Publication Specific Impact of Articles Published by Rheological Journals

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Abstract:
The Impact Factor of a journal is a quantitative way of assessing its worth and relevance to the academic community it serves. Many librarians see the ratio between Impact Factor and price as a suitable yardstick by which to measure the value of their collections. In addition, the research assessment exercises which, in many countries, are now being carried out on a more formal basis mean that authors submitting original research must publish it in a journal with the highest perceived worth possible in order to secure future funding, job promotions and peer recognition. It has been suspected [T. Opthof, Cardiovasc. Res. 33 (1997) 1; J. Stegmann, Nature 390 (1990) 550], however, that a particular author's impact is not much related to the journals in which her/he publishes. As will be demonstrated in this letter, the impact of articles published in rheological journals is largely influenced by criteria such as length of article, number of authors, number of cited references.

Zusammenfassung:
Mit dem ‚Impact Factor' steht ein quantitatives Mass zur Verfügung, die Relevanz eines Journals für seine Leserschaft zu beurteilen. Viele Bibliotheken sehen im Verhältnis des Impact Factors zum Preis eines Journals ein wichtiges Kriterium, um die Güte ihrer Auswahl zu messen. Außerdem führen viele Länder Forschungsevaluationen durch, die vermehrt auf formaler Basis geschehen, d. h., Autoren müssen versuchen, ihre Originalarbeiten in möglichst anerkannten Journalen zu platzieren, um die zukünftige Finanzierung und Anerkennung ihrer Projekte zu sichern. Es wurde in der Vergangenheit bereits vermutet [T. Opthof, Cardiovasc. Res. 33 (1997) 1; J. Stegmann, Nature 390 (1990) 550], dass der ‚Impact' eines Autors nicht sehr stark mit dem Journaltyp korrelliert, in dem sie/er publiziert. In diesem Beitrag wird demonstriert, dass der ‚Impact' von Artikeln, die in rheologischen Journalen publiziert werden wesentlich beeinflusst ist durch Kriterien wie die Länge eines Artikels, die Zahl der Autoren, die Zahl der Referenzen.

Résumé:
Le facteur d'impact d'un journal est un moyen quantitatif d'évaluer son intérêt et sa pertinence vis-à-vis de la communauté scientifique à laquelle il s'adresse. Beaucoup de libraires jugent le rapport facteur d'impact / prix comme une mesure adéquate de la qualité de leurs collections. De plus, les études d'évaluation sur la qualité de la recherche qui sont aujourd'hui conduites d'une manière plus officielle dans de nombreux pays, montrent que les auteurs soumettant leurs travaux de recherche originaux doivent le faire dans un journal ayant la renommée la plus grande, s'ils veulent s'assurer de financements futurs, de promotions professionnelles et de la reconnaissance de leurs pairs. On soupçonne cependant que l'impact d'un auteur en particulier n'est pas vraiment relié au journal dans lequel il / elle publie [T. Opthof, Cardiovasc. Res. 33 (1997) 1; J. Stegmann, Nature 390 (1990) 550]. Comme nous le démontrons ici, l'impact des articles publiés dans des journaux de rhéologie est grandement influencé par des critères comme la longueur de l'article, le nombre de ses auteurs et le nombre de références citées.

Key words: Impact factor, journal impact, author impact, article impact, criteria, evaluation, classification tree

1 INTRODUCTION

The Impact Factor was devised by and is calculated by ISI, part of the Thomson Corporation. ISI was founded by Eugene Garfield in 1958 and its best known product is the current awareness service, Current Contents, which covers over 7,000 journals in pure and applied science, medicine, social sciences and the humanities. In order to be comprehensive, an index to the journal literature might be expected to cover all the scientific journals published. However, this approach would be not only impractical economically, but as analyses of the scientific literature have shown, unnecessary. It has been demonstrated that a relatively small number of journals publishes the bulk of significant scientific results. Applied Rheology is upon the indexed journals since 1997, re-indexed after a publisher change in 2005. This 'bulk' principle is often referred to as Bradford's Law. Recent citation analyses have shown that as few as 150 journals account for half of what is cited and one quarter of what is published. It has also been

