An Assessment of Individual and Institutional

Research Productivity in DEA

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Abstract

Data Envelopment Analysis (DEA) has been used to measure the relative efficiencies of organizations, such as hospitals, universities, and restaurants. A total of 142 DEA theoretical articles were selected from OR related journals for a period 1991 through 1999. The purpose this paper is to: evaluate who are the top researchers in the DEA area, which institutions are most productive in publishing research in the OR related journals. The results of this study show that the University of Texas at Austin, University of Massachusetts, and Warwick University are the first three productive institutions in publishing DEA research. As to the productivity of researchers, Lawrence M. Seiford, Joe Zhu, William W. Cooper, and Jati K. Sengupta are the leading researchers. USA is the most dominant country, accounts for 50.70% of total published articles, in publishing DEA research. The second country, United Kingdom produced 22.54% of the total published articles in DEA.

1. Introduction

Often we wonder if a university, hospital, restaurant, or other business is operating efficiently. Data Envelopment Analysis Method (DEA) can be used to answer this question. As a powerful technique, DEA not only supplements traditional approaches but also provides a more comprehensive insight into how well a person or an organization is really performing.

To complement the subjective judgment about the leading DEA researches and institutions, this work has ranked the leading DEA publishers and institutions according to measurable objective criteria. It is the purpose of this study to assess research productivity of DEA researchers and institutions for the period 1991 through 1999 using measure-normal count, adjusted count. This paper attempts to answer the following question:

- Who are the top researchers in the DEA area?
- Which institutions are most productive in DEA area?
- Which countries are most productive in DEA area?

2. Methodology

IAOR(International Abstract of Operation) and EBSCO, Stockholm, ProQuest databases were selected to measure individual and institutional research productivity. Articles were chosen using keywords related to "Data Envelopment Analysis". However, book reviews, dissertation abstracts, letters, opinions, columns and editorials were excluded from the sample. In addition, the articles of DEA applications are eliminated. For the selected DEA articles, a record of their authors, affiliated institutions, the number of pages, and their country were compiled.

A total of 142 theoretical DEA articles were selected from OR related journals of the past decade, 1991 to 1999. **Table 1** shows the number of articles in selected journals.

Journal	# of Articles	%
Annals of Operations Research	12	8.45%
Computers & Mathematics with Applications	1	0.70%
Computers & Operations Research	8	5.63%
EJOR	58	40.85%
INFOR	4	2.82%
Interfaces	3	2.11%
JORS	30	21.13%
Journal of the Operations Research Society of Japan	5	3.52%
Management Science	18	12.68%
Math. Prog.	1	0.70%
Omega	2	1.41%
Total	142	100.00%

Table 1. Numbers of Articles in selected journals

To assess the research productivity of a given researcher, the normal and adjusted count approaches suggested by Lindsey [2] were used. In the normal count approach, all publications in which the researcher participates are counted. For example, an article with two or more co-authors provides a unit count for each of the researchers. Compared to the normal count method, the adjusted count approach provides a more realistic representation of the accomplishments of a researcher. Each co-author of a paper receives a fraction of a unit count. For example, an article with three co-authors yields a one-third credit for each of them.

3. Findings and Discussion

3.1 Individual Research Productivity

In the case of individual research productivity, normal count is the favored method among researchers in many disciplines [1]. The list of authors was sorted according to their values on the normal count. There are 18 authors identified as the most productive researchers with a normal count over 3. **Table 2** lists the score of these authors, and their ranking among the entire group of 149 researchers. When a tie occurred in the values on the normal count, the values on the adjusted count were used to list the authors in this table.

According to **Table 2**, the coefficient of Spearman's rank order correlation between normal count ranking and adjusted count ranking was 0.639 with two-tailed significance of 0.004. From this coefficient, it is clear that the two rankings for the top 18 researchers were not rather different from each other. **Table 2** shows that according to the normal count, Lawrence M. Seiford is the most productive researcher with 13 papers to his credit. Joe Zhu is ranked as the second most highly productive researcher. As **Fig. 1** illustrates, the top 5 researchers (6 persons represent 4.03% of the total number of researchers) provided 17.61% of the published articles. The top 18 researchers (12.08% of the total number of researchers) provided 37.68% of the published articles. It indicates that a small group of individual researchers have produced a considerable percentage of the published research.

	Table 2 List of top 16 researchers										
RA	NK	Author	SC	CORE		RA	١K	Author	SCORE		
Ν	А	Aution	Ν	А		Ν	А	Autrioi	Ν	А	
1	2	Lawrence M Seiford	13	5 1/2		7	9	Li, Susan X.	5	2 2/3	
2	1	Zhu, Joe	10	6 1/2		7	12	Doyle, John R.	5	2 1/3	
3	8	Cooper, William W.	8	2 7/10		7	12	Green, Rodney H.	5	2 1/3	
4	6	Athanassopoulos, A.D.	7	4 1/12		7	7 19 Rousseau, John J.			1 11/12	
5	7	E. Thanassoulis	6	3 5/12		7	20	Cook, Wade D.	5	1 5/6	
5	16	Brockett, Patrick L.	6	2 1/30		16	12	Semple, John H.	4	2 1/3	
7	3	Sengupta, Jati K.	5	5		16	23	Yu, Gang	4	1 7/12	
7	4	John Ruggiero	5	4 1/2		16 32 Robert G. Dyson 4 1 5/				1 5/12	
7	5	Sueyoshi, Toshiyuki	5	4 1/4		N=Normal Count; A=Adjusted Count					
7	9	Ali, Agha Iqbal	5	2 2/3							

