

OPERATIONS RESEARCH: BILLIONS AND BILLIONS OF BENEFITS!

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Over 302 billion U.S. dollars of impact! That's impressive! How were they estimated? How broad is the impact? Is there more?

Since 1974, the Edelman finalists publish their project accomplishments in the *INFORMS Journal on Applied Analytics* (formerly *Interfaces*). While reviewing the 284 articles, their cumulative monetary impact was estimated under the following guidelines:

- Be objective and make conservative assumptions.
- Include reported impact plus at most two more years of anticipated impact.
- Include only one year of enormous impact (10s of billions) to downplay the huge size and budget of some organizations.
- Ignore relative impact even though saving \$10 million for a small company may be more impressive than saving \$100 million for a large company.

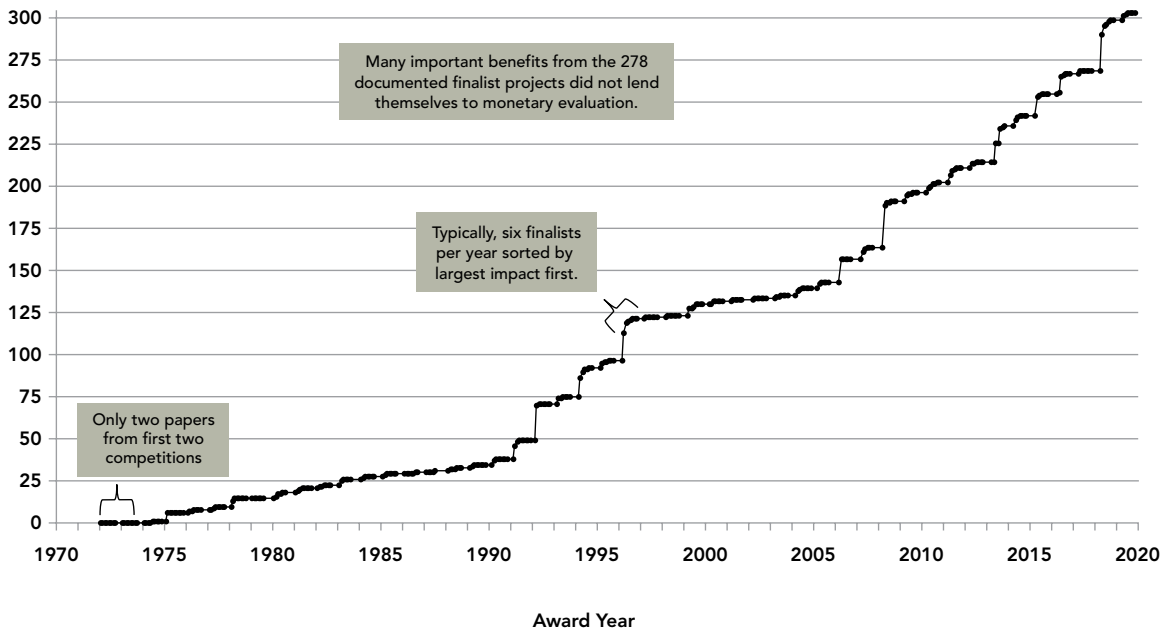
These conservative guidelines exclude important yet difficult-to-quantify reported benefits like better: legal dispute resolution, cancer treatments, airline safety, epidemic disease control, organizational structure, on-time railways, space shuttle heat shielding and water quality. For example, there are more than 20 finalist papers with significant life and health benefits. Most are difficult to quantify, however, a CDC project on (future) U.S. epidemics expects annual savings of 6,000 lives valued at \$12B¹ and one U.S. Army project estimates 4,500

avoided casualties by reducing requirements for helicopter and ground-convoy movements². Nearly all finalist papers report non-monetary benefits and frequently tout them as most important and longer lasting by establishing, for example, ongoing practices and organizational changes that improve health, safety, cooperation, decision making, timeliness, and job satisfaction. Great! Clearly, reported monetary benefits understate the full impact of the Edelman finalist projects.

Another important indication of the influence of operations research (O.R.) is the impressive breadth of applications. The Edelman finalists represent 143 different application areas including aviation (safety, traffic), banking, canal operations, communications (broadband, broadcasting, radio spectrum), consumer products, crowd control, delivery (express, truck), defense (Air Force, Army), education, financial (contract bidding, credit card, fraud, investment, pension, settlement), fire protection, forestry, healthcare (blood collection, cancer, diagnosis, disease control, elderly, hospital, medical displays, pharmaceutical, surgery), hotel management, energy production and distribution (coal, gas, electric, nuclear, oil, wind), land use, manufacturing (electronics, food, paper, seeds, steel, tires, vehicles), marketing, mining, printing, sanitation, security (airport, police), senior housing, social networks, sports, tax collection, transportation (airline, highway, railway, rental, outer space, school bus), treasure hunting, waste management, water (flood, flow, resources, quality), and weapons dismantlement. The list goes on and on! In fact, 733 organizations³ from business, government, and academia are recognized and honored as supporting or benefiting from finalist projects.

Benefits over \$302 Billion from Edelman Finalist Projects 1972 through 2019

(Conservatively quantified benefits, realized plus at most two years anticipated, in 2020 U.S. dollars)



Finally, this is just the “tip of the iceberg” because the Edelman competition only captures those O.R. professionals choosing to compete! Just think, the 1,353 Edelman finalist authors¹ represent only 10% of the current INFORMS membership. Undoubtedly, there is a vast number of projects with significant impact that did not compete due to confidentiality, lack of internal support to compete (e.g., no one thought of it, too busy, no management support, inadequate documentation), or the team was simply unaware of the competition.

The impact is immense! O.R. professionals should be proud of their profession – you can say “hundreds of billions” when asked about the value of O.R.!

² “Bayesian Networks for Combat Equipment Diagnostics,” *Interfaces*, Vol. 47, No. 1.

³ Some organizations and contestants have competed multiple times and are counted more than once.

⁴ Interesting how the average number of authors per paper has grown from 1.8 over first 10 award years (1974–1982) to 8.2 over last 10 award years (2010–2019). Linear regression gives 0.17 annual growth in average authors per paper with $R^2 = 0.80$.

¹ For CDC: 6000 lives/year \approx 314M U.S. population * 5% epidemic penetration * 10% die under current practices * (1-80% fatality reduction under improved practices) * 1 epidemic per 200 years. Value of quality year of life in U.S. is \$2M / average life \approx \$50K/year (a standard value) * 78 years life expectancy * 50% average life lived. Total expected annual impact is \$12B = 6,000 * \$2M. See “Advancing Public Health and Medical Preparedness with Operations Research,” *Interfaces*, Vol. 43, No. 1 (note Figure 6). Numbers are reasonable values offered by the author.