Edelman Awards Gala

THE FRANZ EDELMAN AWARD
Achievement in Operations Research

THE INFORMS PRIZE
Sustained Integration of Operations Research

April 14, 2008
Baltimore, Maryland



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BOTH PAST AND PRESENT.

We salute the honorees of the 2008 Edelman Awards. As the academic half of the team that won the 2007 award, Georgia Tech has a long tradition of education and research in the field of operations research. We know and applaud the ingenuity and hard work that is needed to achieve the excellence that is being recognized on this year's teams. Congratulations for a job well done!



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The Operations Research Profession

Introduction

by Cynthia Barnhart, Massachusetts Institute of Technology, President of INFORMS

A Prized Jewel

The Franz Edelman Award Competition is a prized jewel in the INFORMS portfolio of activities. It serves to spotlight the important role that operations research has and can play within organizations and the significant resulting impact. As a member of the UPS Air Group/MIT Edelman team in 2003, we worked to design the future network for overnight package delivery service at UPS. This first-hand experience served to underscore, for me, the challenges of addressing important, real-world problems, and the powerful contribution that operations research can make in these endeavors. As UPS and other organizations throughout the world strive for constant improvement, operations researchers play a critical role; armed with their advanced analytical models and methods and their domain knowledge, they affect changes that allow more effective deployment of resources and more effective delivery of services.



Photo courtesy of Betsy Fruhling

The financial impact, as Jeffrey Alden of General Motors points out in these pages, is substantial for a field that often goes unnoticed. In the 37 years of this competition alone, Edelman finalists have contributed over $130 billion in improvements, savings, and benefits using operations research.

This year's finalists are notable in several ways. They include teams that have worked to overcome problems of airspace congestion, an area that I know well, as well as improve the quality and efficiency of home health care, optimize an offshore pipeline system for natural gas, improve productivity in the printing industry, reduce security risks in drinking water systems, and schedule commuter lines that bring people to work every day. The 2008 entries attest to the international character of the competition, with half of this year's finalists from western Europe.

For the first time, in this year's gala, we showcase two important honors given by our association: the Edelman Award and the INFORMS Prize. In doing so, we recognize both teams of operations researchers with outstanding contributions to organizations, and this year's exemplar organization at utilizing operations research and reaping its associated benefits.

As you listen to tonight's presentations, I'm sure you'll be applauding your colleagues and saluting the organizations for their remarkable contributions. I hope you'll also be thinking about the future. What great strides can your operations research department make in the year ahead? How can you have a positive impact and, like the honorees tonight, do good with good O.R.? Whether aimed at your organizational needs or more broadly at societal needs, with operations research, we can make a difference. *OR*



A Salute to the Edelman Finalists and the O.R. Profession

by Lawrence D. Burns
Vice President, GM Research & Development and Strategic Planning

Reminiscences and Reflections from the 2005 Edelman Award Winner



I was first exposed to the "beauty and power" of operations research by Martin Beckmann when I was just 19, and I have had the privilege of applying O.R. throughout every stage of my career at General Motors—as a researcher and as a manager overseeing product development, manufacturing, quality, and planning, and currently as a senior executive.

In addition to being introduced to the field by Martin Beckmann, I was schooled in O.R. by Steve Pollack at Michigan and Gordon Newell and Carlos Daganzo at Berkeley. Steve's courses "lit a fire" inside me and gave me the confidence to feed this fire. Gordon taught me to focus on the question. In fact, he was convinced that once you figured out the question you were 90 % of the way home. Martin taught me that a global O.R. lifestyle can be really fun. And Carlos has been my colleague on numerous important projects. I am indebted to all of them for inspiring me and teaching me.

It is a thrill for me share my thoughts about the O.R. profession and what the prestigious Edelman competition represents. Let me begin by saluting the Edelman finalist organizations, which, by achieving Edelman finalist status, have experienced significant benefits in their organizations through the outstanding practice of O.R.. In fact, as reported later in this booklet, the Edelman finalists' projects have achieved over $130 billion of impact since 1972! And this does not reflect important non-monetary benefits like enhanced safety, health care, on-time arrivals, and national security.

So what is driving the need for O.R.? I believe it is globalization, intense competition, and rapid change. These trends present tough decisions with huge impact,

multiple objectives, numerous alternatives, conflicting trade-offs, messy data, lots of constraints, and substantial uncertainty and risk. This is why the Edelman competition is so special … it calls out, recognizes, and rewards outstanding examples of O.R. practice in the real world.

Knowing that you have left your fingerprints on real-world challenges is very gratifying. The throughput work for which the GM team received the 2005 Edelman prize, for example, saved over $2 billion through improved productivity at over 30 assembly plants in 10 countries!

Some other examples of successful O.R. applications at General Motors include:

- Simulated annealing for assembly line scheduling to reduce cost and improve quality,
- Epidemiology studies, using CDC practices as the benchmark, to reduce warranty frequency and cost,
- Optimization, queueing, and simulation models to improve sheet metal stamping operations,
- "Little's Law" to reduce vehicle development time,
- A "greedy algorithm" to optimize GM's product portfolio return under risk, and
- Game theory to enhance negotiation strategies.

All of the Edelman Laureates have similar stories to tell. And although it is evident from reviewing the Edelman finalists' projects that the application areas for O.R. are very diverse and the challenges are unique, there is also a commonality among the finalists. With input from Steve Graves and Randy Robinson, I have developed a list of characteristics that Edelman finalists typically share. They:

- Understand that relationships matter.
- Have courage and resolve.
- Ask the right questions.
- Inspire others to share in their journey.
- Obtain and embrace practical experience.
- Are tenacious in chasing down details, getting data, and implementing solutions.
- Work well in teams and engage key stakeholders to gain joint ownership.
- Understand that "approximately right" is better than "precisely wrong."
- Model and analyze at the right level of detail to achieve results quickly.
- Deliver solutions in a way that decision-makers can understand and act upon.
- Effectively partner with O.R. academics to develop innovative solutions.
- Have imagination and a spirit of innovation that goes beyond the routine.
- Move fast but are patient, making sure to avoid the quick and easy but less robust fix.
- Are highly motivated to be the best!

Clearly, O.R. is not just about solving problems … it is about creating opportunities to make the world a better place. More than mathematics, O.R. is a mindset that ties our right and left brains together and allows us to see things in ways that others do not. As the world goes global—as innovation strives to create more, faster, better, and at less cost—as new business and technology paradigms emerge —opportunities abound to take advantage of operations research and reap the substantial good that can be realized from its practice.

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Achievement in Operations Research



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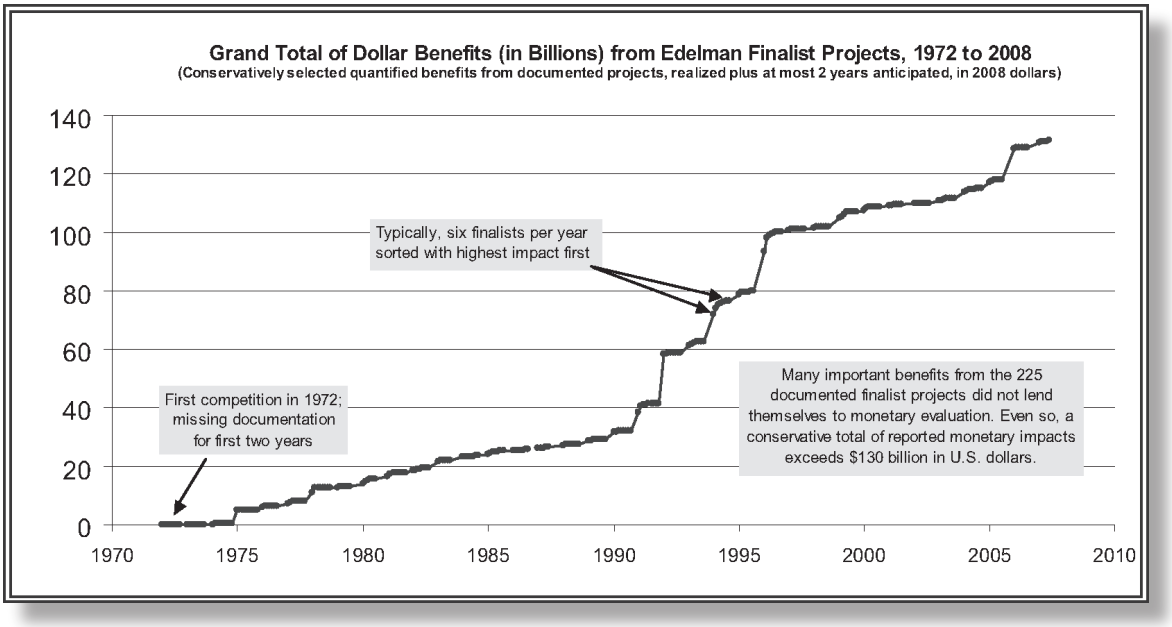
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Seeing is Is Believing: A Graphical Representation of the Value of O.R.

by Jeffrey M. Alden
Group Manager, GM Operations Research



Over $130 billion dollars of impact! That's impressive! Is it believable? What's behind these numbers? How were they were estimated? Could there be more?

Well, starting in 1974, the Edelman finalists were asked to publish their project accomplishments in the INFORMS journal *Interfaces*. After reading all of the articles (over 200), the monetary impact was estimated under the following guidelines:

- Be objective and conservative, yet make a serious attempt to somehow estimate cost savings and increased revenues.
- Use all past reported savings and, to be conservative, include at most two more years of anticipated impact.
- Ignore minor costs, like development and implementation costs, unless they are significant.
- If the impact is enormous (billions, for example, in some military, energy, and governmental projects), then include only one year of impact to downplay the huge leverage of organizational size and budget.
- Ignore relative impact analysis even though, for example, doubling company revenues to $10 million in one company may be far more impressive than saving $100 million for another company.