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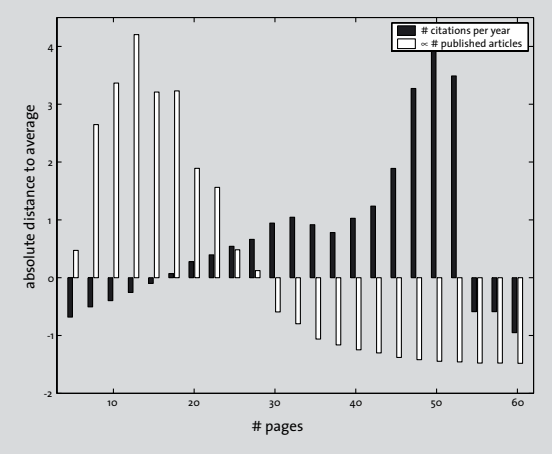


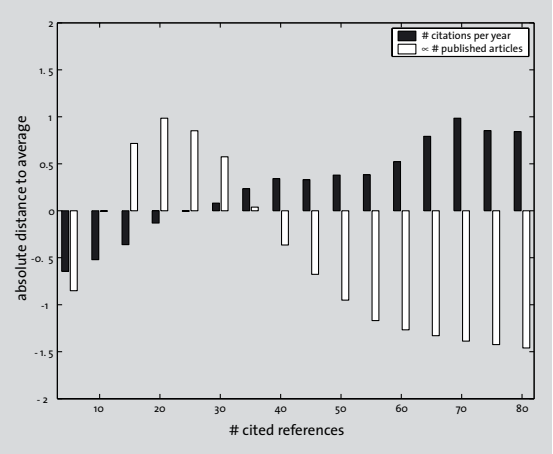


Fig. 1 (left):
Mean number of citations per year (CPY) for articles published in the four rheological journals mentioned in the text part versus number of article pages. CPY values are shown relative to the mean CPY which is 1.48 (also used to scale subsequent figures). For articles of length smaller than 30 pages, the CPY is linearly increasing with the number of pages, i.e., the number of citations per year and page is, in a very good approximation, a constant, whose precise value 'slightly' depends on the journal. The figure also provides the length distribution. Accordingly, the most probable number of pages is close to 12.5, and the impact of papers with this amount of pages is below the mean impact (CPY value). The mean number of article pages for all scanned publications between 1990 and 2004 is 16.3

Fig. 2:
Same representation as for Fig. 1 for the number of cited references rather than for the number of article pages. Most often, article cite 15-25 references, but the CPY of article significantly increases with the number of references. Notice, that the (mean) number of references is linear in the number of publication pages with a factor of proportionality close to 1.9 references per article page. The mean number of cited references for all scanned publications between 1995 - 2004 is 27.8.

shown that a core of approximately 2,000 journals now accounts for about 85% of published articles and 95% of cited articles To merit inclusion in the ISI database (and therefore to receive an Impact Factor) a journal must pass a vetting procedure which begins with an inhouse editor with appropriate subject expertise and concludes with a review and confirmation by the entire editorial team. The assessment involves a number of parameters including regularity of publication, profile of the editorial team, whether it is peer reviewed and the relevance and topicality of the contents. ISI staff search the reference lists of all the journals they cover (citing journal) and count all the citations to record a total for each destination journal (cited journal). The cited journals are then analysed to determine the number of articles they contain that can be considered substantial enough to warrant being counted as source items. It is the source items that attract the citations from the citing journals.

