

Editorial: The 10th Rothkopf Rankings of Universities' Contributions to the INFORMS Practice Literature

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This paper presents the 10th ranking of universities according to their contributions to the INFORMS practice literature. Two rankings are given, each based on a different metric: visibility is the number of times a university is listed as the primary academic affiliation in the INFORMS practice literature; yield is the equivalent number of INFORMS practice papers attributable to each university based on author primary academic affiliation. For U.S. universities, Georgia Institute of Technology ranks first in visibility, followed by the Naval Postgraduate School in second, and the Colorado School of Mines in third; for yield, the Naval Postgraduate School ranks first, followed by the Colorado School of Mines in second, and Georgia Institute of Technology third. For non-U.S. universities, the University of Chile ranks first and the University of Toronto ranks second for both visibility and yield, the Norwegian University of Science and Technology is third for visibility, and Cass Business School is third for yield.

Key words: professional: comments on.

In an August, 2011 column in the *Institute of Mathematical Statistics Bulletin* (Durrett 2011), Professor Rick Durrett wrote a wonderful column focused on the importance of motivating theoretical work with applications. Those familiar with Professor Durrett's work will recognize that he is no lightweight when it comes to theoretical research; yet in this column, he writes,

...one of the problems with what is published in the *Annals of Applied Probability* lies in the dictum applied by referees: "if it's not hard, then it's not good." It seems to me that one should at least give equal weight to the question: does the paper say something interesting about the application? (p. 4).

He subsequently goes on to say,

To quote my academic godfather, Kai Lai Chung, from the preface of his book on Markov Chains: "mathematicians are more inclined to build fire stations than to put out fires." Given the content of our journals, the quote should be updated to: "Once we have a blueprint for one fire station, there is no need to actually build it or to engage in the boring enterprise of putting out fires" (p. 4).

As a counterweight to this situation, and particularly to encourage the publication of operations research (OR) applications, Professor Michael Rothkopf first ranked universities' contributions to the OR practice literature in a 1996 *Interfaces* editorial (Rothkopf 1996).

The purpose of the rankings is to recognize those academics and academic institutions concerned with and active in operations research/management science (OR/MS) practice. In terms of Professor Durrett's metaphor, these rankings are intended to recognize academics and academic institutions that not only design fire stations, but that also help firemen put out fires. Professor Rothkopf published six rankings, and I have subsequently published three more (Fricker 2009, 2011, 2012), including the first rankings of nonacademic organizations (Fricker 2012).

Updates and Changes to the Rankings

In this paper, I update the university rankings with the most recent data from 2011 and 2012. In a departure from previous Rothkopf rankings, I now count practice papers published in *Manufacturing and Service Operations Management (M&SOM)* as well as *Interfaces* and OR practice papers in *Operations Research*. See Fricker (2011) for further discussion about the inclusion of M&SOM practice papers in the rankings.

M&SOM practice papers are identified by the word "practice" in a paper's key word list and OM forum papers are counted as columns for the purposes of these rankings. The idea is that OM forum papers are consistent in content with *Interfaces* columns and this approach has the advantage that the M&SOM journal

editors, not me, decide what constitutes an OM forum paper (and hence a column in these rankings).

For *Interfaces* and *Operations Research*, these rankings are based on the most recent seven years of practice papers and columns published from 2006 to 2012. However, because *M&SOM* just started identifying practice papers in 2011, the rankings include only practice papers and columns published in that journal in 2011 and 2012. Of course, as time passes, the rankings will eventually include the most recent seven years of practice papers for all three journals.

A key tenant of these rankings is leaving it up to each journal editor to specify the criteria for what constitutes a practice paper, and then classify the papers in his (her) journal. For example, in 2012, *Operations Research* modified its definition: “The OR Practice area expands its current scope to include papers that synthesize the experience from multiple cases of OR practice implementation and provide insights into the critical success factors of practice” (Zenios 2012, p. 2).

That said, from my perspective, papers classified as practice should predominantly be about the actual implementation of OR in a real-world problem. In contrast, papers that are methodological or theoretically oriented and that only contain a largely illustrative example should not be classified as practice.

Rothkopf Ranking Results

Across the three journals, 283 papers and columns are included in these rankings. From 2006 to 2012, 198 papers and 61 columns were published in *Interfaces* and 21 practice papers were published in *Operations Research*. From 2011 to 2012, two practice papers and one column were published in *Manufacturing and Service Operations Management*.

