INVITED COMMENTARY

Novelty Rate:
A Metric for Evaluation of Journals' Novelty

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ABSTRACT

There are many metrics for ranking Journals and Researchers. Most metrics are based on the number of citations and classifies Journals based on them. Current metrics have problems, e.g., for ranking new science branches, they allocate them a low ranking by mistake. In this paper, the authors will introduce a new metric entitled "Novelty Rate" in order to rank authors, papers and journals. This metric is an independent metric and it is not proposed as an alternative for impact factor or other scientific journal rankings, but with the purpose to complete them.

Keyword: H Index, Impact Factor, Journal Ranking, Novelty Rank, SJR

INTRODUCTION

There are many metrics for evaluating journals and scientists. We can name Thomson Reuters' impact factor and scientific journal rankings (SJR) as the most popular metrics (González-Pereira el al., 2010). First journal metrics were based on citation counts and developed by Eugene Garfield, founder of the Institute for Scientific Information (ISI), to evaluate the impact of scholarly journals which has been extensively used for more than 40 years (Giddins, 2014). *SJR* is another metric based on number of citations which a journal received and the importance of the journals where such citations come from (Mingers & Leydesdorff, 2015). Generally, Impact factor (IF) and *SJR* are based on number. of cited papers in journals and a journal with high number of citations will receive a higher impact factor or *SJR*. There are other metrics such as *h index* and number of citations which are used to rank researchers. *H index* was introduced by Jorge E. Hirsch in 2005 (Bertoli-Barsotti & Lando, 2015). This metric, based on numbers of citations, is a metric for determining productivity and impact of researchers and scholarly journals (Bertoli-Barsotti & Lando, 2015). Source Normalized Impact per Paper (*SNIP*) is another metric which has been developed by Professor Henk Moed at the Centre for Science and Technology Studies, University of Leiden (Moed, 2010). This metric tries to solve some problems of citation frequency in science. For example, citation frequency in mathematics is lower than biomedical sciences. This metric uses "citation potential" in the different science fields. When authors of a specific field

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use many references in their papers, these science field's papers have more chance to receive citations than other science fields (Leydesdorff & Opthof, 2010).

However, SNIP and similar metrics face with some problems. E, g, researchers or journals involved in a new science branch are discriminated, getting an unjust minor *h index* value than other researchers/journals. It is necessary to develop new metrics able to consider the novelty of journals, papers, or researchers.

Here, we will introduce a new metric entitled "Novelty Rate", able to indicate the novelty of journals, papers and authors. A high value of novelty rank for a journal, compared to the one of other journals, means that the first one publishes more papers in new and updated subjects. This metric is an independent metric and it is not alternative to impact factor or *SJR* and *SNIP*. Indeed, this new metric plays a role of completing the other metrics.

A PROPOSED METRIC FOR NOVELTY EVALUATION

We have developed a new metric entitled "Novelty Rate" which indicates the novelty of a paper, journal or scientist. With this metric, new science branches will get high ranking. A journal which publishes papers in new subjects will get a high ranking and authors who launch a new branch in science will get a suitable place. Thus, this metric will solve some problems of the previous metrics. In our approach, we search papers' keywords in citation databases and *Novelty Rate* is calculated. Equation (1) will be use when we want to calculate novelty rate of a paper. Where w is number of paper's keywords, N is number of search results for each keyword in scientific databases and NR_P is the *Novelty Rate* of that paper.

$$\mathrm{NR_p} = \frac{1}{w}\sum_{n=1}^{w}\frac{1}{N} \tag{1}$$

By similar approach, we can develop an equation for calculating *Novelty Rate* of journals per year. Equation (2) will be use when we want to rank journals based on its novelty. Where w is number of paper's keywords, N is number of search results for each keyword in scientific databases, p is number of papers in each issue, i is number of issues in each volume and NR_j is the *Novelty Rate* of the journal per year.

$$\mathrm{NR_j} = \frac{1}{i}\sum_{n=1}^{i}\frac{1}{p}\sum_{n=1}^{p}\frac{1}{w}\sum_{n=1}^{w}\frac{1}{N} \tag{2}$$

Comparing different NRjs for each journal, a journal with a high value of NR_j will be newer than the others. High value of $\mathrm{NR_j}$ for a journal means that this journal publishes more papers in new and updated subjects. Key matter which determines novelty of a journal is the novelty of published papers in it. Number of published or cited papers has no effect on journals' *Novelty Rate*. So, this metric can help authors to decide better about journals; when a journal has a low impact factor but a high NR_j, it means that the journal publishes new papers where a little number of scientists work in that branch.

