
Journal Selection Based on Citation Analysis: A Comparative Analysis of Three Studies

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Many libraries rely on the subjective judgment of the librarian for journal selection, who uses considerations of cost, utility to intended users, quality of journals and relevance to the disciplines and areas of interest. More objective data can be obtained from usage statistics and users' surveys; however, data based on these methods can be misleading since use depends on availability. Becoming more common is the use of bibliometric studies which employ citation analysis to rank journals for consideration in collection development.

The data produced by citation studies can be of practical use to librarians by providing a moer scientific basis on which to select, retain, weed or relocate resources in the collection. Three studies which use citation analysis as a basis for journal selection are described herein. Initially, a description of the research methodology and

conclusions is presented, which is followed by an analysis of the studies, their implications and usefulness.

Journal Selection in Nigeria¹

At the library of the University of Port Harcourt, Nigeria, core journals in microbiology were selected using citatin analysis. The methodology of the research, as reported by Aziagba, consisted of studying five volumes (10 issues) of the Nigerian Journal of Microbiology. The total number of articles in each issue was calculated as well as the total number of references at the end of each article. In addition to calculating incidences of coauthorship and self-citation, the researchers listed all journals referred to according to the number of times each journal appeared in the references. After their cumulative citations and cumulative percentages of appearance were calculated, the journals were ranked in descending order of citation frequency.

The results of the study indicate that 118 articles were published, generating 1688 references, making the ratio of source articles to reference articles 1:15. Other statistics about authorship were calculated, but the most important findings of the study for the purpose of this paper relate to the ranking of the journal list. The total number of times particular titles of publications were mentioned in the citations was calculated and ranked; "this is a measure of their level of importance" as the author noted². A total of 308 publications were mentioned. Of those, 56 (18.8%) were mentioned more than 5 times; only these publications were considered for the research.

The researchers then calculated the cumulative total and cumulative percentage of the citations, providing a list that could be divided into quartiles. The upper quartile included 6 journals which were cited more than 24 times. The median number of citations was 17 and the number of journals falling within the upper half of the list was 16. The author concluded this portion of the research with the remarks that "The lean resources of libraries can allow subscriptions to only the journals that fall above the upper quartile on the graph.... These will satisfy the interest of many information seekers"³ and that "journals in the upper quartile can com-

fortably be accommodated. These will serve the need of most researchers"⁴.

Women's Studies Journals Selection⁵

Thura Mack at the libraries of the University of Tennessee did a citation analysis of women's studies literature and revealed a core collection of 20 women's studies journals. The goal of the study was to identify an evaluation method that will assist collection development managers in developing and maintaining a group of useful and important women's studies journals, especially that women's studies programs are relatively new and the disciplines and scholarly journals that contribute to the field need to be identified.

The best research method and the uniqueness of the study were first determined as well as the type of literature to be studied, i.e. primary (journal article references) or secondary (abstracting and indexing sources). Primary sources were chosen for study based on the fact that subjects as they relate to women would usually originate from related fields rather than women's studies journals.

Based on a list of journals preferred by women's studies teaching faculty, Signs: Journal of Women in Culture and Society was chosen from the top 6 journals based on coverage, circulation figures, scholarly focus and recommendations by Katz and Katz⁶. Three years of Signs were studied: 1976, 1981 and 1986. Journals cited in

Signs during those years were ranked according to the number of times cited. This data provided part of the selection criteria for the titles included in the final core list of women's studies journals. Mack reported that the stipulation for a journal to be considered for the core list of women's studies journals was that the title had to be cited 5 or more times at least one of the 3 years under study. The draft list consisted of approximately 61 titles which were measured against three variables: input from the women's studies teaching faculty (i.e., preliminary list of the six most used journals), a study of the subject patterns and rankings of the literature, and title frequency as indicated by Signs. These considerations reduced the number of titles by 66%, yielding a list of 20 titles that comprised the recommended core journals.

Journal Selection in Veterinary Medicine⁷

He and Pao conducted an experiment to test the validity of the Discipline Influence Measure, a discipline specific journal selection algorithm. First a list of candidate journals of potential contribution to the discipline (Candidate Journal Set) was identified and, second, each candidate journal was scored so that it could be ranked according to relevance to the discipline. In He and Pao's study, veterinary medicine was chosen as the disci-

pline. Its literature depends on medical research literature and not only on veterinary medicine journals.

