work experience with young practitioner preparation are being piloted. An industry roundtable and advisory board provides feedback on recent graduate work performance and helps identify new content and innovative program enhancements.

Massachusetts Institute of Technology,
Leaders for Global Operations Program



The Leaders for Global Operations (LGO) program, formerly known as Leaders for Manufacturing, was started in 1988 to develop technically-trained managers who would lead the U.S. manufacturing industry. It was the first program in the United States to forge a partnership between industry and schools of management and engineering. Since its inception, the program has evolved to reflect the rise of the service industry and the increasingly global nature of operations and manufacturing.

LGO is a two-year dual degree program. Upon graduation, its students receive an MBA or MS from the MIT Sloan School of Management and an MS from one of seven MIT engineering programs. Each year, approximately 48 students with science and engineering backgrounds and an average of five years of work experience are admitted, resulting in a total enrollment of 96. Every LGO student receives a fellowship sponsored by one of the program's industry partners that covers a substantial portion of tuition costs. In addition, merit scholarships are awarded to outstanding students. LGO graduates are among the most sought after in the industry.

The LGO curriculum is based on the belief that fundamental knowledge of operations research is essential to achieving superiority in operations. OR courses are central to the LGO core curriculum and form a critical part of its electives. LGO is supported by a distinguished and diverse faculty from MIT's schools of management and engineering who are at the forefront of operations research and engineering practice. In addition to technical skills, the students also get strong training in "soft skills" that are vital for translating theory into practice.

Intense hands-on training is a significant part of the LGO curriculum. Students help companies improve their operations through two electives centered on real-world operations management practice. In "Operations Lab," they work with local companies, and in "Lion Teams," they work in operations at Chinese companies with their peers from an affiliated program called China Leaders for Global Operations.

The central part of practical training in LGO is a required six-month internship at an industry partner company. During this internship, students work on specific operations challenges and draw on their LGO training to solve it. The internship research and results form the basis of the dual master's thesis.

LGO graduates also benefit from a strong alumni network that fosters development long after leaving the program. Its graduates, who now number more than 1200, hold important positions in industry and continue to lead operations and manufacturing around the globe.

University of British Columbia
Centre for Operations Excellence
Sauder School of Business

Founded in 1998, the Centre for Operations Excellence (COE) and the Master of Management in Operations Research (MMOR) program at the Sauder School of Business, University of British Columbia, provides rigorous practical training in the quantitative analysis of business problems. The main goal of this 16-month professional master's program is competency in O.R. practice. Accordingly, the program features a 4.5 month industry project as its centerpiece. Each MMOR student is matched with a COE industry partner company to consult on a significant operational challenge faced by the company, one that they would otherwise approach a leading consulting firm to address. Although the projects vary considerably, they have one characteristic in common: each has been identified by the client as containing an important problem within their organization that, if solved, would allow for enhanced performance in terms of productivity, efficiency, or effectiveness.

After eight months of coursework that provides students with a strong background in operations research and analytics, students are immersed in full-time work on their industry project. Each student takes the role of lead analyst on a project, and is supported by a large team. One-on-one mentorship is provided by a COE staff project advisor, guidance is provided by a Sauder faculty advisor, technical support is available from a pool of summer students, and oversight is provided by the COE's directorship. The team as a whole puts in over 2,300 work hours on each project.

At the start of the projects, students follow the lead of their project advisor. Over the course of the project, students are expected to develop their skills, eventually evolving into the leadership role for their project. Depending on their experience prior to the program and their inherent abilities, each student's trajectory to the leadership role is different. The project provides each student with an opportunity to build on strengths and develop weak areas, as well as to demonstrate their ability to creatively solve challenging and open-ended problems.

Each project's trajectory is also different depending on the nature of the problem at hand and the industry partner's needs. All projects, however, involve a "discovery" phase, which includes gathering data and better defining the problem, a model-building and analysis phase, and finally the "delivery" phase, where a tool or report are handed over to the partner. The close working relationship with the partner is reinforced through multiple milestone meetings where students present their progress to the partner's senior management.

In the final semester, students complete their program with elective courses. They are also expected to present their project at the annual COE Roundtable, which showcases the students' work to representatives of the local business community. Students often receive employment offers prior to graduation, often from the industry partner that they worked with. Indeed, some of our long-term industry partners (e.g. Fraser Health and Boeing Canada—AeroInfo) have employed several of our graduates and have been able to set up O.R. groups that are largely made up of MMOR graduates.

Call for 2015

UPS Smith Prize Applications

Call for 2015 Applications

THE GEORGE D. SMITH PRIZE

Strengthing Ties Between Academia and Industry

Deadline for Applications is Monday, October 27, 2014

The UPS George D. Smith Prize was created in the spirit of strengthening ties between industry and the schools of higher education that graduate young practitioners of operations research. INFORMS, with the help of CPMS, will award the prize to an academic department or program for effective and innovative preparation of students to be good practitioners of operations research, management science, or analytics.

The UPS George D. Smith Prize is named in honor of the late UPS chief executive officer who was a champion of operations researchers at a leading Fortune 500 corporation. UPS has generously underwritten the award in his memory.