These guidelines are definitely conservative and do not include many important yet difficult to quantify benefits. Examples of the latter include improving: legal dispute resolution, cancer treatments, airline security, deposition of hazardous materials, allocation of a fixed budget, consideration of risk in decision making, organizational structure, on-time railway performance, and space shuttle heat shielding. How do you assess a dollar value for such improvements? It's not impossible, but definitely challenging! Furthermore, almost all finalist papers report such non-monetary benefits and frequently tout them as more important and longer lasting by establishing, for example, ongoing practices and organizational changes that improve health, safety, cooperation, decision making, and job satisfaction. Great! Clearly, the reported monetary benefits fall short of capturing the full impact of the Edelman finalist projects.

Another important indication of O.R.'s influence is the impressive breadth of applications. The Edelman finalists represent about 100 different application areas, including: air traffic, banking, broadcasting, canal operations, consumer products, defense (air force, army), education, finance (pension, investment, credit card), fire protection, forestry, health care (hospital, pharmaceutical, diagnosis), hotel management, energy production and distribution (gas, hydroelectric, oil, nuclear), land use, manufacturing (electronics, food, paper, seeds, tires, vehicles, wood), marketing, printing, sanitation, security (airport, police), transportation (airline, highway, railway, space), treasure hunting, waste management, water resources, and weapons dismantlement. There's many more … the list goes on and on!

Finally, the O.R. impact reported here is surely the "tip of the iceberg," as the Edelman competition only captures those O.R. professionals choosing to compete! Just think: the entire set of Edelman finalist authors (over 700) represent approximately 7% of the current INFORMS membership (about 10,500). Undoubtedly, there are a vast number of O.R. projects with significant impacts that did not compete due to confidentiality, or the lack of an internal advocate to compete (e.g., no one thought of it, too much effort, lack of management support, or no project documentation), or because the team was simply unaware of the competition.

The impact is immense. The O.R. community has an unquestionable reason to be proud of his or her profession … don't you like saying "over 100 billion bucks" when asked about the value of O.R.?

The Franz Edelman Award

O.R. Remains a Source of Competitive Advantage Even When Edelman Teams Go Public

by Peter C. Bell,
Richard Ivey School of Business, The University of Western Ontario

After Public Disclosure of O.R. Success, Firms May Retain and Improve Benefits

Must operations research (O.R.) that creates a competitive advantage for the client firm be kept confidential? If you attend the finalists' presentations for the Franz Edelman Award, you will learn about outstanding applications of O.R. that had a huge impact on their clients and on the O.R. professionals who did the work. Other organizations refuse to publish their O.R. work and decline to enter the Edelman competition on the grounds of competitive secrecy: they see their work as providing an advantage for the firm and do not want this source of advantage shared with their competitors. The Edelman finalists illustrate that confidentiality is not always necessary to protect a competitive advantage derived from O.R..

Many Edelman finalist applications focus sustained attention on one critical problem that is complex and very difficult. A key lesson from these applications is that their approach can result in O.R. becoming a strategic asset of the firm. Such firms think of their O.R. work as providing on-going support for a key activity rather than as a basket of separate projects. Here are just a few Edelman examples where O.R. practitioners have done this:

- Procter and Gamble was a finalist in 1996 when it re-engineered its North American supply chain. Since then, the Global Logistics Group has flourished by applying similar O.R.-based methods to re-engineer P&G's supply chains all over the globe.
- General Motors was the Edelman Award winner in 2005 for O.R. work on improving the efficiency of its assembly lines. The O.R. group has been working on this same critical problem since 1991 with outstanding results: according to an external evaluator, GM now owns four of the five most productive assembly plants in the United States.
- Crew pairing at American Airlines/ Sabre was an Edelman finalist in 1990. Almost 20 years later O.R. people at Sabre are still developing algorithms and methods to put crews on planes, and American Airlines is still implementing these solutions.
- Merit Brass, a regional plumbing supplies company in the Mid-west, was a finalist in 1992 for a highly successful inventory control application. More than 10 years later, this application was still seen by management as providing a competitive advantage for the company.
- IBM was an Edelman finalist in 1989 with an early effort at supply chain optimization. The company won the Edelman prize in 2000 with essentially the same application, although much further developed and more widely applied.

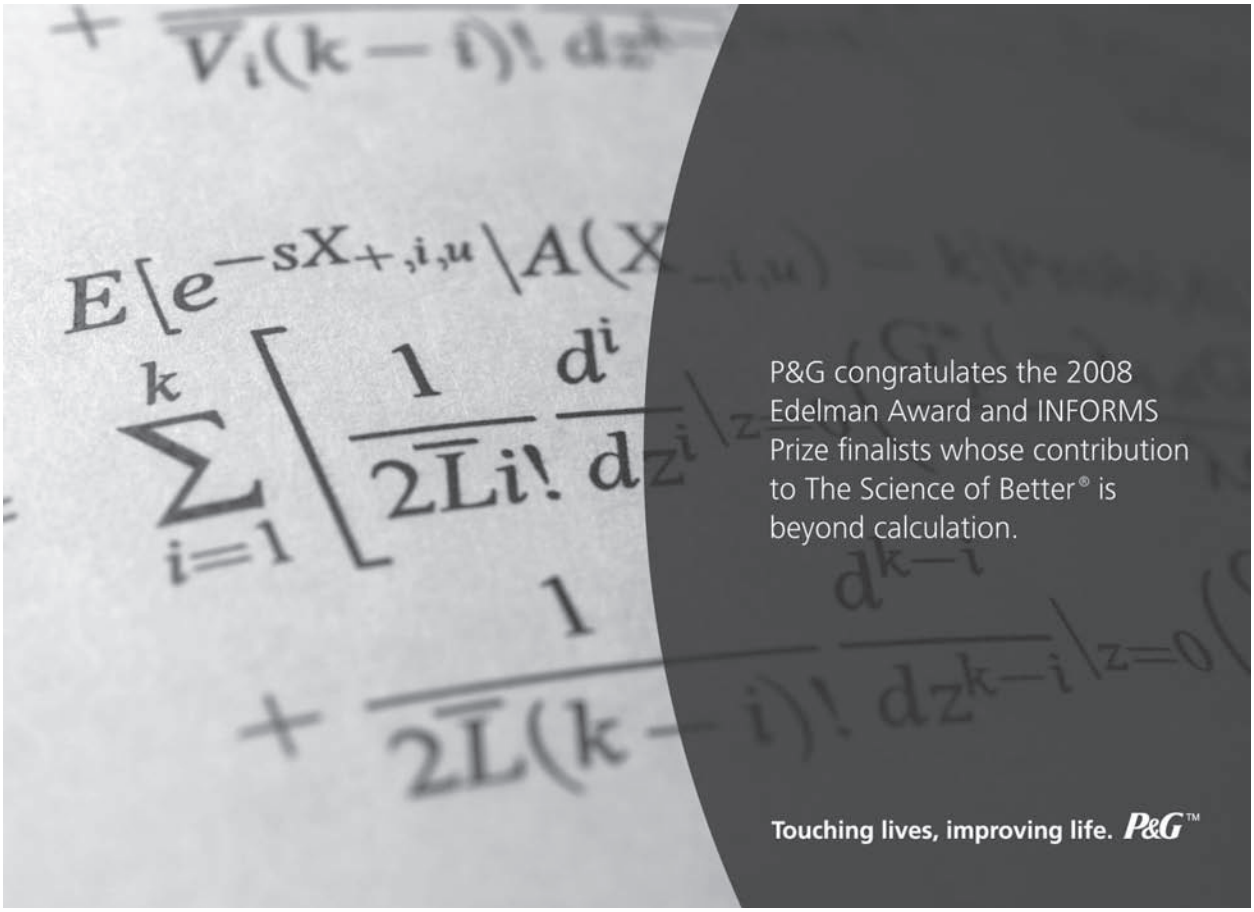
- Yellow Freight Systems was a finalist in 1991 with its shipment routing and network design optimization application. In 2003, Yellow acquired its major (and larger) competitor. The fact that Yellow came out on top in this merger has been attributed to its greatly superior line-haul operations resulting from further development of the original Edelman O.R. work.