The 283 papers and columns had 605 authors with academic affiliations in 26 countries (see Table 1), of which 408 gave U.S. academic affiliations and 197 gave non-U.S. academic affiliations. The 605 authors consist of 476 unique individuals, two of whom had both U.S. and non-U.S. academic affiliations (on different papers) sometime during the 2006–2012 period.

In compiling these rankings, I use two separate metrics—one for visibility and the second for yield—that result in two rankings. The visibility metric is the number of times a university is listed as the primary

Argentina	China	Israel	Switzerland
Australia	Egypt	Italy	The Netherlands
Austria	Finland	Japan	Turkey
Belgium	France	New Zealand	United Kingdom
Brazil	Germany	Norway	United States
Canada	Greece	Spain	
Chile	India	Sweden	

Table 1: From 2006 to 2012, 476 individuals from the 26 countries listed published 283 papers and columns in the practice literature.

academic institution by the INFORMS practice literature authors. No weighting for number of coauthors or any other factor is applied, with the exception that columns are counted as half papers. The yield metric is the number of papers attributable to each university, based on authors' primary academic affiliations, with credit for each paper uniformly divided among the coauthors, and again with columns counted as half papers. See Fricker (2009, 2011) for additional discussion about the metrics.

Visibility

To quantify university visibility, for each of the 476 authors of the 283 papers, I simply sum the number of times a university is listed as an author's primary academic affiliation from 2006 through 2012. In so doing, coauthorship is counted equally whether an individual is the sole author or a coauthor with others, either within or outside of the author's university. No weighting for number of coauthors or any other factor has been applied with the exception of counting columns as half papers.

For example, if three authors from State University collaborated on an *Interfaces* paper, then State University is counted three times in the visibility rankings for that year. Similarly, if the three individuals are authors on three separate *Interfaces* papers (possibly with collaborators from other institutions), then State University is still counted three times. The visibility metric is essentially the number of times an academic institution is listed in print.

Table 2 shows the results for the top 45 U.S. universities that have seven-year scores of 3.0 or higher. Georgia Institute of Technology ranks first, followed by the Naval Postgraduate School second, and the Colorado School of Mines third. Carnegie Mellon University is ranked fourth, followed by the United States Military Academy at fifth, and Purdue University at sixth.

U.S. Universities	Int	Int C	M&SOM	M&SOM C	OR	Score	Rank
Georgia Institute of Technology	22	3	0	0	2	25.5	1
Naval Postgraduate School	22	3	0	0	0	23.5	2
Colorado School of Mines	8	13	0	0	0	14.5	3
Carnegie Mellon University	9	1	0	0	2	11.5	4
United States Military Academy	11	0	0	0	0	11.0	5
Purdue University	8	0	0	0	2	10.0	6
Boston University	9	0	0	0	0	9.0	7
University of Cincinnati	7	4	0	0	0	9.0	7
University of Southern California	8	0	0	0	1	9.0	7
MIT	6	3	0	0	1	8.5	10
University of Maryland, College Park	7	3	0	0	0	8.5	10
Lehigh University	6	0	0	0	2	8.0	12
Villanova University	7	2	0	0	0	8.0	12
Stanford University	5	0	2	0	0	7.0	14
University of Dayton	6	2	0	0	0	7.0	14
North Carolina State University	3	7	0	0	0	6.5	16
University of California, Los Angeles	1	1	0	0	5	6.5	16
East Carolina University	6	0	0	0	0	6.0	18
University of Arizona, Tucson	6	0	0	0	0	6.0	18
University of Connecticut, Storrs	4	0	0	0	2	6.0	18
University of Texas at Austin	6	0	0	0	0	6.0	18
Cornell University	5	1	0	0	0	5.5	22
Texas A&M University	5	0	0	0	0	5.0	23
University of Arkansas	5	0	0	0	0	5.0	23
University of Missouri, Columbia	5	0	0	0	0	5.0	23
Virginia Commonwealth University	5	0	0	0	0	5.0	23
Princeton University	3	0	0	0	1	4.0	27
San Francisco State University	4	0	0	0	0	4.0	27
The University of Texas at Dallas	4	0	0	0	0	4.0	27
Thomas Jefferson University	4	0	0	0	0	4.0	27
University of Michigan, Ann Arbor	3	0	1	0	0	4.0	27
University of North Carolina	4	0	0	0	0	4.0	27
University of South Carolina	4	0	0	0	0	4.0	27
University of Tennessee	4	0	0	0	0	4.0	27
Columbia University	2	0	0	1	1	3.5	35
New York University	3	0	0	0	0	3.0	36
Northwestern University	3	0	0	0	0	3.0	36
Pennsylvania State University, University Park	2	2	0	0	0	3.0	36
University of Alabama, Tuscaloosa	3	0	0	0	0	3.0	36
University of Colorado at Denver	3	0	0	0	0	3.0	36
University of Florida, Gainesville	3	0	0	0	0	3.0	36
University of Iowa	2	2	0	0	0	3.0	36
University of Miami	2	0	0	0	1	3.0	36
University of Pennsylvania	2	2	0	0	0	3.0	36
Yale University	2	0	0	0	1	3.0	36

