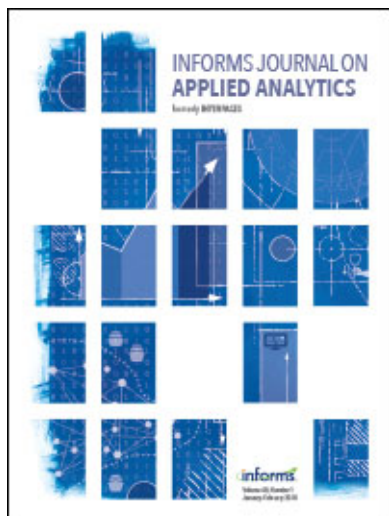




INFORMS Journal on Applied Analytics

Publication details, including instructions for authors and subscription information:
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Editorial: The 13th Rothkopf Rankings: All-Time Interfaces/INFORMS Journal on Applied Analytics 50-Year Anniversary Special Edition

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To cite this article:

Michael F. Gorman (2020) Editorial: The 13th Rothkopf Rankings: All-Time Interfaces/INFORMS Journal on Applied Analytics 50-Year Anniversary Special Edition. INFORMS Journal on Applied Analytics 50(6):387-395.
<https://doi.org/10.1287/inte.2020.1049>

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Editorial: The 13th Rothkopf Rankings: All-Time *Interfaces/INFORMS Journal on Applied Analytics* 50-Year Anniversary Special Edition

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Received: June 15, 2020

Accepted: June 17, 2020

<https://doi.org/10.1287/inte.2020.1049>

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Abstract. In 1996, Michael Rothkopf created an index of institutional contributions to the practice of operations research (OR) and management science (MS). Since then, Ron Fricker and I have continued to calculate, evolve, and extend this ranking. In this *Interfaces (INT)* and *INFORMS Journal on Applied Analytics (IJAA)* anniversary ranking, I analyze organizational contributions to the practice of OR/MS in *INT* since the inception of the journal in 1971. I calculate all three prior ranking measures—visibility, yield, and academic yield—and a blend of the rankings. This analysis considers only articles in *INT/IJAA*, which is a departure from prior rankings, which included applied work in some other journals. However, for the first time, we have a single database of every article ever published in *INT/IJAA*, allowing analysis of trends over time. I am also able to compute the all-time contributions of nonacademic institutions as done by Fricker in 2012.

Keywords: professional: comments on • Rothkopf ranking

Introduction: 50th Anniversary Edition

In 1996, Michael Rothkopf developed an index of which universities contribute most to the practice literature. This ranking is now known as the Rothkopf Rankings in his honor, and this article is the 13th in the series in 25 years. The purpose of these rankings is to identify the universities that contribute to the practice literature. Michael Rothkopf conducted seven applied research rankings between 1997 and 2007 (Rothkopf 1996, 1997, 1999, 2002, 2004, 2005, 2007), Ron Fricker provided three rankings from 2009 to 2012 (Fricker 2009, 2011, 2013), and I provided the most recent Rothkopf Rankings in Gorman (2016, 2019). Table 1 summarizes the date range evaluated for each ranking effort. Generally, these rankings represent a rolling measure of such contributions, with a seven-year history for each ranking conducted approximately every two years, with five overlapping years. More recently, they have been conducted every three years, with four overlapping years.

This ranking is the first to consider “all-time” contributions to *Interfaces (INT)* and *INFORMS Journal on Applied Analytics (IJAA)* since its inception in 1970, a time span of 50 years (1970–2019). As such, it measures not what an institution has contributed recently, but the institutional contribution to the journal over a much longer period, the life of *INT/IJAA*. This all-in ranking offers a number of advantages.

- First, the original ranking (Rothkopf 1996) had a starting year of 1988; the major contributing

organizations of the first 18 years of the journal had never been measured. This analysis considers every submission for the full 50-year history of the journal, from 1970 to 2019.

- Second, because the yield measure (Fricker 2009) was created with the 8th ranking and the academic yield measure (Gorman 2016) was created with the 11th ranking, they did not exist in earlier rankings. In this analysis, all three measures of contribution defined below (visibility, yield, and academic yield, as well as a blended ranking across the measures) are included for the life of the journal.

- Third, the prior time series analysis of the visibility, yield, and academic yield presented in Gorman (2019) was severely hampered by the lack of availability of data from some prior analyses as well as overlapping time periods. For example, only the top n universities had a reported rank in any single report; Gorman (2019) could only report an average rank for those institutions whose rank was reported in prior analyses. Thus, this report provides a more complete time series, eliminating those missing values.

- It has been noted in prior Rothkopf Rankings that, with a seven-year horizon, considerable shifts in the rankings can occur, which may be due largely to noise and the fortunate or unfortunate start and end points for the study. The full 50-year data set gives a measure of a long-lasting commitment to applied research over time.