2 DEFINITION

The Impact Factor for a given year is defined as the total number of citations received in that year to articles published in the previous two years divided by the total number of citable items (source items) published by the journal in those two years. Clearly, according to this definition the impact factor depends not only on the number of citations, but also on what the ISI defines as a source item. When comparing the rankings of journals within a given subject, care must be exercised in attaching too much importance to apparent positions in the rankings [1–3]. Since the Impact Factor is an average measure, there is some element of error margin on either side. A recent study has estimated that the variations in Impact Factor due to statistical noise alone are as much as 40% for small journals (because of the large sampling error) and, even for large journals, are above 15%. A useful rule of thumb for the 'average' monthly journal is that two Impact. Factors must differ by more than 25% to be meaningful. Otherwise they are just random variations

3 RESULTS

All data shown in Figs. 1–8 had been collected by scanning citations for the Journal of Rheology, Applied Rheology, Journal of Non-Newtonian Fluid Mechanics, and Rheologica Acta, four established journals in the field of rheology between 1990 and 2004. Applied Rheology re-entered the Science Citation Index in 2005 and therefore the corresponding bibliographic data for the years 1991 - 2004 is not yet available by using the ISI database. However, we included data from Refs.[4 – 43] manually. The figures show excerpts of these data. Most of them show the number of citations per year (CPY). They clearly answer the question if the length of a paper, its number of authors, the length of the abstract and title have influence on the impact of an individual article. Notice that the number of citations per article page and year (CPY per page) for the four journals slightly differs, it ranges between 0.07 (JNNFM) and 0.11 (J. Rheol) which is small compared to the difference in the journal impact factors for these journals and is a first hint towards the significance of individual paper's or author's impact vs journal's impact when evaluating journals. The mean CPY, used to scale Figs. 1 – 6 is 1.48. Mean values and distributions are given in the figures. The sample classification (decision) tree shown in Fig. 8, obtained with a program made available through [44 – 45], applied, e.g., in [44 – 46], and now also available from SPSS [47] and other providers [48] to classify data, potentially offers a more distinguished picture.

4 CONCLUSIONS

Some minimum conclusions valid for the studied journals are:

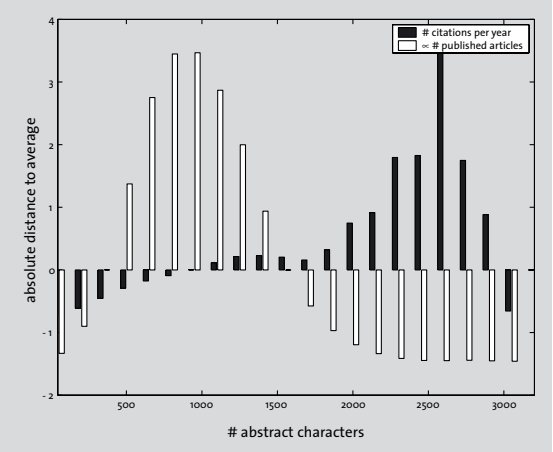
- Number of citations per year (CPY) linearly increase with the number of article pages for articles with less than 30 pages. It therefore seems that referees and editors (if not the authors) did a very good job in taking care about 'appropriate lengths' of articles.

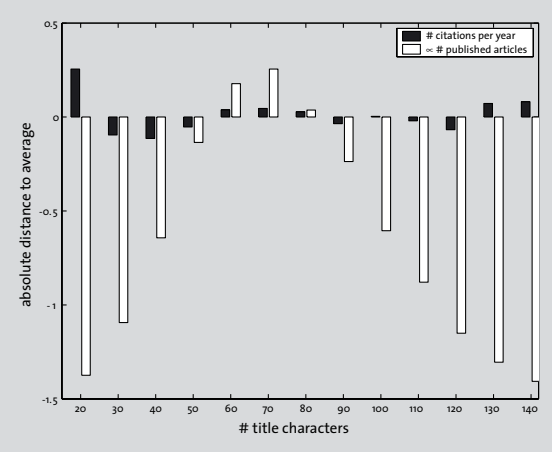
Fig. 3 (left above): Also the number of characters in the abstract of scientific articles is not uncorrelated with the CPY. Most abstracts have between 500 and 1500 characters, but papers with longer abstracts receive more attention. Again, the length of abstracts is also correlated with the length of the corresponding papers, and since the CPY is linear in the number of article pages, it is fair to conclude that in an average sense, each page of any of the rheological publications receives quite a comparable amount of attention, i.e., citations. The mean number of title characters for all scanned publications between 1990 and 2004 is 978.