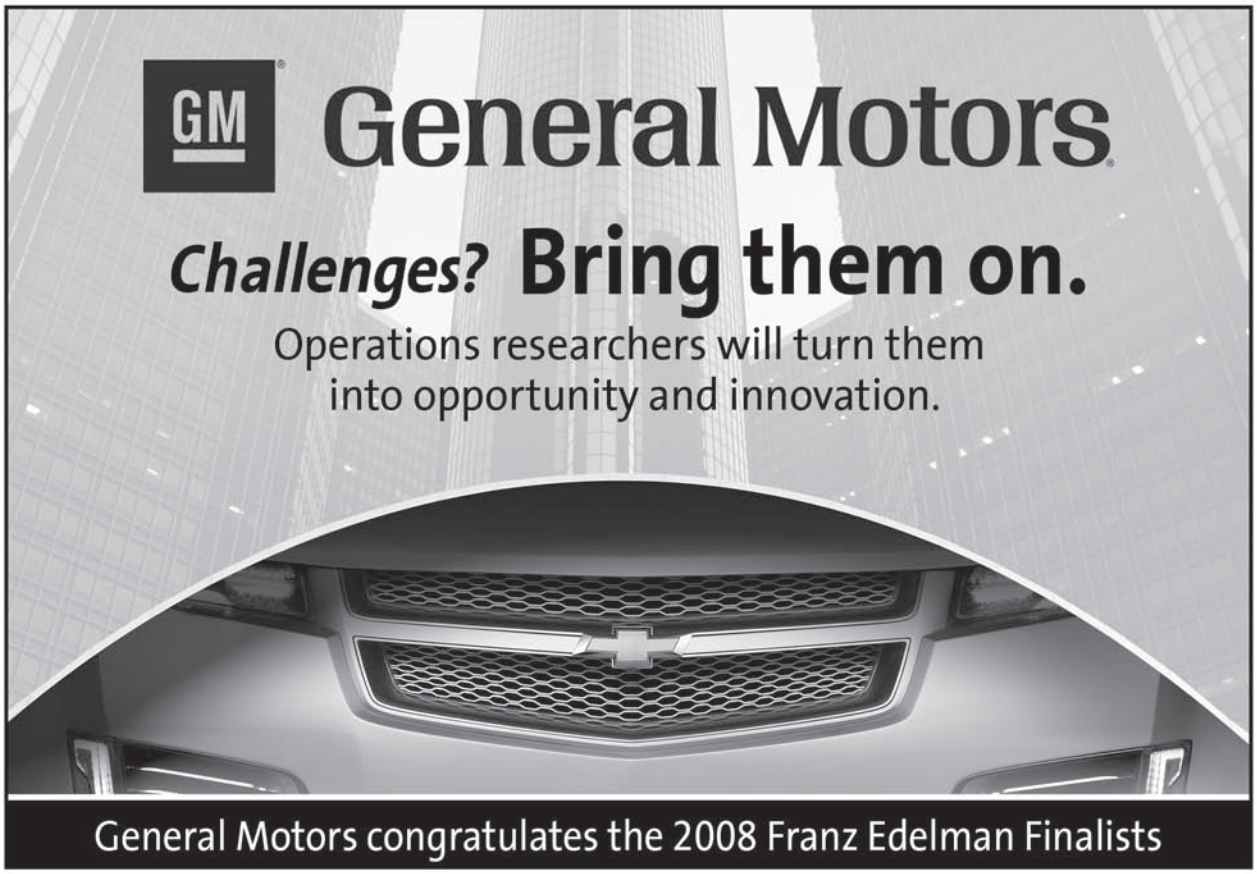
Focusing O.R. attention on one complex, critical issue for 10 or more years results in the development of deep problem understanding as well as problem-specific skills and tools to address key elements of the problem. Prolonged attention to the same problem leads the O.R. practitioner through a set of continually improved algorithms, codes, and to the collection of large amounts of relevant data. Importantly, successful O.R. solutions will result in an evolution of the problem: this might be as simple as adding equipment to a manufacturing line following suggestions from the models, adding specific types of vehicles to a supply chain, hiring new air crews in new locations, or renegotiating union contracts to reduce labor costs. Other changes to the firm may be more dramatic such as moving production and warehouses around, adding major new capacity (such as new, larger airplanes), entering new markets, or switching to more flexible pricing.

Sustained success with improving costs or revenues over a period of time is possible as the O.R. group members come to understand the problem better and apply more sophisticated methods to achieve improved solutions, and also as the firm evolves its systems in the directions suggested by the models. As the benefits keep building, at some point the O.R. will be seen as a source of competitive advantage for the firm.

Strategic O.R. work of this kind cannot be bought. A competitor might be able to buy the code or the algorithm, but it cannot buy the firm-specific data or the deep problem knowledge. Importantly, a new entrant cannot quickly make the system improvements that are required to match the cost or revenue benefits of the first-mover. Collecting the data, developing the problem–solving skills, and evolving the system in the direction suggested by the O.R. all take time. As this time passes, the first-mover may also be improving his or her solutions, further lengthening the time required to catch up. Some first-movers have recognized this fact and profited from it: for example, American Airlines was selling crew-pairing software to its competitors at the same time it was enjoying a competitive advantage from having the lowest crew cost in the industry. Clearly, American believed that it could retain its competitive advantage for some time, even if the source of the competitive advantage was well known.

Many Edelman applications live on long after the competition with benefits accumulating year-after-year—in some cases, for 20 years or more. These long-lived applications benefit the host institution while the O.R. groups responsible for such applications also flourish. All this work is in the public domain, yet these firms thrive on the publicity and are not hurt by it. They recognize that their competitors cannot buy what they have and see no reason for secrecy.


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Prize finalists whose contribution
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GM General Motors
Challenges? Bring them on.
Operations researchers will turn them
into opportunity and innovation.
General Motors congratulates the 2008 Franz Edelman Finalists

Edelman Award Recipients

2007 Edelman Award Recipient

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 reduce substantially 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 Edelman Award Recipient

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 Edelman Award Recipient

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 Edelman Award Recipient

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 Edelman Award Recipient

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 Edelman Award Recipient

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 Edelman Award Recipient

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 Edelman Award Recipient

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 Edelman Award Recipient

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 Edelman Award Recipient

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 Edelman Award Recipient

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% to 5%, reductions in manpower and schedule development time, and improvements in planning and scenario evaluation.

1996 Edelman Award Recipient

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 Edelman Award Recipient

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 Edelman Award Recipient

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 Edelman Award Recipient

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; 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 Edelman Award Recipient

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 Edelman Award Recipient

American Airlines

American Airlines pioneered revenue management as an effective way to manage its seat inventory. The airline used sophisticated O.R. models to determine the overbooking levels of each flight and to allocate each flight's seat inventory to a variety of market/fare classes. By optimally overbooking flights and dynamically pricing the seats based on forecast demand, American Airlines generated an estimated $1.4 billion in incremental revenue over a three-year period.

1990 Edelman Award Recipient

Health Care Financing Administration

Diagnosis Related Groups (DRGs), developed to measure hospital output in quantitative terms, required a search for structure through millions of patients' records plus the merging of clinical and statistical decision methods. Medicare, 20 states, and 18 other countries are currently using DRGs; Medicare payments to hospitals alone produced a projected reduction of $18 billion in 1990.

1989 Edelman Award Recipient

ABB Electric, Inc.

O.R. models built sales strategies and accurate prediction of sales through extensive segmentation and attribute choice modeling. Predictions, integrated into production models, guided long-term supply and customer preference and helped make ABB an industry leader in 1988.

1988 Edelman Award Recipient

City of San Francisco Police Department

An optimization-based decision support system for patrol officer deployment allows for "fine-tuning" of optimal scheduling, producing a 25% increase in patrol units available when needed; in addition, response times declined 29% and traffic citations increased 62%. Total benefit? Over $14 million annually.

1987 Edelman Award Recipient

Syntex Laboratories, Inc.

A decision calculus model for salesforce size and deployment was devised by Syntex managers, with a time horizon of three years. Model predictions proved to be more accurate than standard forecasts and in financial terms resulted in increases of $25 million.

1986 Edelman Award Recipient

Southland Corporation (CITGO Petroleum Corp. Subsidiary)

Optimization-based decision support and process control systems aided managers at CITGO in such crucial areas as crude oil acquisition, spot-market buying and selling, logistical operations, and price volume strategies. Forecasting models addressed corporate price and volume. Together, they contributed approximately $70 million in profit improvement per year.

1985 Edelman Award Recipient

Weyerhaeuser Company

The VISION decision simulator was developed to implement dynamic-programming-based improvements in raw materials returns at Weyerhaeuser. Operational benefits to date exceed $100 million in increased profits, and management philosophy has been changed.

1984 Edelman Award Recipients (dual)

Blue Bell, Inc.

Models for inventory targets, manufacturing requirements, and production scheduling were used with a seasonal demand-forecasting technique and diagnostic computer simulation to reduce inventories. Inventory reduction over 18 months was more than $100 million.

The Netherlands Rijkswaterstaat and the RAND Corporation

An integrated system of models was developed to evaluate mixes of new facilities, changes in operating rules, and adjustments to prices and regulations. The system has resulted in a national water management policy, with savings in the hundreds of millions of dollars in investment expenditures and over $10 million in estimated annual savings.

1983 Edelman Award Recipient

Air Products and Chemicals, Inc.

A large mathematical model was developed to control deliveries of liquid oxygen and nitrogen to customers at minimum cost with improved reliability. Savings are over $2 million annually.

1982 Edelman Award Recipient

Arizona Department of Transportation

1981 Edelman Award Recipient

ANR Freight System

1980 Edelman Award Recipient

Kelly-Springfield Tire Company

1979 Edelman Award Recipient

The Greater New York Blood Program

1978 Edelman Award Recipient

Cahill May Roberts, Ltd.

1977 Edelman Award Recipient

Syncrude Canada, Ltd.

1976 Edelman Award Recipient

American Telephone & Telegraph

1975 Edelman Award Recipient

Xerox Corporation

1974 Edelman Award Recipient

Canadian National Energy Board

1973 Edelman Award Recipient

The Babcock & Wilcox Company

1972 Edelman Award Recipient

The Pillsbury Corporation



2007 Winner
Memorial Sloan–Kettering Cancer Center

by Barry List, INFORMS

Reducing the Burden of Cancer Care, Physically and Financially

Fighting prostate cancer can be like going in the boxing ring with an opponent who weaves and jabs, leaving you fearful when he will strike his hardest blow. Physicians and patients begin by nervously reviewing test results to determine whether the disease, which every man will eventually contract if he lives into his nineties, should be treated at all.



Once the decision is made and treatment is chosen, many patients with early stage prostate cancer decide to receive brachytherapy, a procedure for inserting tiny radioactive "seeds" into the diseased gland.

Brachytherapy can be effective, but its side effects often take a serious toll. What's involved is this: If you insert the radioactive seeds into diseased tissue, you reduce the size of the cancer. If you mistakenly insert the seeds into healthy tissue in the prostate or nearby urethra and rectum, you interfere with sexual and bodily functions. In sum, you do less to cure the cancer and delay the patient's eventual recovery, often for years.