Table 1. The Rothkopf Rankings

Ranking number	Author	Year	Years of coverage
1	Rothkopf	1996	1988–1994
2	Rothkopf	1997	1990–1996
3	Rothkopf	1999	1992–1998
4	Rothkopf	2002	1994–2000
5	Rothkopf	2004	1996–2002
6	Rothkopf	2005	1998–2004
7	Rothkopf	2007	2000–2006
8	Fricker	2009	2002–2008
9	Fricker	2011	2004–2010
10	Fricker	2013	2006–2012
11	Gorman	2016	2009–2015
12	Gorman	2019	2012–2018
13	Gorman	2020	1971–2020

Notes. The Rothkopf Rankings tradition (so named in 2009 by Ron Fricker in honor of the rankings' originator, Michael Rothkopf) began in 1996 and has since been conducted roughly every two to three years. Prior rankings have evaluated the most recent seven years, on a rolling, overlapping basis. This 13th ranking is the first to consider a 50-year horizon of contributions.

- Finally, because data on the other measures are more complete, the newly proposed blended measure (Gorman 2019) can now be calculated for the entire history of the journal given the presence of a complete set of data and calculations of the other measures, which allows for consistent time series analysis.

Sample

The starting point for this analysis is every digital object identifier (DOI) ever produced in *Interfaces* or the *INFORMS Journal on Applied Analytics* (Freeman et al. 2020) in its full 50-year history since its inception in 1970 through the last issue of 2019. Over that time frame, *INT/IJAA* has produced 3,416 unique DOIs penned by 7,437 (not necessarily unique) authors. Table 2 identifies the breakdown of the frequency of article types in *INT/IJAA*. Consistent with prior rankings, this analysis will consider full-length, refereed articles and case studies, shorter contributions (such as Art and Science of Practice, Practice Abstracts, and Practice Summaries), and columns from regular contributing editors (such as 20/30 Hindsight, The Ombudsman, The Fifth Column, People Skills, All Around the Model, Creativity in MS/OR, Model World, The Easy Chair, and The Occasional Observer, among others). This subset represents 76% (2,587/3,416) of all the DOIs in the journal. Because full-length articles tend to have more authors than the various types of excluded submissions, the included DOIs constitute 85% (6,300/7,437) of the authors. Consistent with prior Rothkopf Rankings, excluded contributions from *INT/IJAA* include book and application reviews, editorials, announcements, contributor and editorial board lists, calendars, calls for papers, issue introductions, and the like.

Table 2. This Study Includes 2,587 (76%) Articles, Case Studies, Practice Abstracts and Summaries, and Columns Published in *INT/IJAA* Since Its Inception

Included		Not included	
Article	2,080	Book review	177
Column	440	Contributors	89
Practice abstracts	32	Editorial	85
Case study	25	Applications reviews	56
Practice summaries	10	Award	51
Total	2,587	Letter	32
		Introduction	30
		Calendar	43
		Management science roundup	25
		Misapplications reviews	24
		Call for papers	23
		Instructions to authors	20
		Note	12
		Teachers' forum	12
		Other	150
Total articles	3,416	Total	829

In some cases, the academic or professional affiliation or nation could not be discerned for some authors. These authors are included in the counts above but are excluded from Rothkopf Rankings below. For example, among the included works in the rankings, 14 authors' nationalities could not be discerned, and 4 author types (academic/practitioner) could not be determined.

Exclusions from This Study

Prior Rothkopf Rankings included articles from the OR Practice section of *Operations Research* and articles in *Manufacturing and Services Operations Management* (MSOM) and *Decision Analysis* (DA), but they are omitted from this analysis. Historically, the frequency of such papers is relatively low relative to the volume of papers in *INT/IJAA* that they are generally not material to the final rankings. Typically, *Interfaces* articles make up 95% of the articles in each ranking (Gorman 2019); MSOM and DA generally have few applied articles. This is more true in early years for *INT/IJAA*, when MSOM and OR Practice did not exist. Thus, there is little loss in comparability with prior rankings. Consistent with the "anniversary" nature of this article and given that the vast majority of applied research is in *INT/IJAA*, the focus of this report is on contributions to practice solely based solely on contributions to *INT/IJAA*.

Measures of Contribution

For all measures described below, consistent with the scoring proposed by Mike Rothkopf (Rothkopf 1996), full-length articles and case studies count as a full point, and articles and columns count as one half-point.

Table 3. Example Scoring for “University A” Shows the Difference in the Three Measures of Contribution

Article authors	Visibility	Yield	Academic yield
1 from University A	1	1	1
2 from University A	2	1	1
3 from University A, 1 from University B	3	0.75	0.75
2 from University A, 2 from University B, 2 from Company C	2	0.33	0.5
1 from Company C	0	0	0

As described in Gorman (2019), the three scoring methods are simple but varied. Four different methods of apportioning these points have been developed over the years: visibility, yield, and academic yield, and a blended ranking based on the other three. The relative merits of these measures are discussed in detail in Gorman (2016) and are described in brief below.