Novelty Rate can be also used for ranking authors. We have the *h index,* a metric for ranking authors based on citation counts, similarly we can use *Novelty Rate* for ranking authors based on its "novelty". Equation (3) will be used when we want to rank authors basing on its "novelty".

Table 1. Papers' keywords and number of results for searched keyword in Scopus database

Keyword	No. of results for searched keyword in Scopus (N)
Academic incentives and rewards	1
Dissemination of research	521
Invitations	9109
predatory journals	24

Where w is number of paper's keywords, N is number of search results for each keyword in scientific databases, p is number of author's papers, NR_a is the *Novelty Rate* of the author.

$$\mathrm{NR}_{\mathrm{a}}=\frac{1}{p}\sum_{n=1}^{p}\frac{1}{w}\sum_{n=1}^{w}\frac{1}{N} \tag{3}$$

Novelty Rate will be at most equal to one and at least equal to zero. Also, novelty rate may be calculated in the year in which the paper had been published. For example, if a paper was published in 2006, we must search paper's keywords in scientific databases for papers which published papers from the beginning until the end of 2005. There is a concern about keywords: authors may select their papers' keywords in order to increase their paper novelty. In that case, we could develop tools for extraction keywords from papers automatically and to ignore authors' keywords.

By considering impact factor alone, without the new proposed NR_j, we can do a fair judgment about a journal. If a journal has a high impact factor and we can note a high NR_j, we can conclude that it is an excellent journal, really. If a journal has a high impact factor with a low NR_j or, vice versa, it has a low or medium impact factor with high NR_j, it would be a good journal, however. If a journal has low impact factor with low NR_j, it is a poor journal.

CASE STUDY

In this section, we will calculate NR_p and NR_j by using NR equation of section 1 and 2. We will use Scopus database doing a strict search (there are two types of searching, loose and strict, in strict search we will find all papers which contain those keywords, exactly).

Novelty Rate of Paper

We use here a paper where we calculate NR_p for it. This paper was published in 2015 (Moher & Srivastava), we will search its keywords in Scopus database for papers which had been published until 2014. Table 1 shows these papers' keywords and number of results for searched keyword in Scopus (http://www.scopus.com).

This paper has four keywords; thus w is equal to four. Equation (4) shows NR_p for this paper.

w=4

$$NR_p = \frac{1}{4}\left(\frac{1}{1} + \frac{1}{521} + \frac{1}{9109} + \frac{1}{24}\right) = 0.250987138 \quad (4)$$

Novelty Rate of Journal Per Year (NR_j)

We use *International Journal of Knowledge Management* (ISSN: 1548-0666) to calculate its *Novelty Rank*. We calculate *Novelty Rank* of that journal in 2014 (Volume 10). Table 2 shows NR_p for each paper in Vol 10. The journal publishes four issues in 2014, thus *i* is equal to 4. Issue 1, 2 and 3 contain five papers so *p* for these issues is equal to 5 and issue 4 contains four papers so *p* for this issue is equal to 4, where *w* depends on numbers of keywords in each paper. Equation (5) shows NR_j for that journal.

$$NR_j = \frac{1}{i}\sum_{n=1}^{i}\frac{1}{p}\sum_{n=1}^{p}\frac{1}{w}\sum_{n=1}^{w}\frac{1}{N} =$$

$$\frac{1}{4}\begin{pmatrix} \frac{1}{5}\left(0.00013202 + 0.001612333 + 0.004920807 + 0.068976676 + 0.000567987\right) \\ +\frac{1}{5}\left(0.008701728 + 0.013139234 + 0.001291575 + 0.000520202 + 0.000314055\right) \\ +\frac{1}{5}\left(0.100083091 + 0.000189339 + 0.050770652 + 0.000748074 + 0.002961663\right) \\ +\frac{1}{4}\left(0.100459017 + 0.003894256 + 6.1945E-05 + 0.030849639\right) \end{pmatrix} \quad (5)$$
$$= 0.021200525$$

Similarly, we can calculate *Novelty Rank* of the *International Journal of Knowledge Management Studies* (ISSN: 1743-8276) in 2014 (Vol. 5, 3/4). Table 3 shows NR_p for each paper in Vol. 5, 3/4. This journal published two issues all together in 2014, thus *i* is equal to 1. These issues contain six papers so *p* is equal to 6, where *w* depends on the number of keywords in each paper. Equation (6) shows NR_j for that journal.

$$NR_j = \frac{1}{i}\sum_{n=1}^{i}\frac{1}{p}\sum_{n=1}^{p}\frac{1}{w}\sum_{n=1}^{w}\frac{1}{N} = \frac{1}{1}\left(\frac{1}{6}\begin{pmatrix} 0.002290871 \\ +0.148164137 \\ +0.001875532 \\ +0.125900778 \\ +0.000252425 \\ +0.0022624 \end{pmatrix}\right) = 0.046791024 \quad (6)$$

If we want to compare two journals, we can note that the International Journal of Knowledge Management (IJKM) has higher *SJR* and *SNIP* than International Journal of Knowledge Management Studies (IJKMS). Table 4 shows *SJR*, *SNIP* and NR_j for *IJKM* and *IJKMS*. Values of *SNIP* and *SJR* have been gathered from the Scopus database.

