International Workshop on Locational Analysis and Related Problems
X Anniversary of the Spanish Location Network

Torremolinos (Málaga)
June 19-21, 2013

Research status and trends in Operations Research and Management Science journals: a bibliometric analysis based on Web of Science database 2001-2012

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Introduction

The subjects Operations Research (OR) and Management Science (MS) (even though there may be philosophical differences, we use the two terms interchangeably), have been defined by many authors in the field. Definitions range from “a scientific approach to decision making” to “the use of quantitative tools for systems that originate from real life” (Eiselt & Sandblom, 2010). The Institute for Operations Research and the Management Sciences (INFORMS) defines OR/MS as the “science of better”. What all of this essentially means is that the science uses quantitative techniques to make and prepare decisions, by determining the most efficient way to act under given circumstances.

During decades, the journal impact factor (IF) has been an accepted indicator in ranking journals, however, there are increasing arguments against the fairness of using the IF as the sole ranking criteria. In this sense, many possible modifications and improvements have been proposed (Bornmann & Daniel, 2008; Dorta-González & Dorta-González, 2013a,b).

Journal performance is a complex multi-dimensional concept difficult to be fully captured in one single metric (Moed et al., 2012, p. 368). This resulted in the creation of many other quality metric indices such as the fractionally counted impact factor (Leydesdorff & Bornmann, 2011), scimago journal ranking (González-Pereira et al., 2009), h-index (Hirsch, 2005), and central area index (Dorta-González & Dorta-González, 2011) to name a few.

Some studies have been carried out on particular aspects of OR/MS (Chang & Hsieh, 2008; White et al., 2011). But these studies were mainly based on analyses of a part, meanwhile there is no report to analyze the research status and trends of the academic field as a whole.

Materials and methodology

The bibliometric data was obtained from the online version of the Web of Science database (Science Citation Index) during the last week of February 2012. All journals listed in the subject category of OR/MS were considered. The impact factors (IF) of the journals were obtained from the year 2011 Journal Citation Reports (JCR), which were the latest data available.

In the intention to measure and evaluate the scientific progress at the research front, we have focused on the research articles which are the primary font of the research results. Collaboration type was determined by the addresses of the authors, where the term “internationally collaborative publication” was designated to those papers that were coauthored by researchers from more than one country. Similarly, the term “inter-institutionally collaborative publication” was assigned if authors were from different institutions.

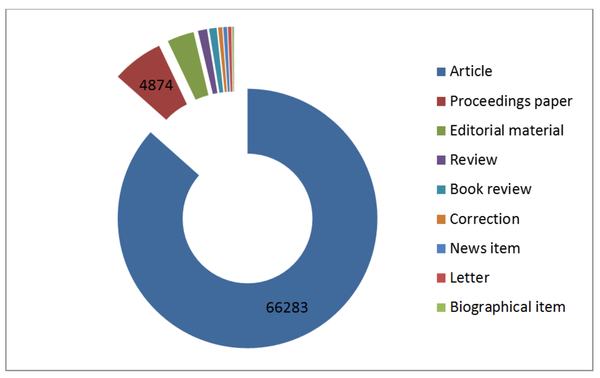

Fig. 1 Document types

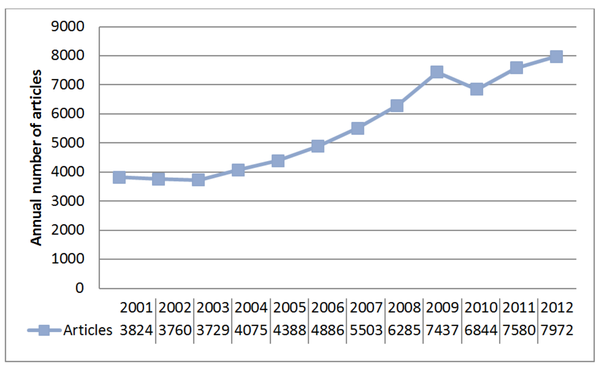

Fig. 2 Annual distribution of research articles

Results and discussion

We obtained some significant points on the global research performance through the period from 2001 to 2012. The number of papers consistently increased in this period. Especially, it was the fast-growing period of 2004–2009 which the growth rate reached 18%. Expert Systems with Applications published the most papers not only in the past twelve years but also in 2012, while Journal of Operations Management had the highest h-index and IF. The citation maturity time in the category OR/MS is greater than two years and the production follows the Bradford’s law with five journals in the core.