1. **Visibility** (Rothkopf 1996): Visibility (so dubbed by Fricker 2009) is the original measure created by Rothkopf (1996). Visibility is a metric based on author participation; each author on an article gets a full point (half-point for columns and practice summaries). The sum of the yield measure is based on the total academic authors contributing to applied articles in the date range. The “visibility” is a function of the number of academics participating in the project.

2. **Yield** (Fricker 2009): Yield splits a single point for an article (half-point for a column) proportionally among all of the authors contributing to an article. Yield is a metric based on proportional author contribution to a work. The sum is the proportion of all the articles contributed by all authors, approximately equal to the number of articles plus one half of the smaller contributions of summaries and columns.

3. **Academic Yield** (Gorman 2016): Academic yield is a contribution metric based solely on the academically produced portion of the article. Academic yield follows a similar formula as in the yield measure; however, nonacademic authors do not count against the measured academic contribution to the article. The total academic points for each article are equal to one (0.5 for each column). The sum of the academic yield is thus equal to the total applied articles plus one half the number of columns in the date range. Because the Rothkopf Rankings were based on *academic* support of applied research, the measure captures the portion of the contribution to an article by academics without penalizing the participation of a nonacademic author.

4. **Blended Measure** (Gorman 2019): The blended ranking takes the average of the ranks achieved by each measure. It captures the scoring contribution of all three measures through an equal weighting of the

ranks from each measure: the awareness (visibility), productivity (yield), and academic contribution (academic yield) to each article. In this ranking, complete data for *INT/IJAA* allow for more complete ranking data and time series analysis.

Table 3 illustrates the differences of each measure for a few illustrative publications with contributions from “University A.” University A receives one point per author with the visibility score and a proportion of a point in the yield score based on the fraction of its authors’ contribution to the article. The sum of the visibility score is the total number of academic authors, the sum of the yield score is the total proportion of the authors on a paper that are from academia, and the sum of the academic yield score is one for any article with academic authors.

The 13th Rothkopf Ranking—50th Anniversary Results

As is the norm, the Rothkopf Ratings are presented by U.S. and non-U.S. categories. Because we are including nonacademic contributions in this ranking, these, too, are split by U.S. and non-U.S. categories. Table 4 summarizes the total authors included, and

Table 4. U.S. Academic and Nonacademic Institutions Contribute the Most to *INT/IJAA*

	Count	Visibility	Yield	Academic yield
United States				
Academic	2,567	2,374	1,129	1,356
Nonacademic	2,178	2,088	684	
Non-U.S.				
Academic	959	935	360	435
Nonacademic	592	578	170	
Total	6,296	5,975	2,343	1,791
United States				
Academic	41%	40%	48%	76%
Nonacademic	35%	35%	29%	
Non-U.S.				
Academic	15%	16%	15%	24%
Nonacademic	9%	10%	7%	

Note. Non-U.S. academic institutions have participated, but non-U.S., nonacademic organizations are least prevalent.

the total of each score, by academic and nonacademic affiliation and U.S. and non-U.S. location. Count is the total authors contributing to this set of articles. Visibility is the author-based total point score, adjusted for the lower point values of practice abstracts and column contributions, and thus is slightly lower than

the total count of authors. Yield is the article-based measure, after adjusting downward for practice and columns, and thus is slightly lower than the total number of articles in the sample.

In the journal's 50-year history, 335 unique, identifiable U.S.-based academic institutions have had authors

Table 5. The Top 50 U.S. Academic Institutions for Contributions to *INT/IJAA* over Its History

