



Evidence Summary

Does a Social Network Based Model of Journal Metrics Improve Ranking?

A review of:

Bollen, Johan, Herbert Van de Sompel, Joan A. Smith and Rick Luce. "Toward Alternative Metrics of Journal Impact: A Comparison of Download and Citation Data." Information Processing and Management 41.6 (2005):1419-40.

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Abstract

Objective – To test a new model for measuring journal impact by using principles of social networking. Research questions are as follows:

1. Can valid networks of journal relationships be derived from reader article download patterns registered in a digital library's server logs?
2. Can social network metrics of journal impact validly be calculated from the structure of such networks?
3. If so, how do the resulting journal impact rankings relate to the ISI impact factor (IF)?

Design – Bibliometric, social network centrality analysis

Setting – Los Alamos National Laboratory (LANL), New Mexico

Subjects – 40,847 full-text articles downloaded from a large digital library by 1,858 unique users over a 6 month period.

Methods – Full-text article downloads from a large digital library for a six-month period were examined using social networking analysis methods. ISSNs for journals in which the retrieved articles were published were paired based upon the proximity of use by the same user, based on the supposition that proximal downloads are related in some way. Reader-Generated Networks (RGNs) were then tested for small-world characteristics. The resulting RGN data were then compared with Author-Generated Networks (AGNs) for the same journals indexed in the Institute of Scientific Information (ISI) annual impact factor (IF) rankings, in the Journal Citation

Reports (JCR) database. Next, a sample of the AGN-derived pairings was examined by a team of 22 scientists, who were asked to rate the strength of relationships between journals on a five-point scale. Centrality ratings were calculated for the AGN and RGN sets of journals, as well as for the ISI IF.

Main results – Closeness and centrality rankings for the ISI IF and the AGN metrics were low, but significant, suggesting that centrality metrics are an acceptable impact metric. Comparison between the RGN and ISI IF data found marked differences, with RGN mirroring local population needs to a much higher degree, and with a non-significant correlation between the ISI IF and RGN ranking, while AGN and RGN centrality rankings show significant centrality and closeness and betweenness correlations. RGN network ranking identified highly localized foci of interest for the LANL, as well as “interest-bridging” subject areas pointing to possible emerging interests among the scientists.

Conclusion – The study results appear to successfully demonstrate an alternative to existing journal impact ranking that can more validly and accurately reflect the practices of a local community. The authors suggest that the social network-derived methodology for identification of impact rankings avoids biases intrinsic to ISI IF as a result of frequentist metrics collected from a global user group. Although the authors resist the idea of generalizability due to the local nature of their data, they suggest that the methodology can be successfully used in other settings, and for a more global community. Finally, the authors propose the automated creation of an open-source RGN whose data could be localized for smaller communities, with potentially large implications for the existing publishing industry.

Commentary

Bollen et al. build a compelling case, as others have done, for the need to find alternative methods for journal impact rankings in an era where more and more grey literature is being published. A particularly salient point is the concern that ISI's impact ranking is based upon a global community, which does not necessarily mirror the practices of a local population – and nor can it do so, based upon its structure. Similar to ISI, the proposed methodology concentrates on a subset of the published literature (specifically, that which is accessed via a digital library). Although mention is made of ISI's exclusion of grey literature in its rankings, Bollen, et al. do not discuss how their new journal impact model might incorporate online or other sources.

One assumption made by the authors is that downloaded full-text articles are analogous to works cited. In somewhat the same way that a Google search often retrieves thousands of false hits, the searcher may frequently download texts in excess of need. One could justifiably argue that selection equals preference, but preference does not equal final selection. The result might be more akin to a “related items” retrieval such as PubMed performs – useful, interesting, but not necessarily pertinent. The authors address this issue by having scientists examine journal-to-journal connections for articles downloaded together, asking them to make judgments about the strength of thematic similarities. Ultimately, the derived data are generated from a localized frequentist model, which is not a quality judgment. This assumption, operationalized into a journal impact ranking system, may introduce error of its own. Additionally, no mention is made of interrater reliability for this part of the process, although the expert examination itself was used as a check system.

The authors state that the download frequencies for individual users are not particularly significant in terms of journal impact operations. Further questions might be, "At what level is significance reached?" and whether rankings constructed within smaller, more localized networks (or those with less than voluminous downloads) are less valid than a larger network. Co-retrieval frequencies were found to be highly skewed, with the highest journal retrievals at 22 and 18, but fully 5,250 of the articles were retrieved only one time. Comparison with unique IP addresses might have shown persistent use by a single user, meaning that a heavy user could significantly skew the impact rankings, which might be of concern to tenure and promotion committees, but no mention is made of this issue.

The findings of this study about the use of social networking methodologies to

construct a new journal impact ranking that is potentially scalable will be of interest to researchers and those who work with the existing ISI IF in an institution or other locality. The authors have advanced the applicability of small-world and social networking metrics to other data, and provide a reproducible, carefully rigorous, and clearly written explanation of their processes. Other new knowledge provided by Bollen et al. is a taxonomy of journal impact rankings, a valuable addition to the literature on this problematic topic. Finally, a social networking-structured impact methodology has the potential to identify emerging research trends among local populations, an important contribution in itself.