Professor Eva K. Lee of the Georgia Institute of Technology studied the conundrum and determined that one of the key problems was in an important aspect of preplanning. Prior to the radiation dose, physicians and technicians draw a plan that involves careful targeting of a patient's diseased tissue. Ideally, the plan should be made immediately before the procedure so that no changes take place in the prostate gland that would resulting in poor aiming of the radioactive pellets.



Medical teams, however, lacked the mathematical framework and the technology to permit instant planning. That's where Prof. Lee began applying her expertise in operations research to the problem. She devised sophisticated



optimization modeling and computational techniques to implement an intra-operative 3D treatment planning system.

Memorial Sloan–Kettering Cancer Center became a client willing to employ this new technology. Sloan–Kettering's Dr. Marco Zaider, a medical physicist, became her partner at Sloan–Kettering. The real-time intra-operative planning system eliminates pre-operation simulation and post-implant imaging analysis. Based on the range of costs of these procedures, Prof. Lee estimates conservatively that their elimination nationwide could save $450 million a year for prostate cancer care alone.

Resulting reduction of complications (45%–60%) due to plans that deliver less radiation to healthy structures improves the quality-of-life for patients, and has a profound impact on the cost for interventions to manage side-effects. Drs. Lee and Zaider also reported that the procedure uses significantly fewer seeds and needles compared with best-practice procedures. Thus, the procedure time is shortened and less invasive, and there is less blood loss. As a result, patients experience less pain and recover faster.

At Memorial Sloan-Kettering Cancer Center, marveled Dr. Zaider at the 2007 Edelman Gala, prostate cancer patients are thanking modern medicine for its advances. Little do they know that in this case an incisive operations research team made all the difference. *OR*

Edelman Accomplishments in the Public Sector

by Barry List, INFORMS

Doing Good with Good Edelman Public Service

This year, the enormous assistance that operations researchers offer to public policy and public projects is a recurring theme for INFORMS: It will be signaled in the upcoming INFORMS Annual Meeting, where subject experts and government officials explain how operations research drives improvements in public health, the environment, and air transportation. In this year's Edelman competition, almost all the competitors are working in or close to the public sector with projects that improve health care, protect water supplies from contamination, relieve airport congestion, improve the flow of gas to consumers, and help commuters through their daily rush.



The Edelman Competition, which presents so many opportunities for the corporate world to exhibit its best work, is also a showcase for operations research that improves services to the public.

Sometimes, these benefits have surprised us with their impact. Americans today are concerned about the escalating costs associated with Medicare. In 1991, Yale University's Robert Fetter told Edelman judges that the Medicare Hospital Trust Fund had worked with him to devise a prospective payment system using a system of diagnosistic related groups (DRGs). From the time that DRGs were adopted in 1983 until he stood before camera and colleagues, this work had saved American taxpayers $50 billion in Medicare hospital payments. Imagine how much more dire Medicare's current woes would be if not for the diligent innovation of operations researchers in health care!

Sometimes, it has been an elegant leap of faith or conscious work to fight a terrible disease that has caught the attention of Edelman judges. When New Haven, Connecticut sought to fight the spread of HIV among addicts in the 1980s and

1990s, operations researcher Edward H. Kaplan worked with the city's Health Department to track a novel program of allowing heroin users to exchange used needles for sterilized syringes. The team demonstrated a 33% drop in HIV infection rate. Operations research was fighting one of the nation's killers.

Edelman contenders have sometimes shown a prescience in their analyseis. Following the explosion of the NASA shuttle Columbia, Elisabeth Paté-Cornell of Stanford and Paul S. Fischbeck of Carnegie Mellon pointed out that the risk of losing a future shuttle could be addressed by paying particular attention to the shuttle's vulnerable tiles. It would be damage to those very tiles that would be blamed for the subsequent Challenger catastrophe that led to the death of a multi-national crew of astronauts and damage to the shuttle program and NASA itself.

Operations researchers have demonstrated that O.R. can contribute to the pursuit of peace, as they did in projects that helped American and Russian negotiators retire nuclear military materials. O.R. has helped fire departments improve productivity,



police departments optimize patrols, the courts reduce arraignment times, public schools plan better educational systems, and an Olympics organizing committee smooth the way toward the return of the great international game to its birthplace thousands of years after its creation in ancient Greece.

It all boils down to the numbers: the skillful use of operations research maximizes the use of taxpayer dollars and increases the benefits that citizens throughout the world receive from their governments. Those are the kind of high-level achievements that spell success in the Franz Edelman Award Competition. *OR*

Judging Edelman Finalists—Which Iceberg Is Best?

by R. John Milne,
IBM Systems and Technology Group, Senior Technical Staff Member
Vice President for Practice Activities, INFORMS

Insights into Decision-Making Within the Panel of Judges

While playing various roles in this decade's Edelman competitions (participant, judge, chair, and coach), people have shared with me their opinions on which team they think should have won the Edelman Award. On occasion, their opinions differed from those of the judges. This is natural since their opinions stem from what appeared to them to be comprehensive presentations of the finalists' work. This is like a person on a cruise ship evaluating an iceberg by what he observes above the water. In contrast, the nine (or so) judges closely study the iceberg—both above the water (at the presentation) and below the water (via detailed written papers that each finalist submits).

Each finalist team is assigned a focal point judge who studies the paper in detail—typically reading it several times. The focal point judge, or another judge, may find a related paper that solves the problem in a better way than a particular finalist solved it; that's one of the strengths of O.R. —that a less–than–ideal solution can yield tremendous improvements. A futile search for related papers may reinforce the notion of a finalist's work being truly innovative. As another example, a judge may consider that a finalist achieved its substantial growth in profit (due to O.R.) at the same time that others in the industry were doing poorly (or well) without O.R. A casual observer of the Edelman presentations will not be aware of some of these considerations.

It is possible for a casual observer to overlook an important criterion in evaluating the work. Few would overlook the absolute impact claimed (e.g., millions of euros saved), but what about relative impact (percent improvement) or qualitative impact? How about the technical depth/breadth or innovation of the work? Or the managerial or political



obstacles overcome? How portable is the work to other situations?

Finally, many insightful comments are made in the judging room as the evidence is evaluated. On two of the three occasions I've entered the judging room with a tentative first place team in mind, my opinion changed as a result of the astute observations of my colleagues. INFORMS Fellow Tom Spencer observed that although typically he has been unable to predict the first place team solely from listening to the presentations, on the seven occasions he served as judge he always agreed with the other judges on which team to award first place. If you find yourself reaching a different conclusion than the judges, there is a high probability that you have overlooked important factors.

Also, there is a possibility that you are a finalist who appreciates both the visible and submerged items of your own achievement in detail but are only aware of the visible portion of the first-place team's achievement. Frankly though, I am pleased that the vast majority of the finalists respond graciously to the judges' decisions and rightly feel like the winners they are to have made it to the on-stage round of this rigorous competition.

The Franz Edelman Award Process

The Finest Come Forward: The Franz Edelman Award Competition Process

by Brian Denton, 2008 Franz Edelman Committee 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 two-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, several 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 organizations such as AT&T, Cisco, General Electric, IBM, North Carolina State University, SAS, Southwest Airlines, the University of Western Ontario, and the University of Lancaster. 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 verifier who works behind the scenes to validate the claims made by their assigned entry.

The verifier's primary 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 verifier will 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, as 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 experienced verifiers.

From this group of semifinalists, the Edelman Award Committee then selects the six best entries to advance to the Franz Edelman Award finals. Each finalist must begin the preparation of a journal-quality paper and a 40-minute presentation. Each of the finalist teams is assigned an experienced coach to advise them throughout the process. A coach's major obligation is to ensure that the team's paper and presentation conveys the work clearly to a general operations research audience. Often, a coach is paired with one or more assistant coaches who lend another perspective to the process.

Two months prior to the spring INFORMS Practice Conference, finalist papers are distributed to the judges. The judges study each of the papers and, shortly thereafter, discuss them amongst themselves. Each finalist is assigned a focal point judge who conveys feedback from the judging committee to the finalist's coach. The judge's feedback helps to identify areas where further information and development is required in the finalist presentation in order for the judges to make a proper decision.

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 considered include the difficulty of the obstacles surmounted, the technical solution, implementation, and the total impact and value of the project.

Following the competition, the finalists will work with the special editor of the January/February issue of Interfaces to make any final adjustments to their papers. All finalists are invited to reprise their work at a session of the annual INFORMS meeting in the fall, with the first-place team giving a keynote address. All of the finalists' presentations are available from INFORMS on DVD in the fall.

Following the competition, the finalists will work with the special editor of the January/February issue of Interfaces to make any final adjustments to their papers. All finalists are invited to reprise their work at a session of the annual INFORMS meeting in the fall, with the first- place team giving a keynote address. All of the finalists' presentations are available from INFORMS on DVD in the fall.



The Verification Process & The 2008 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 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. work with verified impact makes it to the Edelman Award finals.

Verifiers:

- Sudhansu Baksi, AT&T Laboratories
- Peter Bell, University of Western Ontario
- Srinivas Bollapragada, General Electric
- Tony Brigandi, AT&T Laboratories
- Bruce Bukiet, New Jersey Institute of Technology
- Mary Crissey, SAS Institute
- Alfred Degbotse, IBM
- Joe Discenza, Smart Crane
- Sid Hess, ICI Americas, Inc. and Drexel University
- Yoshi Ikura, Saitech
- Chuck McCallum
- R. John Milne, IBM Systems and Technology Group
- Patricia Neri, Southwest Airlines
- Graham Rand, Lancaster University Management School, UK
- John Ranyard, Lancaster University
- Samik Raychaudhuri, Crystal Ball, Oracle
- Anne Robinson, CISCO
- Randy Robinson
- Doug Samuelson, Serco and InfoLogix
- Stuart Smith, Navitaire
- Thomas Spencer III, Walden University
- Steve Strauss, AT&T Laboratories
- Jack Theurer, G. Theurer Associates Inc.
- Amy Wilson, Blue Cross Blue Shield of Minnesota

The Coaching and Judging Process & The 2008 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 papers and presentations 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; this can be particularly helpful after the first few drafts of a paper or presentation have been circulated.