Rank	U.S. academic institution	Visibility	Yield	Academic yield	Visibility rank	Yield rank	Academic yield rank	Average rank
1	Colorado School of Mines	72.0	51.5	54.5	2	1	1	1.33
2	Massachusetts Institute of Technology	72.5	32.0	45.2	1	3	3	2.33
3	University of Pennsylvania	70.0	42.8	46.8	3	2	2	2.33
4	Naval Postgraduate School	65.0	21.4	30.1	4	7	5	5.33
5	University of Texas at Austin	56.5	21.4	32.8	6	6	4	5.33
6	Pennsylvania State University	54.0	23.0	27.3	7	4	6	5.67
7	Stanford University	45.5	22.7	25.9	8	5	8	7.00
8	Georgia Institute of Technology	61.0	18.1	26.5	5	11	7	7.67
9	University of Southern California	40.5	19.3	22.9	10	8	10	9.33
10	Northwestern University	34.5	18.9	23.0	14	9	9	10.67
11	Carnegie-Mellon University	44.0	16.3	19.2	9	14	13	12.00
12	University of Maryland	32.5	18.3	22.8	16	10	11	12.33
13	University of Pittsburgh	36.0	16.4	19.2	13	13	14	13.33
14	University of Cincinnati	33.0	16.6	18.8	15	12	15	14.00
15	University of Virginia	38.0	16.2	16.7	11	15	18	14.67
16	University of Michigan	38.0	12.6	16.7	11	20	17	16.00
17	Cornell University	29.5	12.5	17.6	18	21	16	18.33
18	Temple University	21.5	15.5	19.3	26	17	12	18.33
19	Columbia University	21.5	13.1	16.0	26	18	20	21.33
20	Indiana University	22.5	12.8	13.5	22	19	24	21.67
21	University of California, Los Angeles	22.5	12.3	13.8	22	22	23	22.33
22	University of Rochester	19.5	16.1	16.3	32	16	19	22.33
23	University of Alabama	27.0	10.1	13.3	19	28	25	24.00
24	Harvard University	25.0	11.4	13.0	21	25	27	24.33
25	University of Colorado	22.0	11.5	13.2	24	23	26	24.33
26	Princeton University	22.0	10.0	15.9	24	29	21	24.67
27	University of California, Berkeley	21.0	11.5	15.1	29	24	22	25.00
28	University of South Carolina	27.0	10.4	11.7	19	27	31	25.67
29	University of Tennessee, Knoxville	21.5	8.6	12.0	26	33	29	29.33
30	Arizona State University	21.0	8.5	11.9	29	35	30	31.33
31	University of Illinois at Urbana-Champaign	18.5	10.0	11.0	33	30	33	32.00
32	University of Florida	16.5	9.2	12.5	38	32	28	32.67
33	University of Dayton	17.0	9.5	11.4	37	31	32	33.33
34	Purdue University	20.5	8.3	10.7	31	37	34	34.00
35	University of Nebraska-Lincoln	14.5	8.2	9.3	42	38	37	39.00
36	Case Western Reserve University	14.5	8.6	8.6	42	33	45	40.00
37	Rensselaer Polytechnic Institute	30.5	5.3	8.4	17	60	46	41.00
38	Oakland University	10.5	10.5	10.5	62	26	35	41.00
39	George Mason University	14.5	7.8	9.0	42	43	39	41.33
40	Southern Methodist University	14.5	7.8	9.0	42	42	41	41.67
41	University of North Carolina at Chapel Hill	14.5	7.1	9.9	42	47	36	41.67
42	University of Minnesota	18.5	6.3	8.3	33	50	47	43.33
43	Duke University	16.5	7.4	8.0	38	44	48	43.33
44	Texas Tech University	13.0	7.9	9.0	51	41	39	43.67
45	Villanova University	18.0	7.0	7.5	35	48	51	44.67
46	University of Massachusetts Boston	10.5	8.5	9.3	62	36	37	45.00
47	West Virginia University	18.0	8.0	6.0	35	40	62	45.67
48	Boston University	15.0	5.7	8.8	41	54	42	45.67
49	University of Houston	13.0	7.3	8.8	51	45	43	46.33
50	Yale University	13.0	7.3	8.8	51	46	44	47.00

who contributed to the journal. Over that same history, 314 unique, identifiable non-U.S. academic institutions have contributed to the journal. Table 5 shows the top 50 U.S. academic institutions, sorted by their average rank across the three measures. Table 6 shows the

top 50 non-U.S. academic institutions, sorted by their average rank across the three measures.

In the United States, the Colorado School of Mines is the leading contributor to the journal over its history, followed closely by Massachusetts Institute of

Table 6. The Top 50 Non-U.S. Academic Institutions for Contributions to *INT/JIAA* over Its History