The prize will be awarded to an academic program or department. It will include a trophy and a $10,000 cash award. The UPS George D. Smith Prize winner will be announced at the 2015 INFORMS Franz Edelman Gala.

The application process begins with a summary of the role of operations research in the academic program and why competence in operations research practice is one of the goals of the program, written verification of program success, and a commitment, if selected as a finalist, to give a 30-minute oral presentation at the spring Analytics Conference in Huntington Beach, California, and, if selected as a winner, to reprise the presentation at the INFORMS Annual Meeting in Philadelphia, Pennsylvania. The finalist papers are published in a special issue of *Interfaces*.

Submissions can be made to RNuggehalli@ups.com. For more details on the application process, please visit **www.informs.org/smithprize**.

See you at the 2015 INFORMS Conference on Business Analytics and Operations Research!

www.informs.org/smithprize

The INFORMS Prize:

Sustained Integration of Operations Research



2014 Winner



The 2014 INFORMS Prize is awarded to Mayo Clinic for their sustained, novel, and rich legacy of integrating advanced analytics and operations research/ management science (OR/MS) with clinical care, research, education, and administration to consistently deliver the best care to every patient.

Mayo Clinic's century-long history of using systems thinking, analytics, and operations research traces its roots back to Dr. Henry Plummer, who developed the first integrated, paper medical record as a platform to organize and share patient information within a group practice of medicine. This served as the foundation of Mayo Clinic's culture of applying engineering and operations research principles and methods.

Mayo Clinic continues to make significant investments to ensure a sophisticated advanced analytics and operations research infrastructure. With more than 500 OR/MS practitioners, Mayo Clinic is able to continually leverage analytical methods to enhance strategic planning, care process redesign, patient experience, inventory management, and project management—leading to important patient benefits as well as financial savings. Example projects include optimization models for patient scheduling; queuing theory for effectively transporting patients; systems dynamics for strategic capital allocation planning; simulation modeling to redesign pharmacies to reduce patient waiting time; and discrete event simulation models and heuristics for blood management.

In addition to applying advanced analytics and operations research to its business, Mayo Clinic has made significant strides to educate their staff and disseminate what they've learned. The College of Medicine at Mayo Medical School, Quality Academy, and Systems Engineering & Operations Research Collaborative educate staff in tools, methods, and data analytics. Mayo Clinic also offers academic rank in Health Care Systems Engineering to staff who make significant contributions in the development and translation of OR/MS research.

Mayo Clinic's leadership recognizes analytics and engineering as key contributors to the organization's sustained excellence, market differentiation, and superior customer experience. Looking to the future, senior leaders at Mayo Clinic consider these disciplines to be vital in addressing the formidable challenges facing healthcare today.



The INFORMS Prize

A History

This is the sixth year in which the INFORMS Prize has been honored during the Edelman Gala. While the Edelman Award and the Wagner Prize recognize single projects that demonstrate outstanding accomplishments in O.R. practice, the INFORMS Prize complements them by recognizing long-term, multiproject achievements.

The INFORMS Prize is awarded annually to recognize effective integration of operations research into organizational decision making. The award is given to an organization that has repeatedly applied the principles of O.R. in pioneering, varied, novel, and lasting ways.

INFORMS Prize Winners

2014 Mayo Clinic
2013 Ford Motor Company
2012 Memorial Sloan-Kettering Cancer Center
2011 Sasol
2010 Jeppesen
2009 Intel *Decision Technologies Group*
2008 GE Global Research *Risk & Value Management Laboratory*
2006 Schneider National, Inc.
2005 Air Products & Chemicals, Inc.
2004 Procter & Gamble
2003 UPS
2002 Hewlett-Packard
1999 IBM
1998 Lucent Technologies
1997 Merrill Lynch Private Client Group
1996 Pfizer Inc
1995 Bellcore
1994 AT&T and US West Technologies
1993 New York City *Office of Management and Budget* and United Airlines
1992 San Miguel Corporation
1991 American Airlines and Federal Express

2014 INFORMS Prize Committee

Jeff Winters, UPS, Chair
Stefan E. Karisch, Jeppesen, Past Chair
Pete Buczkowski, Disney Parks & Resorts
Timothy L. Jacobs, US Airways
Maciek Nowak, Loyola University
Stephen M. Pollock, University of Michigan
Qingwei Li, Eastman Chemical Company

Notes:
Prior to 1995, the award was called the ORSA Prize.
No prize recipients were chosen in 2000 and 2001.

To adjust to the new INFORMS Prize presentation schedule, no award was given in 2007.



The INFORMS Prize

Criteria

Variety of Applications of O.R. The demonstrated use of a wide set of disciplines and application areas led to a richer set of offerings, leading to greater opportunities for impacting the winning organization.

Competitive Advantage to the Organization. O.R. adoption within an organization is clearly varied among organizations. There are examples where O.R. permeates the parent organization's operations and was considered integral and of strategic competitive advantage for the organization. Companies that soundly demonstrate this type of adoption were rated higher by the prize committee.