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:

- Layek Abdel-Malek, New Jersey Institute of Technology
- Sudhansu Baksi, AT&T Labs
- Peter Bell, University of Western Ontario
- Tony Brigandi, AT&T Labs
- Bruce Bukiet, New Jersey Institute of Technology
- Sid Hess, ICI Americas, Inc. and Drexel University
- Patricia Neri, Southwest Airlines
- Graham Rand, Lancaster University
- Samik Raychaudhuri, Crystal Ball, Oracle
- Randy Robinson
- Thomas Spencer III, Walden University
- Doug Samuelson, Serco and InfoLogix
- Steve Strauss, AT&T Labs

Judges:

- Brian Denton, North Carolina State University
- Srinivas Bollapragada, General Electric
- Jeff Camm, University of Cincinnati
- Mary Crissey, SAS
- Alfred Degbotse, IBM
- Yoshi Ikura, Saitech, Inc.
- Mohan Sodhi, Cass Business School. City University
- Anne Robinson, CISCO
- Bob Smith, Monmouth University

Recognizing & Rewarding Real Achievement

The Franz Edelman Award Competition is jointly sponsored by INFORMS and CPMS, the Practice Section of INFORMS.



The purpose of the Franz Edelman competition is to call out, recognize, and reward outstanding examples of operations research practice in the world.

The annual Edelman Award competition brings together top examples of innovation from large and small, profit and nonprofit, corporate and governmental organizations from around the world. The common theme characterizing all the final competing teams is the use of sophisticated analytical tools employed in operations research to make a major impact on an organization and the people it serves.

Abstracts from past Edelman Award winners are available through Interfaces Online, and full-text versions of some of the Interfaces papers are available in an online archive. Videotapes of past competitions, suitable for teaching, marketing, or publicizing O.R. practice successes, are available for purchase from INFORMS.

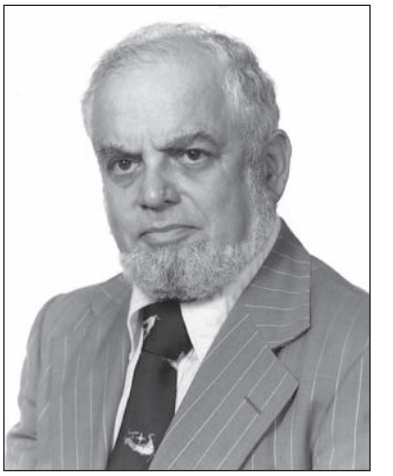
The Institute of Management Sciences (TIMS), together with its College on the Practice of Management Science (CPMS), created the award competition in 1972.

In 1986, the CPMS/TIMS award was renamed in memory of Franz Edelman, one of the forefathers of O.R. in North America.

After fleeing his native Germany in the late 1930s to escape Hitler and his Nazi regime, Franz 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 and later obtained a Ph.D. in applied mathematics from Brown University.

Franz joined the RCA Corporation as an engineer and became involved in computational problems. Initially a physical science problem solver, Franz rapidly came to envision the great value of computer systems in business. His imagination and dedication made him a quintessential practitioner of operations research.

Franz established RCA's Operations Research Group, one of the first such groups in North America. Having become Vice President of Business Systems and Analysis, he retired from RCA after 30 years of service to form Edelman Associates, an O.R. consulting firm. The Franz Edelman Award Fund was named in his memory to advance the profession to which he contributed so much. *OR*



Franz Edelman

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 of analytical decision making in the world.

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 decision making work.

The membership of the Franz Edelman Academy represents 37 years of extraordinary contributions to society through the innovative application of analytical decision making.

Nothing But the Best:

The 2008 Franz Edelman Finalists

Introduced in the pages that follow are the five finalists for the 2008 Franz Edelman Award.

Over the past several months these teams have demonstrated to the judges that their work is among the finest examples of analytical decision making in the world. One of these organizations will be recognized as the best in class, the first-place recipient of the 2008 Franz Edelman Award.

Each finalist's work is described here in a shortened summary. Full papers will be published in the January/February 2009 issue of Interfaces, the INFORMS journal dedicated to improving the practical application of analytical decision making and policies in today's organizations and industries.

The Finalists for the 2008 Franz Edelman Award Are

City of Stockholm, Sweden

Federal Aviation Administration with Metron Aviation and the Volpe Center, U.S. Department of Transportation

Netherlands Railways

StatoilHydro and Gassco

U.S. Environmental Protection Agency

Xerox



City of Stockholm, Sweden

O.R. Improves Quality and Efficiency in Home Health Care

Project Summary

Elderly care systems in the Western world are facing increased costs, primarily because the elderly constitute a growing percentage of the total population. The Swedish system is publicly financed. In 2005, the cost to tax-payers at the national level was €8.8 billion ($13 billion). Stockholm's public policy aims to make it possible for the elderly to keep living in their own homes, and for good reason: the result for the individual is increased quality of life; for the taxpayer, home health care lowers the total cost for providing the care when the alternative is paying all the services associated with placing an elderly man or woman in a retirement home. The care is performed through visits to the elderly, and a wide range of services are performed, including cleaning, washing, medical assistance, and social support. The elderly care sector is labor intensive, and therefore good staff planning is necessary.

The planning of home care services involves many components, such as scheduling visits, routing staff, matching visit requirements and staff competencies, fairness among staff members, and quality of services. In addition, the daily operative planning deals with many last–minute changes (for example, staff members call in sick and visits are cancelled or added) and is therefore difficult and time-consuming. Traditionally, this planning has been done in early-morning staff meetings.

The City of Stockholm has been using an operations research-based decision support system, Laps Care, in a number of units since 2003. The system is used to create the daily operative plans, in which visits to the elderly are allocated to staff members. The planning considers geographic information, calculates travel times for several transportation modes (car, bike, and



walking), and makes use of optimization-based heuristic algorithms.

With the system in place, planning time has been reduced by two thirds. This means that staff can now spend more time calling on needy clients rather than sitting through lengthy meetings. The use of resources is also more efficient. For example, there is less need to hire extra staff. This has resulted in increased efficiency of 10%–15 %. Quality aspects like continuity (keeping the number of different staff members who visit each client as low as possible), maintaining a fair staff work load, and reduction of missed and re-scheduled visits are considerably improved. The system has also provided managers with a better basis for economic reporting and control.

Currently, there are 200 units with 4,000 staff members in 50 Swedish municipalities that are using Laps Care, and the annual savings reported are €20–€30 million ($30–$45 million). During 2008, the City of Stockholm is rolling out another 1,000 units with 15,000 staff members, and expects to save €20–€ 30 million ($30–$45 million) for the city alone.



Organizational Overview

The City of Stockholm, the capital of Sweden, has 800,000 inhabitants. The municipal government employs 47,000 staff, of which 60% work within social services. The budget for 2008 is €3,9 billion ($5.7 billion), and social services to elderly citizens and the disabled is the city's largest growing activity. All users of Laps Care are organized in Forum Laps Care, an agency including 50 municipalities from all parts of Sweden. At the end of 2008, there will be approximately 20,000 staff that are scheduled daily.



Federal Aviation Administration with Metron Aviation and the Volpe Center, U.S. Department of Transportation

Airspace Flow Programs (AFPs)

Project Summary

Managing the nation's skies is a challenging duty. The Federal Aviation Administration (FAA) has the task of managing flights so that they operate in a safe and efficient way. One component of this management is air traffic control, which is responsible for dealing with individual flights and making sure that they speed up or turn or do whatever is necessary to maintain the desired separation between planes. The other component is traffic flow management (TFM), which aggregates flights so that congestion is minimized.

The FAA has long had TFM tools to deal with particular types of congestion. For example, when there is congestion because of bad weather at an airport, the FAA can issue a ground delay program to control arrivals so that they reach the airport at the rate the airport can handle. For small-scale weather disturbances, like thunderstorms, the FAA can reroute flights around the weather.

Prior to 2006, however, the FAA did not have a tool that dealt with large-scale weather systems that covered a large part of the country. The FAA/Metron Aviation/Volpe Center in 2005 and 2006 created and deployed a tool called Airspace Flow Programs (AFPs) to deal with these large-scale weather problems.

Issuing and executing an AFP typically consists of the following steps.

- An FAA traffic manager selects the area that is affected by the weather. Managers can filter the flights that go through this area, for example choosing only flights going from west to east.
- An FAA traffic manager chooses the rate at which flights may enter the area. That is, even during bad weather, some flights, although far fewer than usual, are able to find their way through.
- AFP software calculates the times that flights should depart so that they arrive at the area of bad weather at the desired rate.
- These controlled departure times are distributed. Airlines and other flight operators are informed of the time that each flight should depart. The system also informs FAA personnel in control towers when flights should be allowed to take off.





- As the day unfolds, the FAA can revise the AFP as necessary to reflect unexpected developments in weather or demand.
- The flight operators can, if desired, reroute flights around the bad weather; that is, they are allowed to take the longer flying time instead of the departure delay if they choose.

In this way, decision making is distributed among the FAA and the flight operators, avoiding undue congestion in a controlled way so that the disruption to efficient operations is minimized.