Rank	Non-U.S. academic institution	Visibility	Yield	Academic yield	Visibility rank	Yield rank	Academic yield rank	Average rank
1	University of Chile	52.0	11.6	13.8	1	1	1	1.00
2	Erasmus University	30.0	9.1	11.8	2	2	2	2.00
3	University of Waterloo	17.0	8.6	9.5	4	3	3	3.33
4	University of British Columbia	20.0	6.8	9.3	3	6	4	4.33
5	Indian Institute of Management	15.0	7.4	8.7	5	4	5	4.67
6	Lancaster University	14.0	7.0	7.5	7	5	6	6.00
7	University of Toronto	15.0	5.3	7.0	5	8	7	6.67
8	University of Ottawa	11.0	5.0	5.8	8	9	10	9.00
9	University of Auckland	9.0	4.5	6.5	12	11	8	10.33
10	Technion - Israel Institute of Technology	8.5	5.7	6.5	16	7	8	10.33
11	University of Western Ontario	8.0	5.0	5.5	17	9	11	12.33
12	Eindhoven University of Technology	9.0	3.8	4.8	12	13	13	12.67
13	University College	8.0	4.4	5.0	17	12	12	13.67
14	Katholieke Universiteit Leuven	9.0	3.6	4.0	12	14	16	14.00
15	Laval University	10.0	3.3	4.3	9	21	15	15.00
16	University of Alberta	8.0	3.3	4.7	17	18	14	16.33
17	London School of Economics and Political Science	9.0	3.3	3.6	12	18	20	16.67
18	INSEAD	7.5	3.2	3.8	23	23	19	21.67
19	Ecole des Hautes Etudes Commerciales	7.0	3.5	3.1	24	16	26	22.00
20	Manchester University	6.0	3.4	4.0	34	17	16	22.33
21	Korea Advanced Institute of Science and Technology	7.0	2.5	3.0	24	27	27	26.00
22	University of Waikato	6.0	3.3	3.3	34	20	24	26.00
23	Pontifical Catholic University of Chile	6.5	3.3	3.3	32	22	25	26.33
24	University of Groningen	7.0	2.3	3.0	24	36	27	29.00
25	University of Montreal	5.5	2.8	3.5	40	26	21	29.00
26	Royal Military College of Canada	4.5	3.5	3.5	51	15	21	29.00
27	Dalhousie University	5.0	2.5	3.5	43	27	21	30.33
28	Polytechnic University of Madrid	8.0	2.3	2.5	17	40	38	31.67
29	Tsinghua University	10.0	1.7	2.6	9	50	37	32.00
30	University of Buenos Aires	8.0	2.4	2.5	17	34	45	32.00
31	Indian Institute of Technology	8.0	2.4	2.4	17	35	46	32.67
32	University of Sao Paulo	6.0	2.3	3.0	34	37	27	32.67
33	University of Melbourne	6.0	2.5	2.5	34	27	38	33.00
34	University of Seville	7.0	1.8	3.0	24	49	27	33.33
35	University of Bath	4.5	2.5	3.0	51	27	27	35.00
36	Tilburg University	7.0	1.3	4.0	24	66	16	35.33
37	American University	4.0	2.5	3.0	53	27	27	35.67
38	University of Strathclyde	7.0	2.0	2.3	24	44	47	38.33
39	Henley College	3.0	3.0	3.0	69	24	27	40.00
40	University of Canterbury	3.0	3.0	3.0	69	24	27	40.00
41	University of Calgary	3.0	2.5	3.0	69	27	27	41.00
42	Public University of Navarre	5.5	1.6	2.6	40	53	36	43.00
43	Bilkent University	5.5	1.5	2.5	40	54	38	44.00
44	Cass Business School, City University of London	5.0	2.2	2.2	43	41	49	44.33
45	University of Florence	6.0	1.8	1.8	34	45	56	45.00
46	Norwegian University of Science and Technology	7.0	1.3	2.0	24	69	51	48.00
47	National University of Singapore	3.0	2.3	2.5	69	37	38	48.00
48	Imperial College	3.0	2.5	2.0	69	27	51	49.00
49	Ecole Supérieure des Sciences Economiques et Commerciales	3.0	2.0	2.5	69	42	38	49.67
50	Tel Aviv University	3.0	2.3	2.3	69	37	47	51.00

Technology and the University of Pennsylvania. Those three institutions are ranked in the top three in all three measures of contribution. The remainder of the top 10 generally attain a ranking in the top 10 in all three rankings: Naval Postgraduate School, University of Texas at Austin, Pennsylvania State University, Stanford University, Georgia Institute of Technology, University of Southern California, and Northwestern University.

Internationally, the University of Chile dominates in all three measures over the life of the journal, and Erasmus University holds the second rank in all three measures. The University of Waterloo, the University of British Columbia, the Indian Institute of Management, and Lancaster University generally hold ranks 3 through 6 in the measures. The University of Toronto, the University of Ottawa, the University of Auckland, and Technion - Israel Institute of Technology round out the top 10.

It is noteworthy that a top 10 finish in the United States requires significantly higher absolute scores; a top 10 finish in the United States requires something on the order of 20 articles, whereas the same rank internationally requires something more like 6. Put another way, the University of Chile would have ranked 16th worldwide if U.S. schools were included; Erasmus University would have ranked 18th.

Time Series Analysis

Although a primary benefit of this study is to take the long view over the life of the journal, it is interesting to look at behaviors over time. This study allows a first-time look at consistently developed measures over the life of the journal. Figure 1 shows the top 20 U.S. schools in each of the five decades of *INT/IJAA*'s existence. In total, 54 different schools have been in the top 20 in any decade. Figure 2 shows the rankings of the 26 schools who have made the top 20 in two or more decades. They are sorted by frequency in the top 20. Three U.S. institutions have been in the top 20 in all five decades of the existence of *INT/IJAA*: the

Colorado School of Mines, Massachusetts Institute of Technology, and the University of Texas at Arlington. The Colorado School of Mines was never ranked lower than sixth in any decade.