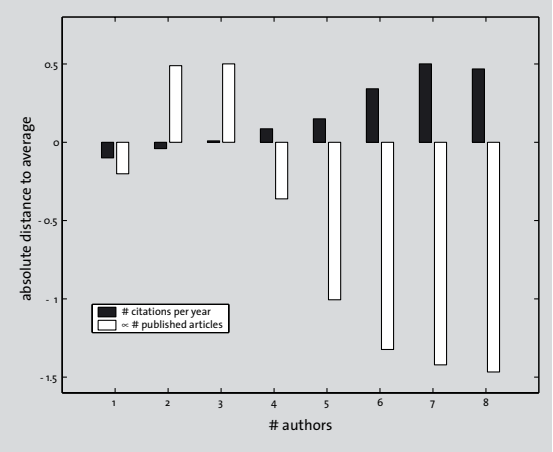
Fig. 4 (right above): The number of characters in the title of an article has little effect on the impact of an article. Exceptions are articles with titles below 30 characters which are very rare, but tend to receive a great attention. Notice the comparable poor statistical quality for papers with short titles, quantified through the plot. The mean number of title characters for all scanned publications between 1990 and 2004 is 73.7.

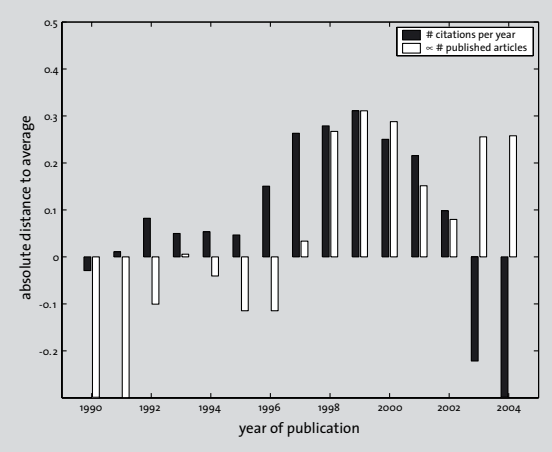
Fig. 5 (left below): The number of authors has a large influence on the CPY, while the CPY per author clearly has its maximum at papers written by a single author. The mean number of authors for all scanned publications between 1990 and 2004 is 2.65.

Fig. 6 (right below): CPY versus year of publication revealing the 'dynamics' of citations. In the first few years after publication, the CPY is small compared to its long-time average. Also shown are the number of articles published in the 15 years time frame.









Alternatively, article pages may be cited randomly which can be translated to a mostly constant number of citations per published character, and may be understandable in view of a number of search hits proportional to the number of characters in a document.

- The CPY sub-linearly increase with the number of authors. The sublinear increase is certainly affected by self-citations, which tend to increase linearly with the number of authors.
- The CPY linearly increase with the number of cited references for papers with up to 40 references. There is some tendency that authors get aware of other papers only if they cite their own works, and some tendency of referees to positively judge about the relevance of a field if their own work is discussed which makes this dependency understandable.
- The length of the abstract and title alone have little influence on the impact of an article. An exception are papers with a very short title which often receive extraordinary attention. A small number of papers with very long abstracts receive large attention, too.