Impact. There are several ways that O.R. professionals can quantify and qualify the impact their work is having on the organization as a whole. The prize committee took one-off project impacts into consideration, as well as those O.R. applications that were used on a sustained, systemic manner and the quantifiable value they delivered. Some applicants demonstrated instances in which O.R. made fundamental changes to the client organization's overall business model and/or organizational structure, and the prize committee considered these examples in which O.R. truly made an impact on the organization's operations.

Model for Success. Applicants' business models vary, based on different industries. Some are represented very well, including marketing, budgeting, cost recovery, research funding approaches, and strategic planning. This provides a sense of sustained, growing capability, and of direction for O.R. in the organization.

Endorsements. Strong submissions include personally written endorsements from top-level organization management.

Overall Quality of the Application. The best applicants clearly put extra effort into creating a singular submission with all supporting references and endorsements. A well-written application, taken together with the overview statement, aids the prize committee and, in turn, the applicant.

Call for 2015

INFORMS Prize Nominations

Call for 2015 Nominations



Applications for the 2015 INFORMS Prize are now being accepted.

Organizations in the public and private sectors are eligible. Outside contractors to a candidate organization are not eligible, unless a proven, dedicated relationship exists over a prolonged time period between the vendor and the client organization. In this case, the client organization and vendor will be co-recipients of the prize, presented to appropriate executives of both organizations.

The measurement of the contribution is judged relative to the impact OR/MS has had on the overall success of the organization. Thus, a multibillion dollar firm that has a large OR/MS staff but integrates OR/MS techniques only occasionally might be ranked relatively lower than a small firm that uses OR/MS throughout its activities.

Potential applicants can be assured that strict guidelines regarding the confidentiality of their application are enforced.

The Awards Committee may conduct site visits to those organizations selected as finalists. The award is presented to the key executive in charge of OR/MS activities within the organization.

Please include the following with your application:
A summary description (1-3 pages) of the scope, scale, and impact of OR/MS activities in the organization, and more detailed descriptions (one page each) of two or three major OR/MS projects and their impact. For more information about the application process, please visit: **www.informs.org/informsprize**.

Deadline is December 1, 2014.

See you at the 2015 INFORMS Conference on Business Analytics and Operations Research! April 12–14, Huntington Beach, California

Congratulations to Edelman Award winners both past and present

Merrill Lynch salutes the finalists of the 2014 Edelman Award. And we applaud INFORMS for celebrating excellence in the practice of operations research and management science. As a member of the Franz Edelman Academy, we proudly congratulate all Edelman Award winners and finalists.



Merrill Lynch
Bank of America Corporation

The Franz Edelman Award, presented annually by the Institute for Operations Research and the Management Sciences (INFORMS), recognizes outstanding examples of operations research, management science and advanced analytics in practice throughout the world.

Merrill Lynch makes available products and services offered by Merrill Lynch, Pierce, Fenner & Smith Incorporated, a registered broker-dealer and member SIPC, and other subsidiaries of Bank of America Corporation.

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About INFORMS, a Pioneer in Analytics

The Institute for Operations Research and the Management Sciences is the leading professional society for advanced analytics professionals.



With the tremendous growth in recent years of analytics, Big Data, business intelligence, and operations research—*U.S. News & World Report* ranked "operations research analyst" as number two in its annual listing of best business jobs this year—INFORMS has risen to become the leading professional association for professionals in these fields, a place where business executives gain assistance, professionals obtain credentials and recognition, and academics publish new, influential research.

This conference, with a special component for executives, is just one example of the way that management can engage with analytics—by attending sessions on using analytics at their firms, watching presentations by the best analytical teams at the Edelman competition, comparing notes at an executive forum, and interviewing potential employees at Analytics Connect. Professionals turn to INFORMS to obtain credentials—witness the Certified Analytics Professional (CAP®) exam being given at this conference. They compare notes at conferences and through publications written for them; they join an analytics community, a special interest group for people like them; they take continuing education classes that bring degreed professionals up-to-date. And as those who saw the beta version during this conference can attest, they will gain a new tool being developed by INFORMS: an analytics maturity model that will help them assess the state of analytics at their organization, how their organization compares to others, and how they should approach strengthening their current assets and improving, moving their analytics efforts to a new, more beneficial level.

INFORMS has expanded its offering to the business world through *Analytics* magazine, an online publication for analytics experts who analyze data in the

marketplace and those who work with them and direct their departments. The magazine's homepage, www.analytics-magazine.org, offers breaking news, feature articles, and an Executive Edge column written by guest writers like Andrew Jennings, the chief analytics officer at FICO, and Chuck Holland, vice president of industrial engineering at UPS.

Academics share their research in INFORMS journals like *Interfaces*, the INFORMS Journal on the Practice of Operations Research, which shows how business and government execute important, successful analytics projects. Indeed, INFORMS publishes 13 journals with the most important research in all the specialized subjects that have brought scientific contributions from the related disciplines of math modeling, O.R., management science, and, of course, analytics.