The University of Pennsylvania and the University of Southern California were in the top 20 in three decades, but the contributions have been lighter in recent decades. Seven institutions have appeared in the top 20 in three decades, with Carnegie-Mellon University and the Naval Postgraduate School making strong contributions in the last 30 years on a consistent basis.

Of the schools that have appeared in the top 20 twice, Cornell University, the Georgia Institute of Technology, the University of Dayton, and the University of Tennessee, Knoxville have shown a recent high level of contribution.

Figure 3 shows the ranking for the top 10 international schools by decade. (Ten was chosen because there are fewer international schools and generally make lower contributions; the top 20 in any decade might be 2/3 of the total contributors.) Internationally, 35 different schools made the top 10 over the five decades. Only four schools appear in the top 10 in three of the five decades: Waterloo in the 1970s through the 1990s; University of Chile, Erasmus University, and University of Auckland in the 1990s through the 2010s; and University of British Columbia in the 1970s, 1990s, and 2000s.

Measures Applied to Nonacademic Institutions

Fricker (2012) is the only attempt to measure the contribution of nonacademic institutions to the practice literature. That work focused on the contribution of nonacademic institutions to the applied literature for the years 2005–2011. As he did, I follow the methodologies described above for each institution; however, in this case, as with the academic analysis, I do so solely for *INT/IJAA* and for the entire 50-year life of the journal. Unlike Fricker, I restrict the articles solely to *INT/IJAA*

Figure 1. Fifty-Four Different Schools Have Been in the Top 20 in the Last Five Decades

Rank	1970's	1980's	1990's	2000's	2010's
1	University of Pennsylvania	Massachusetts Institute of Technology	Stanford University	Naval Postgraduate School	Georgia Institute of Technology
2	University of Rochester	University of Pennsylvania	University of Maryland	Colorado School of Mines	Colorado School of Mines
3	Colorado School of Mines	University of Texas at Austin	Naval Postgraduate School	University of Virginia	Naval Postgraduate School
4	Oakland University	Colorado School of Mines	Massachusetts Institute of Technology	Pennsylvania State University	University of Dayton
5	Northwestern University	Pennsylvania State University	Pennsylvania State University	Georgia Institute of Technology	Massachusetts Institute of Technology
6	University of Southern California	University of Pittsburgh	Colorado School of Mines	University of Maryland	Carnegie-Mellon University
7	Columbia University	Indiana University	Princeton University	University of Pennsylvania	University of Tennessee, Knoxville
8	University of Pittsburgh	Stanford University	University of Pennsylvania	Temple University	University of Michigan
9	University of Texas at Austin	University of Michigan	Temple University	Cornell University	University of Cincinnati
10	University of California, Los Angeles	Harvard University	University of Colorado	Carnegie-Mellon University	University of South Carolina
11	Case Western Reserve University	University of Cincinnati	University of Texas at Austin	Massachusetts Institute of Technology	Villanova University
12	Massachusetts Institute of Technology	University of Southern California	University of Cincinnati	University of North Carolina at Chapel Hill	University of Southern California
13	University of Georgia	University of Illinois at Urbana-Champaign	Carnegie-Mellon University	Rutgers University	Northwestern University
14	Texas Tech University	University of Virginia	University of Southern California	University of Texas at Austin	Walden University
15	University of Colorado	University of Nebraska-Lincoln	Northwestern University	University of Missouri	Columbia University
16	Duke University	University of Alabama	University of Virginia	Boston University	Stanford University
17	West Virginia University	West Virginia University	Arizona State University	University of Tennessee, Knoxville	University of Alabama
18	Oregon State University	University of California, Berkeley	University of South Carolina	Purdue University	Cornell University
19	University of Minnesota	University of Utah	Yale University	San Francisco State University	Arizona State University
20	University of New Orleans	Brigham Young University	George Mason University	University of Dayton	University of Texas at Austin

Figure 2. U.S. Institution Ranking by Decade

School	Rank achieved by a school in each decade				
	70's	80s	90s	2000s	2010s
Colorado School of Mines	3	4	6	2	2
Massachusetts Institute of Technology	12	1	4	11	5
University of Texas at Austin	9	3	11	14	20
University of Pennsylvania	1	2	8	7	
University of Southern California	6	12	14		12
Carnegie-Mellon University			13	10	6
Naval Postgraduate School			3	1	3
Northwestern University	5		15		13
Pennsylvania State University		5	5	4	
Stanford University		8	1		16
University of Cincinnati		11	12		9
University of Virginia		14	16	3	
Arizona State University			17		19
Columbia University	7				15
Cornell University				9	18
Georgia Institute of Technology				5	1
Temple University			9	8	
University of Alabama		16			17
University of Colorado	15		10		
University of Dayton				20	4
University of Maryland			2	6	
University of Michigan		9			8
University of Pittsburgh	8	6			
University of South Carolina			18		10
University of Tennessee, Knoxville				17	7
West Virginia University	17	17			

articles over its 50-year history; however, as noted above, *INT/IJAA* makes up the vast majority of the applied analytics literature (over 95% of the scoring in Fricker (2012) came from *INT/IJAA* articles). Among practitioners, *INT/IJAA* is undoubtedly a more likely outlet for applied research.

