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40th Anniversary Paper

Forty years of the European Journal of Operational Research: A bibliometric overview



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ABSTRACT

The European Journal of Operational Research (EJOR) published its first issue in 1977. This paper presents a general overview of the journal over its lifetime by using bibliometric indicators. We discuss its performance compared to other journals in the field and identify key contributing countries/institutions/authors as well as trends in research topics based on the Web of Science Core Collection database. The results indicate that EJOR is one of the leading journals in the area of operational research (OR) and management science (MS), with a wide range of authors from institutions and countries from all over the world publishing in it. Graphical visualization of similarities (VOS) provides further insights into how EJOR links to other journals and how it links researchers across the globe.

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1. Introduction

The European Journal of Operational Research (EJOR) was launched in 1977 as the flagship journal of the Association of European Operational Research Societies (EURO) that was created in 1975 (Brans, 1995; Zimmermann, 1995). The idea of creating the journal originated at the first Council Meeting of EURO held on 30th January 1975 (<https://www.euro-online.org/web/pages/1516/history-of-ejor>). To assess viability of such a journal, a committee consisting of Germain Kreweras, Bernard Roy, Bernhard Tilanus and Hans-Jürgen Zimmermann was appointed. Following their positive recommendation, the Council decided to launch the journal on 8 May 1975. The first editorial team of the journal was formed by Alan Mercer, Bernhard Tilanus and Hans-Jürgen Zimmermann, who remained in charge as co-editors until 1999. Since then,

the journal has grown significantly, becoming in the mid-nineties the largest operational research (OR) journal worldwide (Speranza, 2012). In 1999, a new leading editorial team composed of Roman Słowiński, Jacques Teghem and Jyrki Wallenius, took over. Jesús Artalejo, Lorenzo Peccati and Jean-Charles Billaut also served terms as co-editors in this millennium. To deal with an increasing number of submissions on a variety of topics, the number of editors was increased to six over the past decade and the current editors are: Robert Dyson, Immanuel Bomze, Emanuele Borgonovo, José Fernando Oliveira, Ruud Teunter and Roman Słowiński, with the latter acting as the coordinating editor since 2006 (<https://www.euro-online.org/web/pages/1516/history-of-ejor>).

Contrasting with many other OR journals, the journal has never had a departmental structure, partly to be more open to innovative papers that cross the traditional subfields of OR (<https://www.euro-online.org/web/pages/1516/history-of-ejor>). Currently, the journal receives more than 3377 submissions per year and has an acceptance rate around 19%. Its policy is to ask for a revision if there is a potentially important contribution, even if it takes multiple rounds of major revisions to get a paper in an acceptable form. The number of reviewers and reviews per accepted paper are 2.4

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and 4.6, respectively. Moreover, almost always, the reviewing process leading to acceptance goes through at least one major revision (Słowiński, 2016). The journal publishes 24 issues per year divided in eight volumes producing around 8400 pages with the international publisher Elsevier. The journal is indexed in the Journal Citation Reports (JCR) of the Web of Science (WoS) Core Collection database.

In 2017, EJOR celebrates its 40th anniversary. This paper presents a general bibliometric overview of the journal between 1977 and 2016. We identify and visualize leading trends that have affected the journal during this time. In order to do so, this study analyzes a wide range of bibliometric issues, including publication and citation evolution of the journal, the most productive and influential authors, institutions and countries, the most cited papers and a keyword analysis. Additionally, the work develops a graphical visualization of the bibliographic material published in EJOR by using visualization of similarities (VOS) viewer software (Van Eck & Waltman, 2010). This mapping analysis is carried out with bibliographic coupling (Kessler, 1963), co-occurrence and co-citation analysis (Small, 1973). Note that EJOR published a special anniversary issue for celebrating the first thirty years of EURO with some classical papers published in the journal, but a bibliometric overview of the journal was not given at that time (Mercer et al., 2005).

The rest of the paper is structured as follows. Section 2 briefly reviews the bibliometric methodology to be used throughout the paper. Section 3 presents the results of the bibliometric analysis including the publication and citation structure, the leading authors, institutions and countries, the most cited papers and the citing articles. Finally, Section 4 summarizes the main findings.