INFORMS was established in 1995 with the merger of the Operations Research Society of America (ORSA) and the Institute of Management Sciences (TIMS). The international scientific society, which has over 11,000 members, is dedicated to applying scientific methods to help improve decision making, management, and operations. Members of INFORMS represent industries as diverse as airlines, healthcare, the military, finance, and telecommunications.

INFORMS retains its traditional side. Since the pioneering days of people like Franz Edelman, operations researchers have taken pride in quietly improving



the world. Saving—and earning—billions of dollars annually, model-based support solutions developed by INFORMS members are now relied upon in diverse industries. Research pioneers in O.R. disciplines represented by INFORMS have contributed significantly to the development of algorithms and methodologies now widely employed in engineering, science, and business.

INFORMS is often a leader in identifying the world's foremost researchers—for example, Lloyd Shapley, who would win the 2012 Nobel Prize in Economic Sciences, was recognized with INFORMS John von Neumann Theory Prize 31 years earlier, in 1981.

INFORMS dominates a special place at the intersection of industry and research. Its leaders salute this year's Edelman finalists and all those who have made advanced analytics an important contributor to business, government, healthcare, and higher education.



Recognizing the Leaders and Best

The Tauber Institute for Global Operations salutes the honorees of the 2014 UPS George D. Smith Prize. And we applaud INFORMS and UPS for understanding the value of innovations in operations research, management science, and analytics.

As an inaugural recipient of the UPS George D. Smith Prize, we proudly congratulate all winners.

ORMS

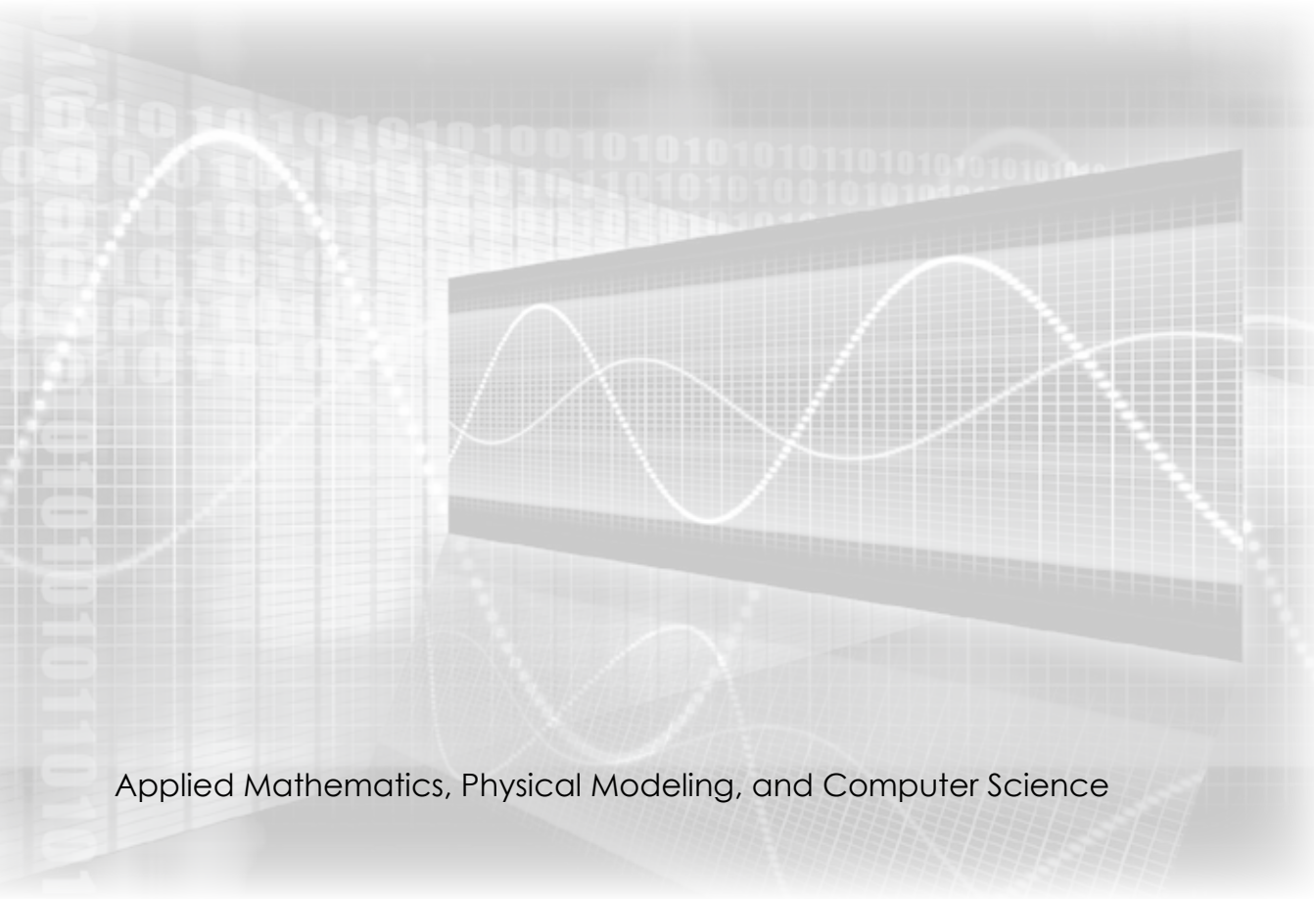
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UNIVERSITY OF MICHIGAN
tauber.umich.edu

academia strengthening ties industry
ups george d smith prize

Congratulations to the 2014 Franz Edelman Finalists!