A list of 74 journals with high impact factors under the subject "veterinary medicine" in the Journal Citation Reports (1983) were identified as the Discipline Journal Set. In order to identify the Candidate Journal Set, five key journals from the Discipline Journal Set were first identified. They contained 25% of all publications in the subject as it appeared in the 1980 volume of the Journal Citation Reports and accounted for 51% of all citations made to veterinary medicine in the ISI database. From the five key journals, antecedent journals and descendent journals were identified, the former being journals cited by any one of the five key journals and the latter being journals which cited one of the five key journals. Second generation antecedents and descendents were included, cut-off points were applied and duplicate titles were eliminated to bring the Candidate Journal Set to contain 146 journal titles linked by citations to and from five key journals in veterinary medicine. The computation of the Discipline Influence score is:

$$DIS_A = \frac{n}{\sum_{i=1}^n \text{total number of times } J_i \text{ cited all journals}}$$

where DIS_A = Discipline Influence

Score of Journal A in the Candidate Journal Set; J_i = a member of the Discipline Journal Set; and n = the total number of journals in the Discipline Journal Set. A

sample of the calculation of the Discipline Influence Score for a candidate journal follows.

Discipline Influence Score for Candidate Journal (title)					
Citing Journal	no. of times citing journal cited candidate journal	X	no. of times citing journal cited all journal		DIS
A	64		10049		0.006375
B	56		6195		0.008717
C	40		3041		0.013154
D	30		2285		0.131291
Total DIS					SUM

After the 146 candidate journals were scored and ranked according to their Discipline Influence Score, the ranked list was compared with the lists of the same journals ranked by four other methods. Each journal in the Candidate Journal Set was ranked according to (1) the number of articles published in 1983, (2) the number of citations received during 1983, (3) the impact factor for 1983, and (4) the total citation influence measure computed for 1983. The choice of these four methods was guided by the practicality of the these methods as well as by their implicit validity. They are briefly described below.

Article Counts. Based on findings by Pan⁸ that the total number of articles in a given journal, regardless of their subject content, was just as accurate an indication of potential usage as were citation counts.

Citation Counts. Based on the claim that there is a direct relationship between the frequency of citations and the "influence" if not "quality" of the cited work, such as the study by Aziagba.

Impact Factor. This is the number of citations made to a citable item in a journal. It is based on the number of citations made to a journal, its computation depending on the number of times the title is cited by all other journals in the ISI database. It may be a useful journal selection method within a general library, however, within the context of a special library where emphasis is on a specific discipline, this method has its limitations.

Total Citation Influence Measure. Proposed by Narin,⁹ this method is used to identify a core list for a specific discipline. It is based primarily on the number

of citations received by a journal but it incorporates the number of references to other Journals by a journal. However, it may not reflect the fact that the journals cited by researchers sometimes differ from those in which they publish their work.

He and Pao's most obvious finding was that the list ranked according to the Discipline Influence Score did not correlate with any of the other four methods. To evaluate the accuracy of the Discipline Influence Score, Two evaluation methods were applied. First, a survey of professionals in veterinary medicine was conducted to assess the utility of the top 20 journals in 3 ranked lists. Since the rankings by article counts and citation counts correlated significantly with that by impact factors and by total citation influence measures, only the ranked lists by impact factors, total citation influence measures and Discipline Influence Scores were examined closely. From each list the top 20 journals were pooled; as a result, 46 unique journal titles were identified and alphabetically arranged. The list was then submitted to researchers and professionals in veterinary medicine who were asked to circle 5 to 10 journals in the list perceived by him or her to be used most frequently in relation to his teaching or research. The results were calculated and a ranked list of 46 journal titles was compiled based on the number of selections

made by the experts. The experts, rankings correlated only with the rankings associated with the Discipline Influence Score.

The second evaluation method consisted of comparing the 5 ranked lists to a recommended basic list of veterinary medicine published in the Journal of Veterinary Medical Education. Of the 113 journals appearing on the list that were still being published, 66 were members of the Candidate Journal Set. These titles were compared to the ranked lists by the five different criteria. Each method's top 20 journals was compared with the 66 journals recommended in the basic list. The top 20 journals identified by the Discipline Influence Scores were all recommended titles on the recommended list, whereas a maximum of 10 titles in each of the other four lists were on the recommended list. Similarly, when the top 40 journals were compared, the list ranked by the Discipline Influence Score showed 38 titles from the recommended list; a maximum of 20 titles from the other four lists were in the recommended list.