In 2006 and 2007, the FAA used AFPs on 43 days. The FAA calculates that the total savings in cost to the flight operators was about $118 million. The total cost of deploying AFPs, including the operations research analysis, software development, working with the users to fine–tune the concept, and preparing the procedures and training, was about $5 million.

Organizational Overview

The Federal Aviation Act of 1958 created the agency under the name Federal Aviation Agency. FAA adopted its present name in 1967 when it became a part of the Department of Transportation. Its major roles include regulating civil aviation to promote safety; encouraging and developing civil aeronautics, including new aviation technology; developing and operating a system of air traffic control and navigation for both civil and military aircraft; researching and developing the National Airspace System and civil aeronautics; developing and carrying out programs to control aircraft noise and other environmental effects of civil aviation; and regulating U.S. commercial space transportation.

Metron Aviation fuses the principles of science and mathematics with unparalleled domain knowledge to provide dynamic and innovative solutions to airspace constraints in the advancement of Traffic Flow Management concepts. Metron Aviation staff work in conjunction with FAA, airlines, NASA, academia, and private industry to ensure modernization of the National Airspace System accommodates increased demand while balancing the need for customers to be informed and safe.

The Volpe National Transportation Systems Center is part of the U.S. Department of Transportation's Research and Innovative Technology Administration and is an innovative, federal, fee-for-service organization. Our mission is to improve the Nation's transportation system. Our work is performed primarily for DOT, as well as other federal agencies and state, local, and international entities.





Netherlands Railways

The new Dutch timetable: the O.R. Revolution

Project Summary

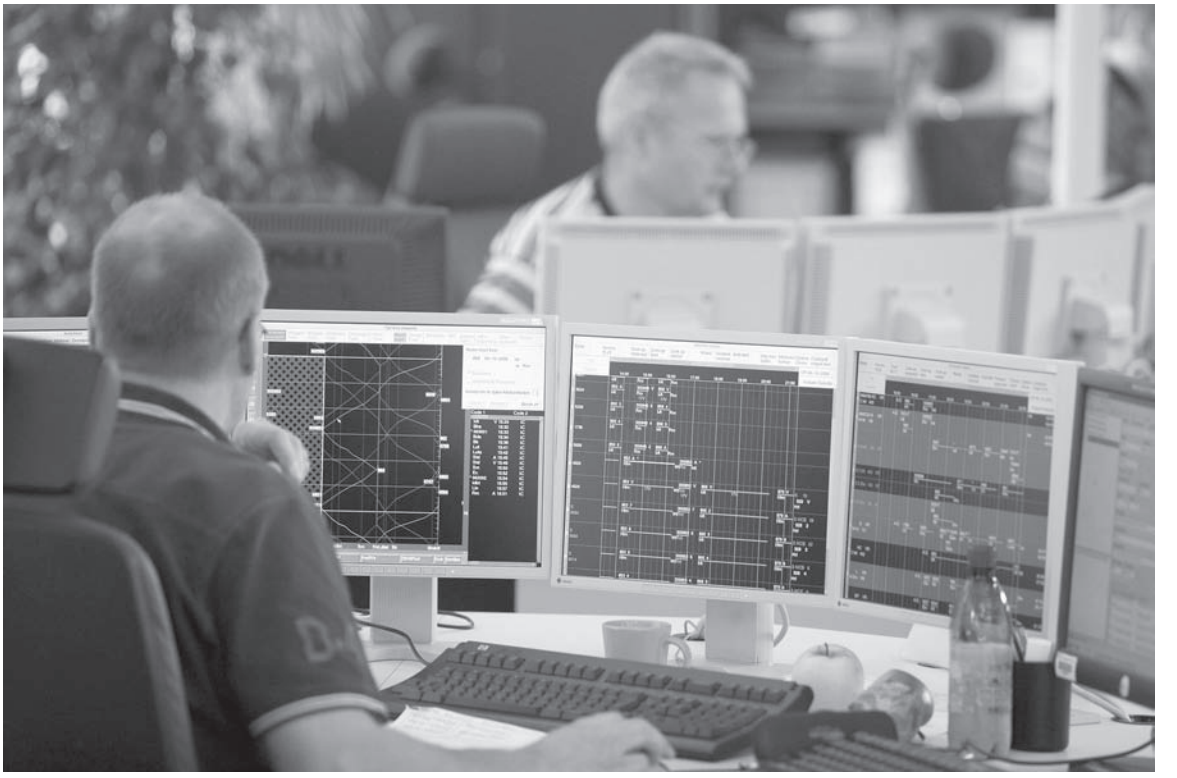
When it comes to commuting in Holland, travel by rail affects an enormous number of Dutch citizens. Netherlands Railways (NS) operates passenger trains on all the principal lines in the Netherlands, transporting approximately 1.1 million passengers daily. In this way, NS plays a very important role in the mobility of the Netherlands.

NS used operations research to produce a completely new timetable for the entire country, which has been in operation since December 2006. Since so many daily life patterns are changed through the modifications in the railway timetable, this change resulted in considerable media attention and in many discussions in the Dutch parliament. The last major change in the timetable took place in 1970. Since then, the number of passenger kilometers on the network nearly doubled, from 8.0 billion to 15.8 billion a year. To accommodate more passengers and at the same time reduce delays using the old timetable could only be realized if railway infrastructure were significantly extended. A report of the Dutch railway sector estimates that those investments would cost an additional €10 billion ($15 billion) through 2020. Because this costly expenditure was not considered acceptable, the only way for NS to accommodate more passengers was to develop a new timetable from scratch.

This new timetable and the related resource schedules for rolling stock and crew have been constructed with the help of O.R. tools. The timetabling step itself consists of two main components: the generation of a cyclic timetable, which is repeated every hour, and the detailed routes through the different stations. To solve both components, two O.R. problem solvers were developed. Another O.R. solution approach was invented to construct rolling stock schedules. All these methods were developed in close cooperation with the scientific community (CWI and Erasmus University Rotterdam). The crew schedules were generated by TURNI, a software system from Double-Click SAS.

The impact for NS is an additional annual profit of €40 million ($60 million) in 2007, with an expectation of growing to €70 million ($105 million) in the coming years. These benefits come from both more efficient resource schedules and an increase in passenger demand and punctuality. Lines with the greatest timetable improvements saw an increase in passenger demand of almost 15% in 2007. On-time performance——the percentage of trains arriving within three minutes of the scheduled arrival time—increased from 84.8% in 2006 to 87.0%, an all-time high record, in 2007. As a result, surveys show that there are more satisfied passengers than ever before. The CPB, an independent advisor of the Dutch government, conservatively estimates every percentage point increase in punctuality of the railway system to be worth €8 million ($12 million) a year for Dutch society.

Since, in the future, additional railway transport can be accommodated by the new timetable, the growing demand for transportation to the main cities in the rush hours can be facilitated by railway transport. This helps reduce congestion on the roads into and inside these cities, as well as greenhouse gases.







Organizational Overview

Nederlandse Spoorwegen (Dutch Railways), or NS, is the principal passenger railway operating company in the Netherlands. Its trains operate over the tracks of the Dutch national rail infrastructure company ProRail.

StatoilHydro and Gassco

Optimizing the offshore pipeline system for natural gas in the North Sea

Project Summary

Here's a riddle: Is the largest offshore pipeline network off the coast of Saudi Arabia or Texas?

Answer: Neither of the above. The transport network of natural gas on the Norwegian continental shelf is the world's largest, built with 7800 km of pipelines. Systems effects are prevalent in such a large complex network and so the network must be analyzed as a whole to determine optimal operation (systems effects appear in complex systems but not in the simple components of these systems).

To examine this vast network, researchers from SINTEF worked in close cooperation with representatives from StatoilHydro and Gassco (the main Norwegian shipper of natural gas and the independent system operator, respectively) and developed an operations research tool.

Their first efforts included a flow maximization model with physical details of natural gas flow, focusing on maximization of throughput and contract fulfilment.

Several of the technical details and characteristics needed to model natural gas flows created modelling challenges. Deliveries have to meet contractual specifications for energy content, pressure, and levels of contaminants. Several aspects of the gas routing problem are described by nonlinear relationships, and these have been linearized and discretized in the StatoilHydro/Gassco/SINTEF model GassOpt.

GassOpt allows users to graphically model their network and easily run optimizations to find the best solutions quickly. This tool is used to evaluate the current network as well as possible network extensions. Operations research methods are now an integrated part of the work of the departments responsible for transport planning, security of supply, and tactical analyses such as energy nominations, and are used strategically to verify details of

Photo courtesy of StatoilHydro: Dag Magne Søyland


OLJE-/VÆSKE
PROSESS, VÅT
PM-20-5012-BS20A

planned infrastructure developments. The operations research tool is used to model the operation of a system with a capacity of 120 billion standard cubic meters of natural gas a year. StatoilHydro estimates the accumulated savings related to their use of GassOpt to be a whopping NOK 10 billion ($1.8 billion).





Photo courtesy of Gassco

Organizational Overview

StatoilHydro is an international integrated energy company based in Norway. The company is the leading operator on the Norwegian continental shelf and has operations in 40 countries. StatoilHydro has a strong values-based culture for performance, has high ethical standards, and shows care for the environment and society. The company was established October 1, 2007, following the merger between Statoil and Hydro's oil and gas activities. StatoilHydro is the world's third-largest net seller of crude oil and one of the largest gas suppliers.

Gassco operates one of the world's most extensive and integrated transport systems for natural gas. This embraces 7800 kilometers of pipelines, platforms, processing plants, and receiving terminals, and is vital to Norway's oil and gas production. Gassco works to ensure the best possible utilization of Norway's gas transport system, which strengthens earnings for both pipeline owners and gas end- users. The company also coordinates efforts to expand Norwegian gas transport capacity through the planning and development of new infrastructure. Gassco is a state-owned limited company. It took over as operator for all natural gas transport from Norway to foreign customers in January, 2002. The system it runs is owned by the Gassled partnership.