Among the top 20 countries/territories were nine in Asia. The USA ranked first in terms of total, single country and internationally collaborative publications. However, the collaborative papers represented only 33.6% of the total publications from the USA, which was least than more of other countries in the top 20. The publication impact of the USA was excellent with the highest h-index (114) among all the countries, followed by China (66) and Canada (62). Among the top 20 institutions were ten in America and nine in Asia. The University of California has strongly independent research ability and less desire to collaboration with other institutions in OR/MS. Among the top 20 most productive authors, ten were from China, five from USA/Canada, and the rest from other Asian countries.

The mainstream research in OR/MS is mainly focused on “networks”, “control”, “simulation”, and “production”, although “genetic algorithms” might be one of research hot topics in the coming years.

Fig. 5 Keyword tag crowd showing the top 100 words (TagCrowd.com)

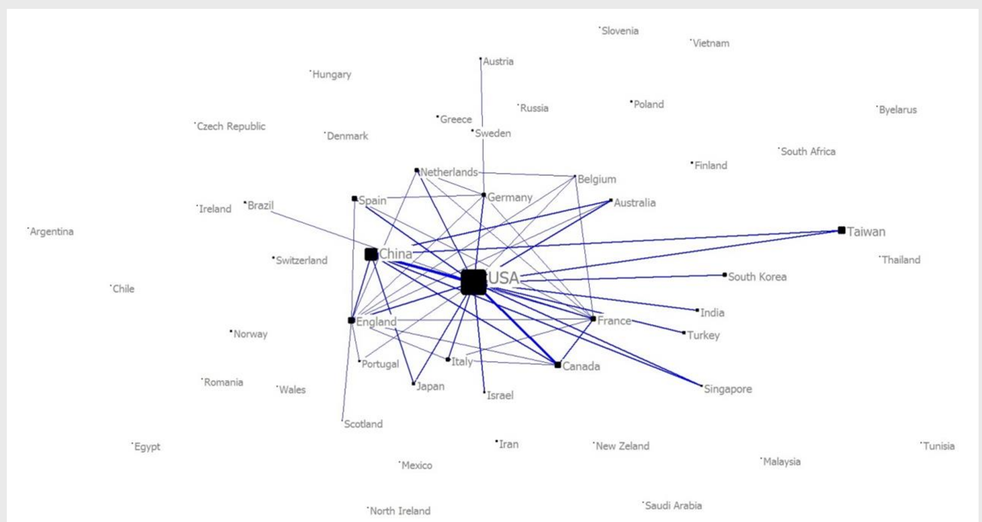

Fig. 3 The network of international collaborations (80 or more) among the top 50 countries/territories

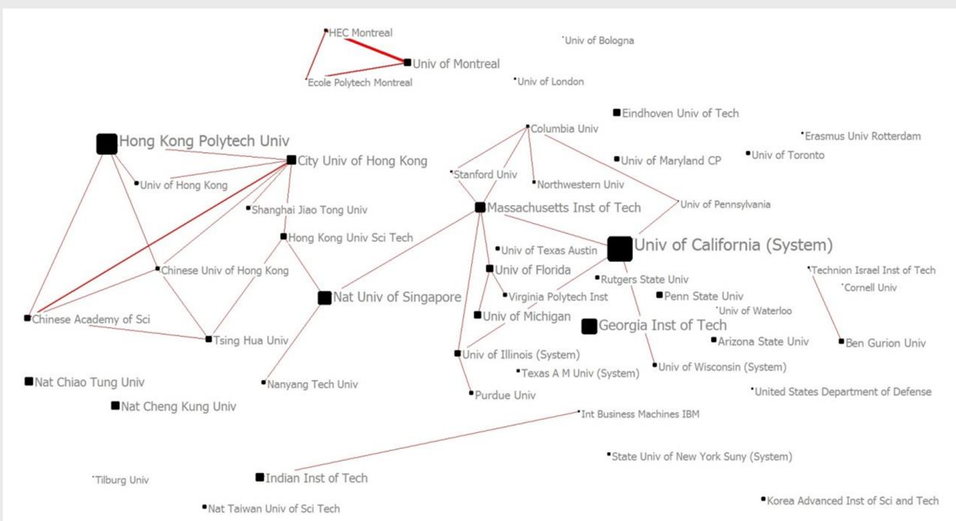

Fig. 4 The network of inter-institutional collaborations (16 or more) among the top 50 institutions