2. Bibliometric methods

Bibliometrics is the research field that studies the bibliographic material quantitatively (Broadus, 1987; Pritchard, 1969), providing general overviews of a set of documents. This study uses a wide range of bibliometric indicators including the total number of publications and citations, the *h*-index (Alonso, Cabrerizo, Herrera-Viedma, & Herrera, 2009; Franceschini & Maisano, 2010; Hirsch, 2005), the cites per paper, citation thresholds and some other related indicators (Merigó, Gil-Lafuente, & Yager, 2015a; Merigó, Mas-Tur, Roig-Tierno, & Ribeiro-Soriano, 2015b). By doing so, the objective is to provide a general informative overview of the bibliographic material (Bonilla, Merigó, & Torres-Abad, 2015; Ding, Rousseau, & Wolfram, 2014; Mingers & Leydesdorff, 2015). However, the rankings may be different depending on the specific indicator considered, so each reader can interpret the results according to her or his interests (Coupé, 2003; Podsakoff, MacKenzie, Podsakoff, & Bachrach, 2008; Hsieh & Chang, 2009).

The article uses the WoS Core Collection database in the search process of the information. We remark that there are other databases for dealing with academic documents (Mongeon & Paul-Hus, 2016). Note that WoS is owned by the company Thomson & Reuters Corporation. The search was carried out between June 2016 and March 2017 and considers all the documents published in the journal since its origin in 1977. The documents from the year 1977 are not directly available in the database. In order to solve this problem, the cited reference search of the WoS Core Collection is used in order to identify all the documents published in 1977 that have received at least one citation. For those documents published in 1977 that have not received any citations, the study tracked them in the webpage of the journal. The search resulted in 16,576 documents published in EJOR until 31 December 2016. This number reduces to 14,617 if only considering articles, reviews, and short communications. Up to 2016, the journal has received 329,739 citations and has 22.6 cites per paper. The *h*-index of 185

indicates that of the set of 14,617 documents, 185 have received 185 citations or more.

The study focuses on the bibliometric analysis of a specific journal. This type of methodology has already been used in previous studies for other journals, including the Journal of Business Research (Merigó et al., 2015b), Knowledge-Based Systems (Cobo, Martínez, Gutiérrez-Salcedo, Fujita, & Herrera-Viedma, 2015), the Journal of Business & Industrial Marketing (Valenzuela, Merigó, Johnston, Nicolás, & Jaramillo, 2017), and the International Journal of Intelligent Systems (Merigó, Blanco-Mesa, Gil-Lafuente, & Yager, 2017). The methodology focuses on the documents published by the journal and analyzes various issues, including the publication and citation structure, temporal evolution, authors, universities, countries and keywords.

In order to map the bibliographic material, we use the VOS viewer software (Van Eck & Waltman, 2010). This software visualizes the results through a wide range of bibliometric indicators including bibliographic coupling, co-citation and co-occurrence (Merigó, Cancino, Coronado, & Urbano, 2016). Bibliographic coupling (Kessler, 1963) occurs when two documents cite the same third document. Co-citation (Small, 1973) appears when two documents receive a citation from the same third document. Co-occurrence analyzes the most common keywords used in the documents. Observe that in this paper the focus of co-occurrence is on the keyword list of the articles provided usually at the first page of the paper. The graphical visualization is carried out through a network representation, where the size of a circle increases with an item's relevance and the network connections identify more closely linked items. The place of the circles and the colors are used to cluster the items. Note that the VOS viewer is freely available and further information can be found at: <http://www.vosviewer.com/>.

3. Results

This section presents the results of the paper. The work analyzes the publication and citation structure of EJOR and the most productive and influential authors, institutions and countries of the journal.

3.1. Publication and citation structure of EJOR

EJOR started publishing articles in 1977. The journal grew very quickly and by the end of the eighties, it was publishing around two hundred papers per year. In the nineties, the number grew up to four hundred papers per year. In the beginning of the millennium, the journal reached a top of 820 articles per year. During the last years, the number of articles published has decreased, and currently is around 650 papers per year. Fig. 1 visualizes the annual number of articles published in the journal.

The number of submissions to the journal per year is, however, a better measure of its growing popularity (Słowiński, 2016). This is shown in Table 1, together with the number of full text downloads of EJOR articles from ScienceDirect. One can note that the number of submissions increased almost six times since 1999, attaining 3377 in 2016. The number of full text downloads of EJOR articles represents the magnitude of the EJOR readership. In the beginning of 2000s, the number of printed copies of EJOR was around 800. After passing to the electronic platform, the number of full text downloads grew dramatically, attaining in 2016 almost 3 million articles. This shows not only the growing popularity of EJOR, but also a real revolution in the readership due to the electronic access to EJOR.

EJOR strives to cover the entire OR spectrum, which is evolving over time. This is one of the reasons why it does not have a departmental structure, but instead uses a periodically reviewed long list of keywords from which one should be picked as the leading

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