Table 2: In the visibility rankings for U.S. universities, a school's score is the total number of citations for authors listing that university as their primary affiliation for papers in *Interfaces* (Int), *Manufacturing and Service Operations Management* (M&SOM), and *Operations Research* (OR), plus half the number of unrefereed columns (Int C and M&SOM C).

Table 3 shows the results for the top 16 non-U.S. universities that have seven-year scores of 3.0 or higher. The University of Chile ranks first, the University of Toronto is second, and the Norwegian University of Science and Technology is third. Although I have continued Professor Rothkopf's tradition of ranking U.S. and non-U.S. universities separately, note that the

University of Chile would rank first among all universities in a combined ranking for visibility.

Yield

To quantify yield, I sum the number of times a university is listed as an author's primary academic affiliation from 2006 through 2012, weighted by the

Non-U.S. Universities	Int	Int C	M&SOM	M&SOM C	OR	Score	Rank
University of Chile	29	0	0	0	5	34.0	1
University of Toronto	8	1	0	0	1	9.5	2
Norwegian University of Science and Technology	6	0	0	0	0	6.0	3
Lancaster University	5	0	0	0	0	5.0	4
Cass Business School	0	8	0	0	0	4.0	5
Laval University	4	0	0	0	0	4.0	5
Miguel Hernández University	4	0	0	0	0	4.0	5
University of Buenos Aires	4	0	0	0	0	4.0	5
Katholieke Universiteit Leuven	3	0	0	0	0	3.0	9
London School of Economics and Political Science	3	0	0	0	0	3.0	9
Nanzan University	3	0	0	0	0	3.0	9
Sabancı University	2	0	0	0	1	3.0	9
Seville University	3	0	0	0	0	3.0	9
University of British Columbia	0	0	0	0	3	3.0	9
University of Cologne	3	0	0	0	0	3.0	9
University of Groningen	2	0	0	0	1	3.0	9

Table 3: In the visibility rankings for non-U.S. universities, a school's score is the total number of citations for authors listing that university as their primary affiliation for papers in *Interfaces* (Int), *Manufacturing and Service Operations Management* (M&SOM), and *Operations Research* (OR), plus half the number of unrefereed columns (Int C and M&SOM C).

inverse of the number of coauthors. For example, for a paper with one author, that author's university receives full credit for the paper; for papers with two coauthors, each university listed as the primary academic affiliation is given half credit; for a paper with three coauthors, each university listed as the primary academic affiliation is given one-third credit; etc. No other weighting is applied with the exception of counting columns as half papers.

Table 4 shows the results for the top 52 U.S. universities that have seven-year scores of 1.0 or higher. This can be interpreted as institutions that published the equivalent of at least one INFORMS practice paper over the seven-year period. In this ranking, the Naval Postgraduate School ranks first, followed by the Colorado School of Mines second, and Georgia Institute of Technology third. The University of Dayton ranks fourth, followed by the University of Maryland, College Park at fifth, and MIT at sixth.

Table 5 shows the results for the top 15 non-U.S. universities that have seven-year scores higher

than 1.0. As in the rankings based on visibility, the University of Chile ranks first, followed by University of Toronto second, and Cass Business School in third. Note that the University of Chile would rank third in a combined ranking for yield.