Table 1 Top 20 journals in the OR/MS category

Journal	*TP (%)*	*TP 2012*	*IF-2 (rank)*	*IF-5*	*h-index (rank)*
Expert Syst Appl	6,936 (10.46)	1,709	2.203 (5)	2.455	83 (5)
Eur J Oper Res	6,913 (10.43)	455	1.815 (6)	2.277	96 (2)
Int J Prod Res	3,732 (5.63)	365	1.115 (25)	1.367	83 (5)
Int J Prod Econ	2,872 (4.33)	303	1.760 (8)	2.384	89 (3)
J Oper Res Soc	2,408 (3.63)	192	0.971 (35)	1.350	67 (11)
Comput Oper Res	2,333 (3.52)	172	1.720 (10)	1.984	54 (16)
Reliab Eng Syst Safe	1,804 (2.72)	163	1.770 (7)	2.170	64 (13)
J Optimiz Theory App	1,726 (2.60)	145	1.062 (28)	1.200	45 (28)
Ann Oper Res	1,631 (2.46)	153	0.840 (41)	1.101	36 (50)
Manage Sci	1,630 (2.46)	136	1.733 (9)	3.304	77 (8)
Syst Control Lett	1,459 (2.20)	136	1.222 (23)	1.718	38 (45)
Int J Syst Sci	1,419 (2.14)	178	0.991 (33)	1.257	47 (22)
Decis Support Syst	1,391 (2.10)	148	1.687 (12)	2.331	46 (26)
J Global Optim	1,275 (1.92)	130	1.196 (24)	1.391	49 (20)
Safety Sci	1,261 (1.90)	159	1.402 (19)	1.578	69 (9)
Oper Res	1,153 (1.74)	116	1.665 (13)	2.285	55 (15)
Oper Res Lett	1,146 (1.73)	92	0.537 (55)	0.821	29 (63)
Int J Technol Manage	1,125 (1.70)	74	0.516 (57)	0.702	78 (7)
Math Program	1,043 (1.57)	78	1.707 (11)	2.182	54 (16)
IIE Trans	1,027 (1.55)	63	0.856 (39)	1.469	47 (22)

TP (%) total number and percentage of publications (articles), *IF* impact factor in 2011

Table 4 Top 25 most frequent author keywords

Keyword	*2001–2012*	*2001–2012 R (%)*	*2001–2004 R (%)*	*2005–2008 R (%)*	*2009–2012 R (%)*
Networks	11,890	1 (7.16)	2 (5.87)	1 (6.66)	1 (8.11)
Control	10,255	2 (6.17)	1 (6.89)	2 (5.95)	2 (5.98)
Simulation	7,166	3 (4.31)	8 (3.95)	8 (4.07)	3 (4.65)
Production	7,026	4 (4.23)	4 (4.94)	4 (4.27)	5 (3.86)
Scheduling	6,967	5 (4.19)	5 (4.62)	3 (4.41)	6 (3.84)
Distribution	6,823	6 (4.11)	6 (4.32)	6 (4.12)	4 (4.00)
Manufacturing	6,486	7 (3.90)	3 (5.04)	7 (4.08)	8 (3.24)
Heuristics	6,451	8 (3.88)	7 (4.01)	5 (4.15)	7 (3.64)
Inventory	4,997	9 (3.01)	9 (3.04)	9 (3.26)	10 (2.82)
Pricing	4,630	10 (2.79)	12 (2.23)	10 (2.90)	9 (2.97)
Linear programming	3,968	11 (2.39)	10 (2.75)	11 (2.42)	13 (2.19)
Integer programming	3,753	12 (2.26)	14 (2.13)	13 (2.33)	12 (2.27)
Constraint programming	3,711	13 (2.23)	13 (2.20)	12 (2.39)	14 (2.14)
Genetic algorithms	3,541	14 (2.13)	20 (1.50)	16 (1.89)	11 (2.60)
Location	3,359	15 (2.02)	15 (1.97)	14 (1.97)	15 (2.08)
Routing	3,057	16 (1.84)	17 (1.71)	15 (1.91)	16 (1.85)
Reliability	2,937	17 (1.77)	16 (1.82)	17 (1.72)	17 (1.78)
Queueing	2,744	18 (1.65)	11 (2.26)	18 (1.68)	24 (1.35)
Assignment	2,598	19 (1.56)	18 (1.64)	19 (1.62)	20 (1.49)
Transportation	2,449	20 (1.47)	22 (1.39)	20 (1.51)	21 (1.48)
Scenarios	2,287	21 (1.38)	27 (1.05)	23 (1.27)	18 (1.61)
Cutting	2,239	22 (1.35)	19 (1.52)	21 (1.38)	25 (1.24)
Logistics	2,200	23 (1.32)	31 (0.95)	25 (1.19)	19 (1.59)
Supply chain management	2,091	24 (1.26)	32 (0.95)	22 (1.30)	22 (1.38)
Decision analysis	2,085	25 (1.25)	24 (1.13)	26 (1.19)	23 (1.36)

TP total publications, *R (%)* rank and percentage of the author keywords in total publications

Conclusions

We have tried to measure the scientific progress in the discipline. These results could help to better understand the global development of the discipline, and potentially guide scientists for evaluating and orienting their research.

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