Photo courtesy of StatoilHydro: Dag Myrestrand



Photo courtesy of StatoilHydro: Harald Pettersen


DRINKING
WATER

U.S. Environmental Protection Agency

Reducing Security Risks in American Drinking Water Systems

Project Summary

Safe and abundant drinking water is critical for the public health and economic vitality of the United States. However, the distributed physical layout of drinking water systems makes them potentially vulnerable to a variety of incidents, including contamination with deadly agents that could result in large numbers of illnesses and fatalities.

As part of its Threat Ensemble Vulnerability Assessment (TEVA) Research Program, the U.S. Environmental Protection Agency (EPA) applied operations research to develop contamination warning systems (CWSs) that enable water utilities to rapidly detect the presence of contaminants in drinking water. A key aspect of CWS design is the strategic placement of sensors to minimize potential public health and economic impacts. The EPA partnered with national laboratory and academic researchers to develop a Sensor Placement Optimization Tool (TEVA-SPOT) that supports a flexible decision framework for sensor placement.

Operations research had a significant impact on the EPA's ability to analyze large-scale water distribution systems. New sensor placement strategies were developed in TEVA-SPOT to analyze very large water distribution networks on typical desktop computers in minutes to hours.

The EPA partnered with member utilities of the American Water Works Association to design CWSs for nine water utilities



that provide water to millions of people. Four CWSs have been deployed, and five more deployments are planned in 2008. These new systems will significantly reduce the impact of catastrophic contamination incidents; the EPA estimates that the median reduction of potential fatalities for these utilities is 48% and the corresponding reduction of potential economic impacts due to fatalities is over 18 billion dollars.

The CWSs developed for these water utilities also help to promote the sustainability of their water distribution systems. CWSs are a valuable tool for detecting accidental contamination and managing common water quality issues. Consequently, these CWSs have helped integrate security programs into daily operations at these utilities.

Organizational Overview

The EPA leads the nation's environmental science, research, education, and assessment efforts. With more than 17,000 employees across the country, the EPA works to research, develop, and enforce regulations that implement environmental laws enacted by Congress.

The EPA is the lead agency in the U. S. government for critical infrastructure protection in the water sector. In 2002, the EPA established the National Homeland Security Research Center to develop technologies and methods that help water utilities prevent, prepare for, and recover from public health and environmental emergencies arising from terrorist threats and natural disasters.



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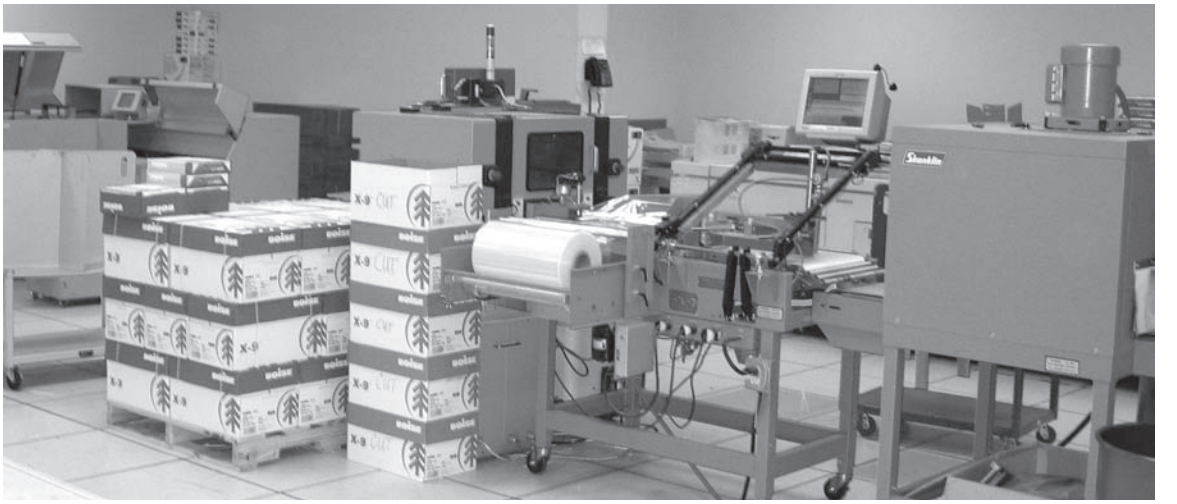
Project Summary

As a creator of the digital printing industry, Xerox has provided the industry with a continuing stream of innovative products and services that have demonstrated improved effectiveness and productivity for over five decades. In the intensely competitive global economy, where industries are facing cost and productivity challenges, providers of print services are required to improve dramatically their productivity to survive. As a global firm with $17 billion dollars in annual sales and 57,400 employees and associates in 160 countries, Xerox is positioned to help such customers worldwide.

Using operations research tools and methodologies, Xerox invented, tested, and implemented a novel class of productivity improvement offerings, trademarked LDP Lean Document Production® Solutions, to meet this need for the printing industry. These tools generate dramatic productivity and cost improvements for both print shops and document manufacturing facilities. Quantitative measures of the associated improvements include labor savings of 20%, productivity improvement by 40%, cycle time reduction of 80%, revenue increase of 17%, and annual profit increase of 20% of the revenue of the shop prior to the LDP implementation. Clearly, implementation of the LDP Solutions in individual printing operations transforms the operations' competitiveness and profitability.

Xerox LDP Lean Document Production® is a simulation-based print production operational framework that utilizes the notion of autonomous cells and a hierarchical dynamic scheduling architecture to route and process jobs. The key idea is to identify job types that have common overlapping workflows and/or dynamic flow characteristics and dedicate equipment and personnel clusters to process these classes of jobs from start to finish, in their entirety, within the clusters. LDP Solutions are delivered to customer print shops via a set of laptop-based computer tools operated by specially trained Xerox service personnel and consultants. Xerox personnel utilize operations research and industrial engineering techniques embedded in these tools to model the work flow in the shop, devise and test alternative layouts and work processes, and propose suitable job control policies. LDP Solutions have been delivered to over 100 print shops in the United States, Canada, China, and Thailand.





The creation and implementation of the LDP Solutions constituted a major innovation in the product development work process in Xerox. They were developed in customer sites by a team of researchers from the Xerox Innovation Group (XIG) working in partnership with the sales and service personnel that serviced those sites. This team, in collaboration with an engineering team from Xerox Global Services (XGS), created the tools and training that were used to roll out the offerings in the sales and service forces. The R&D team established the entire value chain for delivery of the offering in real time, coincidental with the creation of the offering itself, the underlying technology, and the toolkit and training infrastructure needed to deliver the offering in the field.

Implementations of LDP in customer sites create value for both customers and Xerox. Xerox has embedded LDP within its software services platforms, thereby leveraging the high performance of LDP Solutions in both pre-sales and post-sales engagements. The cumulative value delivered by the initial XIG-led implementations (1999-2003), Xerox Mobile Solutions deployments by Lean Six Sigma Black Belts (2003-2007), and external XGS engagements is over $200 million with an additional $50 million expected in 2008. In addition, the higher quality and faster delivery enabled by the LDP solution Solutions provide strategic competitive advantages to print shops.

Productivity improvements as large as those obtained using LDP Solutions over time will likely migrate through the printing industry due to competitive pressures. Based on the scaling laws obtained from the implementations to date, the value of LDP to the $100-billion U.S. printing industry alone is estimated to be tens of billions of dollars annually, even after its benefits have been shared with customers via lower prices.

In this way, applications of operations research tools and techniques are transforming yet another industry.

Organizational Overview

Xerox Corporation is the world's leading document management technology and services enterprise. A $17 billion company, Xerox provides the document industry's broadest portfolio of offerings. Digital systems include color and black-and-white printing and publishing systems, digital presses and "book factories," multifunction devices, laser and solid ink network printers, copiers, and fax machines. Xerox's services expertise is unmatched and includes helping businesses develop online document archives, analyzing how employees can most efficiently share documents and knowledge in the office, operating in-house print shops or mailrooms, and building Web-based processes for personalizing direct mail, invoices, brochures, and more. Xerox also offers associated software, support, and supplies such as toner, paper, and ink. The company's operations are guided by



customer-focused and employee-centered core values—such as environmental sustainability, citizenship, diversity, and quality—augmented by a passion for innovation, speed, and adaptability.

The INFORMS Prize:

Sustained Integration of Operations Research



2008 Winner



GE Global Research
Risk & Value Management Laboratory

GE Global Research's Risk & Value Management Lab is recognized because it has an impressive track record applying operations research methods throughout many distinctive business areas at GE, driving significant, sustained value for the company. GE has employed an excellent mix of O.R. technologies applied to a range of different business units and types of problems. Substantial value has been created and quantified via the use of O.R. Finally, GE has an impressive track record of recognition from INFORMS for its work via Edelman and Wagner finalists and publications in INFORMS journals.

Honorable Mention

Intel Corporation
MITRE Corporation's
Center for Advanced Aviation System Development



The INFORMS Prize

A History

This is the first year that INFORMS is presenting two of its most prestigious practice prizes at the Edelman Awards Gala. The Franz Edelman Award recognizes the very best operations research projects in the world during a given year. In that same year, The INFORMS Prize is a lifetime achievement award honoring an organization's on-going efforts to incorporate operations research practices successfully within its work.

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

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

2008 INFORMS Prize Committee

Glenn Wegryn, Procter & Gamble, Chair
Ranga Nuggehalli, UPS
Peter Bell, University of Western Ontario
Andy Bringhurst, Air Products & Chemicals Incorporated
Mark Ferguson, Georgia Institute of Technology College of Management
Jeffrey D. Camm, University of Cincinnati
Ted Gifford, Schneider National, Inc.