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Bringing You a Crown Jewel of the Operations Research Profession

By Russell P. Labe, CAP, Past Chair, CPMS

Background of the Edelman Award and an Invitation to Participate



As we celebrate the outstanding achievements of this year's Franz Edelman Award finalists, let's take a look at the background of the influential Edelman Award, including the central role of CPMS, the Practice Section of INFORMS.

CPMS is an acronym originally derived from College on the Practice of Management Science. A long-standing acronym often becomes the name, and later we rarely think of its origin. Consider for example AT&T, which once stood for American Telephone and Telegraph, yet is still the acronym even though "telegraph" is no longer part of the AT&T business. So it is for CPMS. "College" was terminology used within The Institute of Management Sciences (TIMS), which merged with the Operations Research Society of America (ORSA) in 1995 to found INFORMS—more appropriate today is the term "Section."

CPMS supports the practice of operations research and the management sciences (OR/MS), also called the practice of advanced analytics. Rather than giving attention only to specific technical methods or areas of study, CPMS, like a family physician, focuses on general practice: how OR/MS may be carried out successfully in any and all organizations where executives and operating personnel seek assistance from qualified practitioners to help improve real organizational performance.

One of the most important activities of CPMS is administering the Franz Edelman Award. This present stewardship directly evolved from the earlier CPMS role in initiating, nurturing, and growing the competition in stature and visibility. First established by TIMS in 1971 as the Practice Prize, the award was renamed to honor Franz Edelman shortly after his death in 1982. Franz was the founder of one of the



first industrial operations research groups in the United States, at RCA, circa 1950. Today, becoming an Edelman finalist is widely viewed to be rigorous certification that an organization has benefited from the application of state-of-the-art, highly impactful operations research. The finalists' stories and their presentations, available from the INFORMS Video Learning Center, in papers published in the journal *Interfaces*, and on DVD, are widely employed in education and otherwise to help strengthen the profession. Past and present finalist organizations and team members are rightfully honored at our gala award ceremony every year, during the spring analytics conference, where the competition takes place.

Administration of the competition is a rigorous, highly-organized effort. The committee of volunteers who operate the competition consists of 35–45 OR/MS professionals, most of whom are CPMS members. The committee's chair, typically serving a two-year term, is assisted by 8–10 judges, 10–15 coaches and assistant coaches, 20–25 verifiers and assistant verifiers, and 35–40 reviewers (some volunteers take multiple roles).





The competition would not be possible without an effective support-and-evaluation infrastructure. We are always looking for new members to get involved in the prize committee. If you would like to help administer the Edelman competition in the future, a good starting point is to volunteer to become one of the reviewers.

CPMS also oversees a number of other activities important to practitioners, including the Daniel H. Wagner Prize and the UPS George D. Smith Prize (both recognized during the Edelman Gala), cluster sessions at INFORMS meetings, isolated practitioner workshops, and a newsletter.

If you are not a member of INFORMS or of CPMS within INFORMS, please join us and pitch in as we serve all full- and part-time practitioners and researchers interested in practice. If you are already a member but not actively involved, contact us (pbell@ivey.uwo.ca) to find out how you can further benefit from your membership through participation. As the cliché goes about university lecturing, "Nobody learns as much as the teacher." There is no better way to learn the ropes of successful OR/MS practice!

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UNIVERSITY OF Cincinnati

Center for Business Analytics

Bringing a New Level of Education to the Field of Analytics

By Michael Rappa, North Carolina State University



During the Gala we hear a great deal about the way that analytics and operations research are transforming programs in business and government, making innovation possible with insightful applications of math modeling and the analysis of Big Data. The Edelman and Wagner Prize teams frequently approach innovation through a collaboration involving an organization with a major project, a consultant group, and academics from universities that partner with the organization.

Establishing collaboration between the academy and business/government is crucial to smart growth and problem solving. We also see the importance of this collaboration manifested in the UPS George D. Smith Prize competition. Those at UPS who saw the importance of underwriting the prize recognize that business needs academic programs that pay attention to the skills required at the workplace, and that academic programs must prepare young people for the very specific tasks they will perform after graduation.

During my tenure as executive director at The Institute for Advanced Analytics at North Carolina State University—founded in 2007 as one of the first analytics programs in the world—we have emphasized the importance of synchronizing the academic education we provide with the needs of businesses that our graduates will serve.

This need is clear as university after university open undergraduate and graduate programs in analytics. Since that pioneering time when I began discussions about the Institute with NCSU in 2005, more than 100 programs have begun—they open so frequently nowadays that it's

hard to keep our count up-to-date. These programs have come to include full-time masters' programs, degrees with special concentrations in analytics, MBA programs with analytics tracks, analytics executive education, online courses, and programs in the United Kingdom, Belgium, Australia, and other countries.