Ron considered “parent” organizations (e.g., all of IBM, regardless of division; all of the U.S. government, regardless of which organization (Centers for Disease Control and Prevention, Environmental Protection Agency, etc.)); I do differentiate the U.S. military divisions, but as Ron did, do not differentiate the other governmental organizations. As with Fricker, I do not differentiate by U.S. and non-U.S. companies but rather provide a worldwide ranking, as many of the leading companies are in fact multinational. Consistency in naming was attempted to some degree. For example, over this large time frame,

“International Business Machines” came to be known as IBM; these names were aggregated into a single company. However, merged companies, such as Santa Fe and BNSF or Chessie System and CSX, were counted separately, as were companies that were divested or spun off, such as Sabre from American Airlines. Finally, I drop the “academic yield” measure in this ranking, as it does not apply to these organizations.

In total, 1,050 nonacademic organizations have contributed to *INT/IJAA*, compared with 649 academic institutions. This large number is not surprising, as often there is author participation from the organization in which a project took place; many such organizations are a one-time participant in a research project in the journal. Also, many of the leading contributors are consulting and technology firms, of which there are many.

Figure 3. (Color online) The Top 10 Non-U.S. Academic Institutions by Decade

Rank	1970's	1980's	1990s	2000's	2010's
1	University of Ottawa	University of Waterloo	University of British Columbia	Erasmus University	University of Chile
2	University of Waterloo	Indian Institute of Management	University of Chile	University of Chile	Erasmus University
3	University of Canterbury	University of Western Ontario	Erasmus University	Eindhoven University of Technology	University of Groningen
4	Imperial College	Pontifical Catholic University of Chile	University of Waterloo	University of Alberta	Tsinghua University
5	Manchester University	University College	University of Montreal	University of Western Ontario	Technion - Israel Inst of Tech
6	Tel Aviv University	University of Bath	University of Auckland	Royal Military College of Canada	Lancaster University
7	Stockholm University	Laval University	Indian Institute of Management	University of Toronto	University of Toronto
8	University of British Columbia	Ecole des Hautes Etudes Commerciales	University of Waikato	University of British Columbia	Indian Institute of Technology
9	Institute for the Study of Hist, Philo and the Sci	Henley College	INSEAD	University of Auckland	Korea Advn Ins of Sci and Tech
10	Norwegian School of Economics and Bus. Admin.	Queensland Institute of Technology	Lancaster University	Tilburg University	University of Auckland

Note. Schools in the top 10 at least three times are bolded, with arrows showing change in rank.

As with academic rankings, Table 7 sorts contributing organizations based on the average rank of the two remaining measures that were applied. By any measure and by a considerable margin, IBM is the top nonacademic contributor to *INT/IJAA*. IBM would rank ahead of any international academic institution and in the top five of U.S. academic institutions for their contributions.

The close second biggest contributor is the U.S. government, which benefits in this method of scoring from the aggregation of its many departments and agencies. Of the 16 different U.S. governmental agencies included in that category, major contributing organizations include the Centers for Disease Control and Prevention, U.S. Environmental Protection Agency, Energy Information Administration,

Table 7. The Top Contributing Nonacademic Institutions in the World Since the Journal's Inception