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. adaptation 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 adaptation were rated higher by the prize committee.

Business 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.

Business 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 2009

INFORMS Prize Nominations

Call for 2009 Nominations



Applications for the 2009 INFORMS Prize are now being accepted.

All organizations are eligible, and applications will be accepted from all sources.

The measurement of the contribution is judged relative to the impact OR/MS has had on the overall success of the organization. Thus, a multi-billion 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 business.

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 firms selected as finalists. The award is presented to the key executive in charge of OR/MS activities within the firm.

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; more detailed descriptions (1 page each) of two or three major OR/MS projects and their impact. For more information about the application process, please go to www.informs.org, chhose the awards menu, and go to INFORMS Prizes and Awards or visit:
www.informs.org/index.php?c=113&kat=INFORMS+Prize

Deadline is December 1, 2008.

See you at the 2009 INFORMS Practice Conference!

Call for 2009

Franz Edelman Award Applications

Call for 2009 Applications

THE FRANZ EDELMAN AWARD

38th 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 38th International Competition for the Franz Edelman Award for Achievement in Operations Research. The competition will take place at the 2009 INFORMS Conference on O.R. Practice.

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 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 2-page summary of your achievement and a 60-word abstract, plus the name, address, phone number, and affiliation of each author by Wednesday, October 22, 2008.

Complete instructions will be announced online at www.scienceofbetter.org/Edelman.

Each finalist group will give an oral presentation of its work at the 2009 INFORMS Conference on O.R. Practice in Spring, 2009.

See you at the 2009 Franz Edelman Award competition!
www.scienceofbetter.org/Edelman

The Institute for Operations Research and the Management Sciences

Service to Society by a Profession

by Mark G. Doherty, Executive Director INFORMS

The Intersection of Intellectual and Social Capital

The hallmark of a professional scientific society is its capacity to generate intellectual capital that not only promotes the growth of a profession, but also creates the basis for reaching solutions that better society as a whole. Another role is to provide the forum for the growth of social capital that allows the like-minded to gather, network, and discuss ideas and theories that further professional development by deliberating hypotheses and advancing concepts that ultimately can resolve societal problems.

The Edelman Competition is a grand example of the intersection of intellection and social capital. The finalists in the competition are unveiling their achievements (intellectual capital) in operations research and competing at a conference as invited speakers (social capital) in front of their peers from many organizations.

While many of the finalists demonstrate the large cost savings that their projects have accomplished, what often goes unsaid is how they have helped their companies remain competitive and survive in the marketplace, thereby saving jobs, providing products and services at fair prices to consumers, and adding to the economic growth in communities.



However, it's not always about money and business. Edelman finalists have paved the way in understanding and addressing public policy issues that can be viewed as controversial in diverse topics such as needle exchange and nuclear nonproliferation. In other cases, operations research methodologies have provided organizations with the wherewithal to make tremendous paradigm shifts in how they see and approach their businesses, causing others in the marketplace to respond in kind.

For over 35 years, the Edelman Competition has brought forth some of the best demonstrations of what operations research has accomplished. The intellectual capital that these groups



Photo courtesy of U.S. Army: Sarah Underhill



have contributed to the profession is remarkable, and covers many industrial sectors, government, and military. Their willingness to share their deliberations and accomplishments with colleagues is a testament to a strong and vibrant profession, and a commitment to the social capital that binds them together. What they have achieved for their organizations also speaks to the solutions that better society in terms of productivity gains, economic improvements, understanding issues, and making better decisions.

As the professional scientific society that sponsors the Edelman Competition, INFORMS is proud of its affiliation and of its many volunteers that take part in the finalists' selection process and judging. These members give freely of their time, contributing to the social capital fabric of the profession while capturing the significant intellectual capital generated by the contenders. These volunteers and contestants make the Edelman what it truly is–a world-class competition of the best-in-class O.R. applications. *OR*

SAS applauds those who apply the power of analytics to gain the competitive edge.

Congratulations to the 2008 Edelman finalists.

sas | THE POWER TO KNOW.

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hp

Congratulations

Edelman Award Winners, Past and Present

HP salutes the honorees of the 2008 Edelman awards. As a 2007 Edelman finalist and 2002 Informs Prize winner, HP applauds INFORMS for recognizing the value of OR in supporting process innovation, data-driven decisions and operational excellence.

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About INFORMS, Its Activity and Its History

The Institute for Operations Research and the Management Sciences (INFORMS) is the largest professional society in the world for professionals in the field of operations research (O.R.).



The Institute for Operations Research and the Management Sciences (INFORMS) is the largest professional society in the world for professionals in the field of operations research (O.R.). It 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 contains over 10,000 members, is dedicated to applying scientific methods to help improve decision making, management, and operations. Members of INFORMS work in business, government, and academia. They represent fields as diverse as airlines, health care, law enforcement, the military, the stock market, and telecommunications.

Since the pioneering days of people like Franz Edelman, operations researchers have taken pride in quietly improving the world. Saving billions of dollars annually, model-based support solutions developed by INFORMS members are now relied upon in such diverse areas as airlines, telecommunications, health care, homeland security, the armed forces, and government. Research pioneers in O.R. disciplines represented by INFORMS have contributed importantly to the development of algorithms and methodologies now employed widely in engineering, science, and business. Contributions to applied math, including optimization, stochastic processes, simulation, game theory, statistics, and decision science, are especially well known.

INFORMS is often a leader in identifying the world's foremost researchers–for example, honoring Nobel Prize winners John F. Nash and Harry Markowitz before they were recognized by the Nobel Academy.

The society serves the scientific and professional needs of O.R. educators, investigators, scientists, students, managers, and consultants, as well as the organizations they serve, by such services as publishing 12 scholarly journals that describe the latest O.R. methods and applications, and a membership magazine with news from across the profession. The society organizes national and international conferences for academics and professionals, as well as members of the society's special interest groups. The Institute serves as a focal point for O.R. professionals, permitting them to communicate with each other and reach out to other professional societies, as well as the varied clientele of the profession's research and practice.





INFORMS advances operations research by:

- Encouraging and rewarding excellence
- Communicating all aspects of operations research to management, policy makers, and the public
- Providing education and career development opportunities to operations researchers
- Attracting young people and all those with talent and skill to the field of operations research.

INFORMS is a member of the International Federation of Operational Research Societies (IFORS).

The Historical Role of the College for the Practice of Management Science

by Russell P. Labe, Director, Merrill Lynch Management Science Group

The Origins and Stewardship of the Franz Edelman Award



The College for the Practice of Management Science, or CPMS, the practice section of INFORMS, was the original source and creator of the Edelman Award. Back in the early 1970s, members of CPMS were discussing the need to capture success stories associated with operations research. At that time, CPMS was part of TIMS, The Institute of Management Sciences. As they are today, most practitioners were focused on solving a particular problem, getting the solution implemented, and then moving on to the next interesting challenge. There was very little motivation to publish and tell the world about the work and its value. So, the idea came about to hold a competition that would encourage practitioners to make their accomplishments more public. Legend has it that the Edelman Award was born in 1971 in a hotel room where a few members of CPMS decided to get the idea off the ground by personally pledging prize money for the first competition. If my sources are correct, those four CPMS members were Gene Woolsey of the Colorado School of Mines; Dave Hirshfeld of MathPro, Inc., Herb Halbrecht of Halbrecht Associates, and Franz Edelman of RCA Corporation.

In the early years, the award was known as the TIMS Prize. Shortly after Franz's sudden death in 1982, a proposal was made by H. Newton Garber to change the name to the Franz Edelman Award. Franz established the O.R. group at RCA, one of the earliest industrial O.R. groups in North America. He worked at RCA for over 30 years and is considered among the fathers of innovation. Newt was one of Franz's earliest recruits to RCA and continued to direct the O.R. group after Franz's retirement. Newt himself became personally identified with the prize because of his dedicated stewardship, serving as a judge for over 30 years.



Over the years, the prize has grown in stature, in complexity of the competitive process, and in the extent of effort required every year to make it happen. Throughout this evolutionary process, CPMS has continued to be a caring steward and proponent of growth. One of the key steps in the evolution was the idea of assigning a coach to each of the finalist teams. The coach is familiar with the intricacies of the competition and helps each team deliver the highest-quality paper and presentation they can. Coaches are essential to the success of the competition. Coaching requires a significant investment of time over a five to six-month period, helping the finalists position their work, providing feedback on the paper and presentation, and preparing for potential tough questions from the judges.

A second major change came in the 1980s when we first began to videotape the presentations to the judges. The videotapes represent an excellent documentation of the work, O.R. contributions, and public statements by senior executives about the value of the work. The videotapes are used by many professors as part of their curriculum to expose students to some of





the best applications of O.R. Of course, today the videos are captured on DVD.

Today, running the competition requires many volunteers. The prize committee involves 30-40 people, mostly members of CPMS. This includes 12-15 verifiers, 6-10 coaches, 8-10 judges, and 25-35 reviewers who read the nominated papers and provide feedback. The chairperson of the committee typically serves a two-year term. They have the responsibility of making all the details come together. All of these dedicated people have other jobs and daily responsibilities, but find time to make the competition happen. They have kept the Edelman Award alive and healthy, and we owe them a great debt. I would have liked to include a list of all the chairpersons, judges, and coaches throughout the years, but due to time limitations, we could not accurately gather all that information. We offer heartfelt thanks to CPMS for preserving this crown jewel for future generations of O.R. students, teachers, and practitioners. *OR*

Acknowledgements

Thank You!

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In Memoriam,

2008

Recognizing the passing of those who have made the Franz Edelman Competition so special.

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