Discussion and Conclusions

This paper ranks universities according to their contributions to the INFORMS practice literature in terms of visibility (the number of times a university is listed as the primary academic affiliation in the INFORMS practice literature) and yield (the equivalent number of INFORMS practice papers attributable to each university based on author primary academic affiliation). As Tables 2–5 show, the results of the two rankings are similar, but not the same. For example, for U.S. universities, Georgia Institute of Technology ranks first in visibility, followed by the Naval Postgraduate School second, and the Colorado School of Mines third; for yield, the Naval Postgraduate School ranks first, followed by the Colorado School of Mines second, and Georgia Institute of Technology third. For non-U.S. universities, the University of Chile ranks first and the University of Toronto ranks second for both visibility and yield, while the Norwegian University of Science and Technology is third for visibility and Cass Business School is third for yield.

As readers of the last university rankings (Fricker 2011) may remember, in addition to incorporating M&SOM in the rankings, I had also planned to include *Decision Analysis*. However, current *Decision Analysis* editorial policies are incompatible with these rankings and have thus unfortunately precluded its incorporation. I hope this situation changes in the future, at which time I will gladly add *Decision Analysis* papers into the rankings.

Returning to Durrett (2011), his theme is “dehydrated elephants,” a metaphor for a problem solved only for its own sake, although it may not have any use in the real world. The source of the metaphor is a cartoon, but Professor Durrett laments in his article: “Naively, I thought that in the age of the Internet I could find a copy of the classic cartoon” (p. 4). I too tried to find the cartoon online without success. However, after resorting to a bit of old-fashioned library research and, ultimately, the delivery of a physical

U.S. Universities	Int	Int C	M&SOM	M&SOM C	OR	Score	Rank
Naval Postgraduate School	7.17	3.00	0.00	0.00	0.00	8.67	1
Colorado School of Mines	2.32	11.50	0.00	0.00	0.00	8.07	2
Georgia Institute of Technology	5.71	1.00	0.00	0.00	0.67	6.88	3
University of Dayton	3.42	1.33	0.00	0.00	0.00	4.08	4
University of Maryland, College Park	2.68	2.33	0.00	0.00	0.00	3.84	5
MIT	1.74	1.50	0.00	0.00	0.50	2.99	6
Boston University	2.98	0.00	0.00	0.00	0.00	2.98	7
University of Cincinnati	1.98	2.00	0.00	0.00	0.00	2.98	7
Purdue University	2.25	0.00	0.00	0.00	0.67	2.92	9
Carnegie Mellon University	2.13	0.50	0.00	0.00	0.50	2.88	10
Villanova University	2.33	1.00	0.00	0.00	0.00	2.83	11
Virginia Commonwealth University	2.67	0.00	0.00	0.00	0.00	2.67	12
United States Military Academy	2.58	0.00	0.00	0.00	0.00	2.58	13
Columbia University	1.50	0.00	0.00	1.00	0.50	2.50	14
Dartmouth College	2.00	1.00	0.00	0.00	0.00	2.50	14
University of Southern California	2.00	0.00	0.00	0.00	0.33	2.33	16
East Carolina University	2.33	0.00	0.00	0.00	0.00	2.33	16
Cornell University	2.02	0.50	0.00	0.00	0.00	2.27	18
Stanford University	1.67	0.00	0.50	0.00	0.00	2.17	19
Walden University	0.00	4.00	0.00	0.00	0.00	2.00	20
University of California, Los Angeles	0.12	0.33	0.00	0.00	1.60	1.89	21
San Francisco State University	1.87	0.00	0.00	0.00	0.00	1.87	22
North Carolina State University	1.00	1.71	0.00	0.00	0.00	1.86	23
Lehigh University	1.25	0.00	0.00	0.00	0.50	1.75	24
Texas A&M University	1.67	0.00	0.00	0.00	0.00	1.67	25
Pennsylvania State University, University Park	0.64	2.00	0.00	0.00	0.00	1.64	26
University of Arizona, Tucson	1.62	0.00	0.00	0.00	0.00	1.62	27
University of Missouri, Columbia	1.60	0.00	0.00	0.00	0.00	1.60	28
University of Alabama, Tuscaloosa	1.58	0.00	0.00	0.00	0.00	1.58	29
University of Florida, Gainesville	1.58	0.00	0.00	0.00	0.00	1.58	29
University of South Carolina	1.58	0.00	0.00	0.00	0.00	1.58	29
University of Tennessee	1.58	0.00	0.00	0.00	0.00	1.58	29
University of North Carolina	1.55	0.00	0.00	0.00	0.00	1.55	33
Temple University	0.00	2.00	0.00	0.00	0.50	1.50	34
University of Colorado at Denver	1.50	0.00	0.00	0.00	0.00	1.50	34
University of Texas at Austin	1.38	0.00	0.00	0.00	0.00	1.38	36
University of Iowa	0.83	1.00	0.00	0.00	0.00	1.33	37
University of Connecticut, Storrs	0.80	0.00	0.00	0.00	0.50	1.30	38
University of San Francisco	1.00	0.50	0.00	0.00	0.00	1.25	39
University of Arkansas	1.20	0.00	0.00	0.00	0.00	1.20	40
University of California, Irvine	1.20	0.00	0.00	0.00	0.00	1.20	40
University of Pennsylvania	0.67	1.00	0.00	0.00	0.00	1.17	42
University of Michigan, Ann Arbor	0.70	0.00	0.33	0.00	0.00	1.03	43
Brigham Young University	0.00	0.00	0.00	0.00	1.00	1.00	44
Drexel University	0.50	1.00	0.00	0.00	0.00	1.00	44
Duke University	0.50	0.00	0.00	0.00	0.00	1.00	44
Illinois Institute of Technology	1.00	0.00	0.00	0.00	0.00	1.00	44
Louisiana State University	1.00	0.00	0.00	0.00	0.00	1.00	44
The University of Texas at Dallas	1.00	0.00	0.00	0.00	0.00	1.00	44
University of North Florida	1.00	0.00	0.00	0.00	0.00	1.00	44
University of Virginia, Charlottesville	1.00	0.00	0.00	0.00	0.00	1.00	44
American University	0.83	0.33	0.00	0.00	0.00	1.00	44