Rank	Organization name	Visibility	Yield	Visibility rank	Yield rank	Average rank
1	IBM	139.0	25.8	1	1	1
2	U.S. Government	56.0	18.3	3	2	2.5
3	General Electric	75.0	16.9	2	3	2.5
4	AT&T	42.0	13.7	6	4	5
5	U.S. Army	44.5	9.9	5	5	5
6	Hewlett Packard	53.0	7.5	4	8	6
7	American Airlines	17.0	9.3	14	6	10
8	Merrill Lynch	23.0	6.0	9	13	11
9	Intel	21.0	6.3	11	12	11.5
10	General Motors	27.0	5.6	7	17	12
11	Xerox	16.5	6.5	17	10	13.5
12	City of New York	24.0	5.3	8	19	13.5
13	RAND Corporation	14.5	6.3	21	11	16
14	U.S. Navy	15.0	5.7	19	15	17
15	Sabre Corporation	17.0	4.3	14	21	17.5
16	Ford	22.0	3.9	10	25	17.5
17	Arthur D. Little	11.0	7.0	29	9	19
18	Weyerhaeuser Company	14.0	5.7	22	16	19
19	Systems Research Incorporated	9.0	8.8	33	7	20
20	Procter & Gamble	18.0	3.0	12	32	22
21	U.S. Air Force	13.0	4.9	25	20	22.5
22	Bethlehem Steel Corporation	11.0	4.3	29	21	25
23	Schneider National	15.0	3.3	19	31	25
24	United Airlines	8.0	4.0	40	23	31.5
25	ExxonMobil	8.5	3.5	38	27	32.5
26	Applied Decision Systems	6.0	6.0	54	13	33.5
27	Decision Focus Incorporated	10.0	2.8	31	38	34.5
28	Syngenta	16.0	2.2	18	51	34.5
29	Dell	18.0	2.0	12	58	35
30	CSIRO	9.0	2.7	33	40	36.5
31	McKinsey & Company	7.0	3.4	45	30	37.5
32	Standard Oil Company	6.0	3.7	54	26	40
33	Mayo Clinic	9.0	2.3	33	49	41
34	U.S. Coast Guard	12.0	2.1	26	56	41
35	Sandia National Laboratories	17.0	2.0	14	72	43
36	Mau Trucking	6.0	3.0	54	33	43.5
37	Booz Allen Hamilton	6.0	2.9	54	37	45.5
38	Bristol-Myers Company	5.5	5.5	74	18	46
39	INSIGHT	7.0	2.5	45	47	46
40	Federal Express	8.0	2.1	40	55	47.5
41	DISTINCT Management Consultant	8.0	2.1	40	57	48.5
42	Bechtel Power Corporation	5.0	3.5	75	28	51.5
43	Phillips	6.0	2.2	54	53	53.5
44	Getty Oil	6.0	2.2	54	53	53.5
45	Delta Airlines, Inc.	9.0	1.9	33	74	53.5
46	U.S. WEST Advanced Technologies	6.0	2.0	54	59	56.5
47	National Science Foundation	5.0	2.7	75	39	57
48	Norfolk Southern Corporation	9.0	1.8	33	81	57
49	UPS	8.5	1.8	38	77	57.5
50	Chesapeake Decision Sciences	5.0	2.5	75	41	58

U.S. Postal Service, and Department of Energy, among others. Many of these would have been in the top 50 based on their own individual contributions.

General Electric (GE) rounds out the top three. GE and the U.S. government share second and third rankings, depending on the measure. AT&T, the U.S. Army, Hewlett Packard, and American Airlines fall approximately into the fourth through seventh rankings. Merrill Lynch, Intel, General Motors, and Xerox round out the top 10.

Discussion

This anniversary edition of the Rothkopf Rankings is the first to produce all three measures of research production developed over the last 30 years (visibility, yield, and academic yield), with a blended ranking between them, for the entire history of the journal. A number of observations can be made. Although we measure institutional contributions to the journal as a way to measure that support, it seems clear that such contributions are ephemeral and highly variable. Of course, what we are truly measuring is the interest and the ability of faculty at those schools (or employees in those organizations, in the case of nonacademic institutions) to pursue applied research, and only secondarily are we suggesting what the institutional support for that research must be in order for it to be sustained. Of course, the level of applied research can come and go over time as faculty are hired, retire, or change positions.

Nonetheless, there are some longtime institutional supporters of applied research identified. The Colorado School of Mines must be commended above all others for the consistency and quality of its support for applied research. Massachusetts Institute of Technology and the University of Texas at Austin similarly so. The University of Pennsylvania has been nearly as supportive. Recently, the Georgia Institute of Technology, Cornell, and the Naval Postgraduate School have been strong supporters.

Internationally, there are generally lower total contributions to *INT/IJAA* and, therefore, some additional variability to the flow of applied research from around the world. The University of Chile, Erasmus University, and Auckland University should be commended for outstanding applied research in recent decades. Longstanding support for applied research can be seen from schools such as the University of Waterloo, the University of British Columbia, the Indian Institute of Management, Lancaster University, the University of Toronto, and the University of Ottawa.

It is a pleasure to see the high level of contributions from nonacademic institutions in the journal. Although the Rothkopf Rankings were originally conceived to measure academic focus on applied research, the measures can also be used to understand the extent of analytics in practitioner organizations that are willing to share them. IBM, the U.S. government and armed forces, GE, and many other organizations have shown the willingness and ability to conduct advanced analytical projects and then share them with the world.

For the *INFORMS Journal on Applied Analytics* and for analytics research as a whole, the need to demonstrate our tools in practice is essential to prove the value of what we do and continue to evolve the discipline to more advanced and useful levels.

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