Table 2 List of top 18 researchers

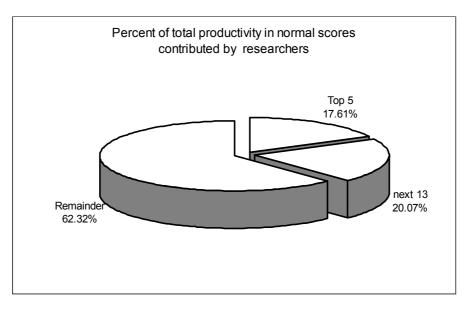


Fig. 1 Individual Productivity in Normal Count

3.2 Institutional Research Productivity

This study used the normal and adjusted counting methods for assessing institutional research productivity. The rankings for these two approaches were not considerable different from each other. Likewise, there was a break after the values on the normal count of 3 and a total 16 institutions were identified with the normal count of 3 at least. Based on **Table 3**, it is possible to identify a set of leading DEA research universities. Particularly, University of Texas at Austin, University of Massachusetts, and University of Warwick can be designated as leading-edge DEA research universities.

Fig. 2 shows another interesting result: the top 3 institutions (4.48% of the total number of 67 institutions) accounted for 30.99% of the total published articles. The top 18 researchers (26.86% of the total number of researchers) provided 64.79% of the published articles. Thus, it may conclude that more than half of the total research papers were published by a small number of institutions.

RA	RANK		SCO	RE		R/	٨NK	Institution		CORE
Ν	А	Institution	Ν	Α		Ν	N A Institution		Ν	Α
1	1	University of Texas, Austin	19	18		8	8	Odense University	3	3
2	2	University of Massachusetts	13	12		8	8	The University of Memphis	3	3
3	2	University of Warwick	12	12	8 8		8	University of Minnesota		3
4	4	University of Dayton	7	6 1/2		8	12	Adelphi University	3	2 1/2
5	5	University of California	5	5		8	12	Israel Institute of Technology	3	2 1/2
5	6	York University	5	4 1/2		8	12	National Cheng Kung Uni.	3	2 1/2
7	7	University of Bath	4	4 3 1/2		8	12	Southern Methodist Uni.	3	2 1/2
8	8	Ben-Gurion University	3	3		8	26	Worcester Polytechnic Inst.	3	1 1/2

Table 3. List of top 16 institutions

3.3 Productivity by Country

Fig. 3 demonstrates the top 6 countries productivity in DEA research. It shows that the USA is the most highly productive in DEA research, and it provided 72 articles, which represents 50.70% of the total articles. The next is United Kingdom, which produced 32 articles, 22.54% of the selected papers. The rest countries are Israel, Denmark, Japan, and Taiwan. Each of them produced 5 articles, 3.52% of the total published articles. These 6 countries contributed a total of 87.32% of the all.

4. Conclusions

This study has examined individual, institutional and country research productivity in DEA by compiling a record of authors, institutions, and country for DEA articles published in the OR related journals between 1991 and 1999. Using the normal counting technique, we have identified 18 top DEA researchers and the top 16 DEA research

institutions in terms of their normal score. Additionally, the United Stated and United Kingdom are the most two dominant countries in DEA research. The result of this study also indicates that a considerable percentage of DEA research papers have been published by a small group of individual and institutional researchers.

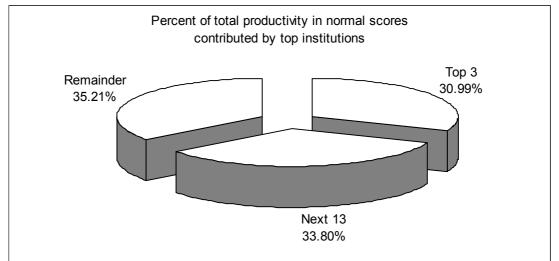


Fig 2. Institutional Productivity in Normal Count

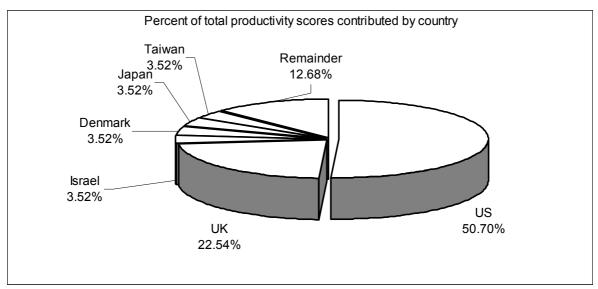


Fig. 3 Percent of total productivity contributed by countries.

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- [2] Lindsey, D., Production and Citation Measure in the Sociology of Science: The Problem of Multiple Authorship, Social Studies of Science, Vol. 10, pp. 145-162, 1980
- [3] The category of selected DEA articles, sorted by the order of Journal, Year, and Author.

Author	Article	Year	Journal	Volume & Page	Author Uni./Inst.	Country
Barr, Richard S.,	An envelopment-analysis approach to	1993	Annals of	45 1/4 Dec	Southern Methodist	US
Seiford, Lawrence M.	measuring the managerial efficiency of		Operations	pp. 1-19.	University, Dallas	
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