Table 4: The table lists yield rankings for U.S. universities. For each category, papers are summed by university based on authors' primary academic affiliation with credit for each paper uniformly divided among the authors. A school's score is the total number of its papers in *Interfaces*, *Manufacturing and Service Operations Management*, and *Operations Research*, plus half its number of columns.

Non-U.S. Universities	Int	Int C	M&SOM	M&SOM C	OR	Score	Rank
University of Chile	6.37	0.00	0.00	0.00	0.55	6.92	1
University of Toronto	3.17	0.33	0.00	0.00	0.25	3.58	2
Cass Business School	0.00	3.67	0.00	0.00	0.00	1.83	3
Lancaster University	1.50	0.00	0.00	0.00	0.00	1.50	4
University of Bath	0.50	2.00	0.00	0.00	0.00	1.50	4
University of Groningen	1.00	0.00	0.00	0.00	0.50	1.50	4
Katholieke Universiteit Leuven	1.33	0.00	0.00	0.00	0.00	1.33	7
Norwegian University of Science and Technology	1.10	0.00	0.00	0.00	0.00	1.10	8
HEC-University of Lausanne	1.00	0.00	0.00	0.00	0.00	1.00	9
Nanzan University	1.00	0.00	0.00	0.00	0.00	1.00	9
Royal Military College of Canada	1.00	0.00	0.00	0.00	0.00	1.00	9
Technion	1.00	0.00	0.00	0.00	0.00	1.00	9
University of Antwerp	0.00	0.00	0.00	0.00	1.00	1.00	9
University of British Columbia	0.00	0.00	0.00	0.00	1.00	1.00	9
American University in Cairo	0.83	0.33	0.00	0.00	0.00	1.00	9

Table 5: The table lists yield rankings for non-U.S. universities. For each category, papers are summed by university based on authors' primary academic affiliation with credit for each paper uniformly divided among the authors. A school's score is the total number of its papers in *Interfaces*, *Manufacturing and Service Operations Management*, and *Operations Research*, plus half its number of columns.

book via interlibrary loan, I found it. For Professor Durrett and all those who have referenced it (e.g., Stewart 2006, Elworthy 1997, Kolata 1975), here it is (see Figure 1). May this be its entre to the Internet.

These rankings are intended to recognize those who contribute to the practice of OR. At its core, OR is an applied discipline in which quantitative methods are used to improve decision making. Although the theoretical development of new OR methods is clearly important, the discipline should always keep applications in mind when developing new methods. OR should have little room for dehydrated elephants.



Figure 1: "Of course, nobody really wanted a dehydrated elephant, but it's nice to see what we can do."

Source. Hein (1964, p. 209) who reproduced it from the *Saturday Evening Post*.

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