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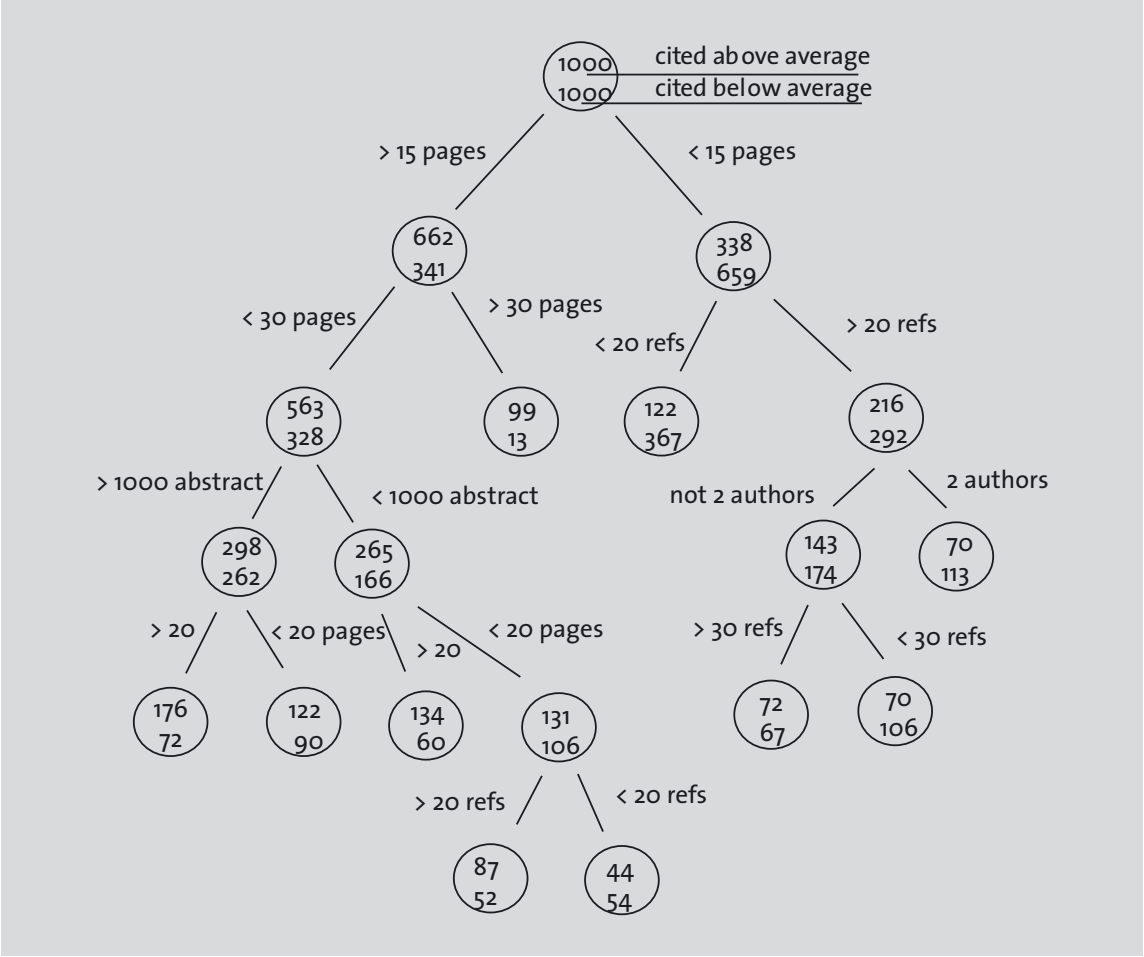
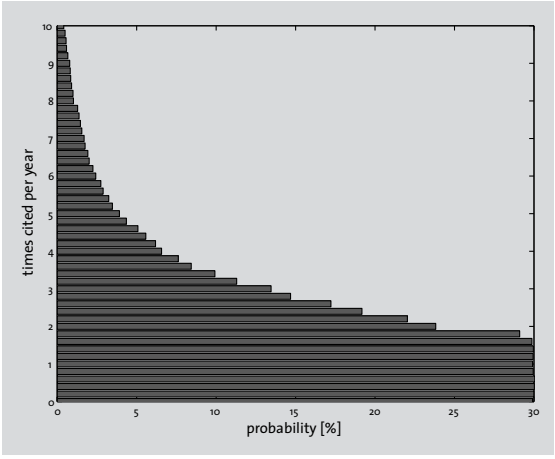


Fig. 7 (below):
The probability of reading (or writing) an article with given CPY (number citations per year). Only 4% of all articles have a CPY larger than 5, i.e., if published in 1996, these articles should have been cited 50 times until the end of 2005.

Fig. 8 (above):
Sample classification tree highlighting relevant impact criteria [44, 45]. Two groups, each consisting of 1000 members are under study, The 'top' group has been cited above average, the 'bottom' group below average. 'refs' stands for number of cited references, 'abstract' for characters within the abstract of an article. The rather bad resolution represents the large uncertainty in the data and a limited predictive power of the classification scheme which is a result by its own.



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