As we recognize prize winners and leaders at the Gala, we can also take a moment to contemplate how we can best design analytics programs that businesses will value, programs that will turn out tomorrow's prize winners. INFORMS invited me to chair a committee on university analytics programs together with my co-chair Diego Klabjan, CAP, of Northwestern University. We work with subcommittee chairs Mike Hardin, Dean of the University of Alabama's Culverhouse College of Commerce (curriculum), Missie Bowers of the University of Tennessee, Knoxville's College of Business Administration (information), Jeff Camm of the University of Cincinnati (academic/industry interface), and many volunteers.

Our aim is to help analytics programs that exist and also provide support for academics who, together with their administrators, are launching university





programs in analytics and would appreciate guidance from peers who have walked this road before them.

We are currently in the planning stage, examining issues such as:

- Identifying the variety of basic information and resources that analytics programs require
- Determining curricula, and working to identify a core curriculum and areas of concentration
- Finding out what different fields and industries want from the graduates they produce—be it well-rounded analytics professionals who can handle many challenges; those who focus on math modeling, software design, and data gathering; or experts who concentrate on specific fields or specific kinds of problems

As we salute the winners of INFORMS awards—Edelman, INFORMS Prize, Wagner Prize, and UPS George D. Smith Prize—we are also preparing for tomorrow's prize winners by turning out well-rounded graduates in analytics and related fields. I feel confident that as businesses in future years cultivate analytics experts, our academic programs will train young people in the skills that will serve best.

The Edelman Laureates

2013

Carlijin Bak
Tejinder Kaur Bimbraw
Brett Bonner
Ruud Brekelmans
Graeme Case
K. Chandrasekhar
Lijun Chen
Zhi-Long Chen
Parag Chitalia
Pawan Chowdhary
Margery Connor
Robert Creek
Mark Davis
Youssef Drissi
Dick den Hertog
Matthijs Duits
Carel Eijgenraam
Bob Gooby
Randhir Hebbar
Ganesh Hegde
Mary Helander
Guofen Hu
Matt Johnson
James Kalina
Kaan Katircioglu
Nick Kenaston
Jarl Kind
Mahesh Krishnan
Wim Kuijken
Rahul Kumar
Ted Kutz
Lin Li
Lebin Lin
Jiyin Liu
Yan Liu
Sudeep Maity
Karl Martin
Doug Meiser
Ying Meng
Nathan Mott
Murugan Pugalenthi
K. Raghava Rau
Kees Roos
Rohit Saksena
Howard Smith
Karthik Sourirajan
Craig Stenstrom
Karthik Subbian
Sumathi Subramanian
Lixin Tang
Pieter Vermeer
David Wagnon
Gongshu Wang
Takashi Yonezawa
Bo Zhang
Xinhui Zhang

2012

Ahmar Abdullah
Suresh Acharya
Sofia Archontaki
Bernard A. Benecke
Greg Burel
Arnab Chakraborty
Kyle Christianson
Frederic Deschamps
John Dimotikalis
Prasanna Dhore
Feryal Erhun
Phillip Finch
Hein Fleuren
James Fuller
Chris Goossens
Marco Hendriks
Erik F. Hertzler
David W. Hill
Karl G. Kempf
Iraklis Lazakis
Eva K. Lee
Marie-Christine Lombard
Kathleen Mallery
Jacquelyn Mason
Ronald P. Menich
Ineke Meuffels
Pelin Pekgün
Chen Peng
Ferdinand H. Pietz
John Poppelaars
Timothy R. Rosenberg
Bharathan R. Shamasundar
Manav Shroff
Ritwik Sinha
Girish Srinivasan
Suresh Subramanian
Rohit Tandon
Osman Turan
James Van Sistine
Orestis Varelas
Takis Varelas

2011

Naoki Abe
Fernando Alarcon
Gary F Anderson
Gustavo Angulo
Alex Beiza
James J. Bennett
Cristian Berner
Brian Carlson
Jaime Catalan
Yonghong Chen
Brent R. Cooley
Kenneth Cooper
Jin Dong
Xing Dong Zhang
Craig Eister
Rafael Epstein
Timothy Gardinier
Edward Godlewski
Cristian Gonzalez
Guillermo Gonzalez
Jon A. Higbie
Mingguo Hong
Sergio Hurtado
Florencio Infante
David L. Jensen
Roy Jones
Dev Koushik
Kevin Larson
Gregory Lee
Guo Li Jie
Xingwang Ma
Prem Melville
Gerard Miller
Mauricio Naveas
Andres Neely
Peter Nieuwesteeg
Cezar Pendus
Xi Quan Wang
Chandan K Reddy
Haili Song
Kimberly Sperry
Matthew Tackett
Doug Taylor
Li Thomas
Vince P. Thomas
Fernado Valenzuela
Jie Wan
Melissa Weatherwax
Andres Weintraub
Liu Xiao Hu
Ming Xie
Jun Yin Wen
Daniel Yung
Eugene Zak
Bin Zhang