The researchers concluded that the ranked list of journals using the Discipline Influence Score was a strong predictor of users' expressed preference of journals in relation to their professional work and that article counts, citation counts, impact factor, and total citation influence

measure were unable to predict users' preference of veterinary medical journals.

Analysis

The three studies summarized in this paper are similar in purpose (to identify a core collection of journals) but different in methodology. Aziagba's study was the simplest. He merely counted citations in a journal of his choice and ranked journals accordingly. Aziagba assumed that there is a positive correlation between the number of citations a journal receives and the quality or usefulness of the journal. While high citation counts may have high face validity, they cannot be relied upon as indicative of worth. The citations may also have reflected the availability of certain journals; it may be the case that authors who published in the Nigerian Journal of Microbiology had few sources to which to refer, or that they were most familiar with the journals in the library with which they were affiliated. In that case, the "core" journals would probably already be present in several libraries, so that the identification of the core would merely by listing what was already available.

In short, Aziagba's research methodology and his conclusion that journals in the upper quartile of the graph would serve the needs of most researchers revealed his lack of understanding of the implications and limitations of citation analysis. He failed to recognize that while

citation analysis yields indicators for journal selection, the results of any study should not only be analyzed for their true value but they should also be compared to other evaluative criteria such as the judgment of librarians or the opinions of professionals in the field of research.

Mack's methodology was more comprehensive than Aziagba's. Firstly, Mack sought input from teaching faculty regarding the selection of a key journal from which to conduct the citation count and her final choice was determined by four other factors. After a ranked list was compiled based on citation counts, it was compared to input from the teaching faculty, an analysis of subject patterns of the literature and title frequency in Signs. Therefore, Mack's study addressed the importance of using evaluative criteria in conjunction with citation analysis to identify a core of journals. While citation analysis provided a more scientific basis on which to base the selection of core journals, it was not used indiscriminately or exclusively as was done in Aziagba's study.

He and Pao's study was the most complicated of the three as the researchers attempted to verify the validity of an algorithm for discipline specific journal selection. Five key journals, which were significant in the Journal Citation Reports, were chosen as the basis for the study;

they identified the journals in the candidate set through links both to and from the key journals. This differs from Aziagba's and Mack's studies, which analyzed the citations of only one journal.

In addition to computing a Discipline Influence Score for each of the journals in the candidate list, He and Pao compared the resulting ranked list to four other ranking methods. The Discipline Influence Measure seems to be a valid method of ranking discipline-specific journals for the selection of a core collection. It most closely correlated to experts' preferences for basic recommended lists in veterinary medicine.

A potential weakness of this study is noted in the second evaluation method which consisted of comparing the 5 ranked lists to the recommended list published in the Journal of Veterinary Medicine. Nearly half (42%) of the journals on the recommended list were not covered in Journal Citation Reports which was the source of the Discipline Journal Set. In effect, the 47 journal titles not covered by Journal Citation Reports were discluded from the Discipline Journal Set. Only citations in th Discipline Journal Set were counted to calculate the Discipline Influence Score. Also, candidate journals were identified from 5 key journals' antecedent and descendent citations. These 5 key were also taken from Journal Citation

Reports. However, since the Candidate Journal Set was made by noting citations to and from the 5 key journals, there was a possibility that a non-listed journal would be counted as a condidate journal, thus minimizing the effects of this weakness in the study.

Conclusion

Of the three studies analyzed in this paper, Mack's study seems to be the most applicable and it avoids blind adherence to citation analysis by incorporating other evaluative methods. He and Pao's study was the most thorough but also the most difficult to apply. Although their concluding remark about the study was that "the actual data collection took a few hours, making this a practical journal identification methos,"¹⁰ it took this reviewer a few hours to fully understand the research methodology, let alone apply it. Although a seemingly reliable selection algorithm, most librarians would probably not have the time or energy to conduct such a study.

In the final analysis, the conclusion drawn by He and Pao is perhaps the most enlightening statement made in the three studies: "Evidence has been overwhelming that this technique appears to rank journals according to the perceived usefulness by professionals"¹¹. If a discipline-specific journal selection algorithm was created, applied and thoroughly test-

ed, and the results closely matched the rankings by professionals in the field, perhaps the age-old method of consulting professionals in the field is a valuable tool for collection development considerations after all. While bibliometrics lends some credibility to journal selection by quantifying the value of journals in complicated scientific and mathematical formulas, the opinion of professionals seems to be just as reliable for selecting discipline-specific core collections.

References

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¹⁰He and Pao, op cit., p. 415.

¹¹Ibid.