Table 2. NR_p for each published paper in International Journal of Knowledge Management. Vol 10

No.	Paper Title	NR_p
1	A Comprehensive Relational Model of Factors Influencing Knowledge Sharing: An Empirical Study	0.00013202
2	Knowledge Management Practices and the Focus on the Individual	0.001612333
3	Modeling the Metrics of Individual, Organizational and Technological Knowledge Sharing Barriers: An Analytical Network Process Approach	0.004920807
4	Reassessing Software Quality Performance: The Role of Knowledge Management	0.068976676
5	Socio-Cultural Influences of Society on Knowledge Construction	0.000567987
6	Integrating IS Security with Knowledge Management: Are We Doing Enough?	0.008701728
7	Genre-Based Approach to Assessing Information and Knowledge Security Risks	0.013139234
8	An Integrated Risk Management Framework: Measuring the Success of Organizational Knowledge Protection	0.001291575
9	Knowledge Management in Support of Enterprise Risk Management	0.000520202
10	Exploring the Effect of Knowledge Transfer Practices on User Compliance to IS Security Practices	0.000314055
11	A Formative Evaluation of Rendezvous: A Platform for Knowledge Sharing and Entertainment	0.100083091
12	Predicting Student Academic Performance: Role of Knowledge Sharing and Outcome Expectations	0.000189339
13	Multi-Group Moderation Analysis for Relationship between Knowledge Sharing Orientation and Business Performance	0.050770652
14	Knowledge Management Practice at a Bulgarian Bank: A Case Study	0.000748074
15	Examining the Transfer of Academic Knowledge to Business Practitioners: Doctoral Program Graduates as Intermediaries	0.002961663
16	Analysis of Reasons, Implications and Consequences of Demographic Change for IT Departments in Times of Scarcity of Talent: A Systematic Review	0.100459017
17	Knowledge Spirals in Higher Education Teaching Innovation	0.003894256
18	The Management and Construction of Knowledge as an Innovation Strategy for Collaborative Learning Through the Use and Creation of Learning Communities and Networks	6.1945E-05
19	Adaptation of Descriptive Metadata for Managing Educational Resources in the GREDOS Repository	0.030849639

Table 3. NR_p for each published paper in International Journal of Knowledge Management Studies, Vol. 5, 3/4

No.	Paper Title	NR_p
1	Intellectual capital and business performances in Italian firms: an empirical investigation	0.002290871
2	Linking knowledge management, job satisfaction and productivity in the Greek public sector	0.148164137
3	Customer knowledge management: state of the art and future research directions	0.001875532
4	Achieving knowledge management excellence for competitive advantage: an integrative model for empirical research	0.125900778
5	Influence of cultural factors on knowledge sharing in medium-sized enterprises within transition economies	0.000252425
6	Implementing customer knowledge management with internet social networking	0.0022624

Table 4. Ranking metrics, IJKM and IJKMS journals

Journal Name\ Metric	SJR	SNIP	NR_j
IJKM	0.240	0.481	0.021
IJKMS	0.172	0.112	0.046

IJKMS owns lower SJR and SNIP, but a higher NRj.

CONCLUSION

Here, we have introduced some current metrics to rank journals, papers and authors, we have presented some problems of current metrics, and, finally, we have proposed a metric for ranking journals, papers and scientists, referring to their novelty, the "Novelty Rate". This metric is an independent metric and it is not alternative to Impact Factor, *SNIP* or *SJR*. Indeed, this new metric plays the role of completing the other metrics and to solve some problems, like as the novelty of a journal or researcher, in order to help researchers themselves to select suitable journals and doing the right judgment about the impact of journals and papers. Finally, we presented a case study by inspecting *IJKM* and *IJKMS journals*. According to calculated NR_j in a case study, we can conclude that *IJKM* publishes more papers in known and popular subjects of knowledge management than *IJKMS* does. Thus, its papers receive more citations. On the other hand, *IJKMS* publishes papers in newer subjects of knowledge management than *IJKM,* thus its NR_j is higher than *IJKM*. We can justify low *SJR* and *SNIP* of *IJKMS* by considering its higher NR_j.

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