2010

Gerkotze Bonthuys
Ebert Cawood
Jay Cunningham
Esmi Dreyer
Ingrid Farasyn
Andrea Feunekes
Ugo Feunekes
Marc Fischer
Michele Fisher
Tjark Freundt
Wolfgang Giehl
Francisco J. Herrería
Salal Humair
Johan Janse van Rensburg
Jaco Joubert
Joel I. Kahn
Peter Kolesar
Miguel de Lascurain
Willem Louw
John MacNaughton
Kim Mathisen
Marlize Meyer
David Fernando Muñoz
John J. Neale
Arturo Palacios-Brun
Steve Palmer
Hylton Robinson
Omar Romero-Hernandez
Oscar Rosen
Ruan Rossouw
John Ruark
Luis de los Santos
James Serio
Francisco Solis
Gerrit Streicher
William Tarlton
Hentie van den Berg
Anette van der Merwe
Wim Van de Velde
Lorraine van Deventer
Jaime Villaseñor
Glenn Wegryn
Sean P. Willems
Cecile Wykes

2009

Dharma Acharya
Jason Amaral
Dirk Beyer
Ann Brecht
Matt Callahan
Brian Cargille
Felipe Caro
Russ Chadinha
Kathy Chou
Matt Collins
Juan Correa
José Manuel Corredoira
Prashant Dave
Gavin DeNyse
Miguel Díaz
Alexey Ershov
Graeme Everett
Qi Feng
Chris Fry
Jérémie Gallien
Javier García
Rune Gjessing
Michael F. Gorman
Sharon Hormby
Shailendra Jain
Shiva Kumar
Rick Lawrence
Michele Meyers
Holger Mishal
Marcos Montes
Julia Morrison
Thomas Olavson
Cookie Padovani
Claudia Perlich
Andy Philpott
Sesh Raj
José Antonio Ramos
Saharon Rosset
David Sellers
Kurt Sunderbruch
Robert Tarjan
Timothy Tenca
Kjetil Vatn
Krishna Venkatraman
Julie Ward
Joseph Woods
Bin Zhang
Jing Zhou

2008

Erwin Abbink
Terra Baranowski
Jonathan Berry
Erik Boman
Michael Brennan
Robert Carr
Lorne Cass
Michael Cirillo
Maria Delbom
Charles B. Duke
Helga Einarsdottir
Mats Eklund
Patrik Eveborn
Pieter-Jan Fioole
Matteo Fischetti
Marte Fodstad
Kim Fox
George Gray
William Hart

Lars Hellemo
Jonathan Herrmann
Ken Howard
Dennis Huisman
Robert Janke
Leo Kroon
Miro Lehky
Vaughn Lowe
Gábor Maróti
Kevin Morley
Regan Murray
James Oiesen
Cynthia Phillips
Cyndi Quan-Trotter
Sudhendu Rai
Lee Ann Riesen
Frode Rømo
Mikael Rönnqvist
Thomas Scheermesser
Lex Schrijver
Adri Steenbeek
Ved Sud
Midori Tanino
Thomas Taxon
Asgeir Tomasgard
James Uber
Jean-Paul Watson
James Wetherly
Roelof Ybema

2007

Corne Aantjes
Deirdre Borrego
Dwight Branvold
Vinayak Deshpande
Kent Everingham
Matt Gaskins
Jerry Hwang
Tim Hyatt
Irina Ionova
Ananth Iyer
Michael Jacks
Goos Kant
Alexei Khavaev
Eva K. Lee
Patty Mackenroth
Venu Nagali
Gary Polaski
Mark Pridgen
Frederick C. Riedlin
David Sanghera
Patrick Scholler
William V. Shearin
Michael A. Shirk
Greg Shoemaker
Jorge Silva-Risso
Tim Thurston
Marco Zaider

2006

William Best
Raymond H. Bittel
Richard Carnevale
Sridhar Chandrasekaran
Louis Cox, Jr.
Ross Darrow
Stéphane Dauzère-Pérès
John Elieson
Christoper A. Forgie
Dirk Guenther
Kjetil Haugen
Ulrich Koester
William H. Lee
Per Olav Myrstad
John J. Nestor
Atle Nordli
Asmund Olstad
Robert M. Peterson
Douglas Popken
B.V. Rao
Alf Reistad
Barry C. Smith
Mandyam Srinivasan
Geir Teistklub
Russell Wooten
Faker Zouaoui

2005

Jeffrey Alden
Dennis Begg
D.A. Beis
Ann Bixby
Lawrence Burns
Michael Concordia
Theodore Costy
Brian Downs
Toshiharu Hasegawa
Rick Hughes
Richard Hutton
Craig Jackson
Jim Jacobs
David Kim
Kevin Kohls
David Levine
P. Loucopoulos
Paul Martyn
Jonathan Owen
Y. Pyrgiotis
Tuomas Sandholm
Mihiro Sasaki
Katsushige Sawaki
Mike Self
Atsuo Suzuki
Mark Turnquist
David Vander Veen
K.G. Zografos

2004

Martin Barkman
John C. Butler
Alexander Chebeskov
Herman Chiu
Mathieu Clerkx
Ton de Kok
Jacques Desrosiers
Yvan Dumas
James Dyer
Thomas A. Edmunds
Rob Harlan
Richard Hicks
Fred Janssen
Jianmin Jia
Mike Kanaley
Joshua Kanner
Alev Kaya
Byung-In Kim
Seongbae Kim
Bob Kraas
Benoit Lacroix
Kam-Keung Lai
Edmond Leung
Yong Liu
Jiyin Liu
Richard Madrid
Sean Marshall
Theresa Metty
Chris Milligan
Tom Moore
Thomas Morris
Katta Murty
Alexander Oussanov
Winfried Peeters
Alexander Popov
Kevin Potts
Robert Pruneau
Olga Raskina
Jeffrey Robbins
Surya Sahoo
Quentin Samelson
Avner Schneur
Rina Schneur
James Smith
Ron Sorensen
François Soumis
Sridhar Tayur
Loren Troyer
Mitchell Tseng
Jan van Doremalen
Erik van Wachem
Yat-Wah Wan
Elan Yaniv

2003

Kirk Abbott
Surain Adyanthaya
Vedat Akgun
Andrew P. Armacost
Mordecai Avriel
Cynthia Barnhart
Corey Billington
Chris Born
E. Andrew Boyd
Gianpaolo Callioni
Monica Carbajal
Rod Case
Barrett Crane
John Fallis
Edward Feitzinger
Chyi-Fu Hong
Phil Ireland
Curtis Keller
Jason Kuehn
Jin Liu
Ronit Meiri
Marc Meketon
Wayne New
Avi Peretz
Robert Prior
Hanna Pri-Zan
Julie Unruh Rapp
Tom Rieger
John Ruark
Robert Slavens
Pat Smith
Jerry Trimarco
Carl Van Dyke
Mark Wallace
Keith A. Ware
Trace White
Sean P. Willems
Alysia M. Wilson
Bert Winemiller
Ron Woestemeyer

2002

Chae An
Michael Argüello
Fred Blakeley
Burçin Bozkaya
Buyang Cao
Andrew Davenport
Ralf Elsner
Wolfang Hall
Gail Hohner
Arnd Huchzermeier
Philip Jones
Jayant Kalagnanam
Greg Kegler
Gilles Kern
Jospeh Knolmajer
Manfred Krafft
Ho Soo Lee
Thierry Lemoine
Timothy Lowe
Sandra McCowan
Ed Ng
Alain Patchong
Grant Reid
John Rich
Gao Song
Rodney Traub
Anna White
Gang Yu

2001

Stuart Altschuler
Rick Ayer
Vince Barabba
Donna Batavia
Jeff Bennett
Srinivas Bollagragada
Robert Butchers
José Vicente Caixeta-Filho
Hong Chen
Fred Cooke
Antonio de Pádua Wagemaker
Robert Fancher
Marc Garbiras
Tim Gibbs
Gregory Hoscheit
Chet Huber
Mark Humphresville
Jeenyoung Kang
James Knowles
Russel Labe
Robert Leachman
Bonnie Liao
Vincent Lin
Kevin Lyman
Raj Nigam
Je Oh
Mark Paich
Greg Parlier
Mary Phillips
Nick Pudar
Surya Sahoo
Michael Scholes
Jim Smith
Jan Maarten van Swaay-Neto

2000

Eric Bibelnieks
Mark Bullock
E. Rod Butchers
Deb Campbell
Kan Chang
Kenneth Chelst
Harlan Crowder
Paul R. Day
Randy Erdahl
Andrew P. Goldie
Michael Haydock
Ken Howard
Doug Johnson
Elena Katok
Jeffrey Lockledge
Peter Lyon
Jeff A. Meyer
Demetrios Mihailidis
Stephen Miller
R. John Milne
Rick Oiesen
Robert Orzell
Alex Przebienda
Robert Rice
David Ryan
Amanda Scott
Laura Shisler
John Sidelko
Midori Tanino
William Tarantino
Ralph Tiedeman
Chris Wallace
Michael Wambsganss

1999

Rob Allan
Ken Ambs
James Angelo
Nader Azarmi
Sugato Bagchi
Steve Buckley
Rony Cremmery
Sebastian Cwilich
Nicolas De Schuyter
Mei Deng
Markus Ettl
Gordon Gould
Ron Holcomb
Terry Holeman
Richard Hopson
David Houck
John Hudson
Dean Jones
Kerry Kim
Edwin Kjeldgaard
Lisa Koenig
Marc Lambrecht
David Lesaint
Grace Lin
George List
David Lynch
Clive Morgan
Charles Muir
John Mulvey
Bret Naccarato
George Pfeil
Shahram Taj
Mark Turnquist
Nico Vandaele
Christos Voudouris
Dicky Yan
David Yao

1998

Henry Alden
Dean P. Angelides
Franz Behlau
Dimitris Bertsimas
Buyang Cao
James Causby
Christopher Darnell
Rafael Epstein
Matthew J. Etzenhouser
L. Russell Fletcher
Corrie Heynen
Scott P. Holmen
R. Jaikumar
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