

Executive Summary

Motto of Scholarly Publishing

There are very few academicians who are interested in doing research that will have no influence on anyone else, inside or outside of academia. In contrast, the vast majority of academicians are highly interested in achieving an academic impact by advancing their discipline, by generating new knowledge or new methods, and potentially even having a positive influence on external audiences, such as researchers from other fields, governments, and the general public. One way of influencing researchers from inside and other fields is through publishing the research results in reputed research journals.

What is Scientific Value of Journal and how it can be measured?

In the publishing domain, reputed scientific research journals have some common features of reliability. These include a genuine peer review —even with a low rejection rate; an editor and editorial board who acknowledge their association and work for the journal encourage scientific debates, criticisms and comments; permanent visibility —the published work will be permanently available; and clear and transparent pricing (if author is required to pay processing and publication fees or APCs). Importantly, in order to be called a journal it must publish regularly, be it print or web publishing. Absence of most of these features should deter an aspiring research writer to rush heedlessly into the process.

In the last few years, there is mushroom growth of journals in every discipline in India. On the other hand, there has been no single source of systematic advice on how to measure the scientific value of Indian journals. The only available indicator is the impact factor, a measure of citation likelihood of journals, persons and institutions throughout the world. However, such surrogate measures cannot be widely considered for Indian journals because of the fact that most of Indian journals are yet to index in Thomson Reuter's database. Further, existing literature also reveals that impact factor alone is not the best possible way to measure impact of scientific research.

Measuring Scientific Value of Indian Journals

The most pertinent question in this existing situation is how to effectively measure the contribution of Indian science globally. The present study aims at developing precise methods for measuring and evaluating the scientific value of research being published in Indian journals in the field of physics, chemistry, and biology (PCB). A team of academics based at the Guru Ghasidas Viswavidyalaya, Bilaspur (later on Banaras Hindu University) have been working on the project for several years. We believe the outcome of this study will be of interest to all prospective authors, libraries and policy makers to better capture and track the impact of scientific research.

Methodology Developed

To fulfil the aim of our study we started our journey by identifying journals that are being published in the fields of physics, chemistry and biology in India by consulting various sources. This was followed by verification of various internationally recognised databases such as WoS, SCOPUS, Indian Science Abstracts, DOAJ, SciELO, etc. to understand their policies of journal inclusion. Accordingly, a mechanism for journal evaluation that goes beyond the impact factor has been developed. We assign the nomenclature of our mechanism as Journal Quality Indicator of India (JQII). In this mechanism a toolbox consisting of 30 criteria and 100 sub-criteria have been identified (chapter 2). Each criterion further is assigned with a value (positive or negative) ranging from 0.001 to 0.1. The sum of all values indicates the relative score of a journal in our system. **The scoring system we devised here is tentative and should never be considered as final, but it is relatively free from bias because it can be applied by anyone.** Over the time, the experience gathered from the actual handling of data may lead to further development of the approach.

Furthermore, to disseminate the mechanism of evaluation of Indian journals and to make use by someone else, a functional website has been constructed. The temporal web address of the site is www.jqii.in. The system's technology stack comprises computer software like Laravel 4 (MVC Framework), Angular JS, PHP, HTML, CSS, JavaScript & MySQL. The system provides features such as User Management, Journal Management, Suggest Journal Module and Journal Score Management. The system also has various access levels to access various modules. The management module comprises sub-modules such as add, edit and activate operations for individual entities. The system also provides authority to activate / deactivate users. In this decentralized web-based system we have incorporated 100+ journals in PCB fields and score considerable number of journals by applying our developed criteria.

We believe that all the criteria (chapter 2) we developed are important in evaluating the quality of any journal from any discipline. When time is in short supply or data inadequate, an evaluator may reduce the number of considered criteria to **10 key points**. These are:

- (1) Longevity & availability of journals** – Since how long the journal has been publishing regularly as per the stated frequency. How the journal can be accessible?
- (2) Promptness and regularity in publishing** – Whether the last three or four volume of the journal were published on-time without combining its issues.
- (3) Uniformity in format** – Whether the format, pattern of abstract, text, references, length follow a uniform pattern in most of its published articles.

(4) Peer Review & Composition of editorial board – Does the journal publish the list of peers every year? Whether all the editors of the journal are based at the same organization; whether there is geographic diversity among editorial members; whether the chief-editor's work in the subject area of the journal; whether editorial members take part in peer reviewing are qualified enough to do this job; and whether the editors have any academic affiliation to be considered eligible for editing scholarly journal.

(5) Proportion of Indian and Foreign contributors – Whether there is a balanced proportion of Indian and foreign contributors in the journal; and whether the journals have global audience?

(6) Number of articles per issue– Does the journal publish a reasonable number of articles per issue which seems to be manageable by human controlled editorial process? Does the journal publish only research articles or a mixture of research, popular and technical articles?

(7) Ratio of Cited/Uncited articles – At what rate are articles from the journal cited elsewhere?, Do only a few of total published articles receive citations with remaining articles not being cited at all (in five years)?

(8) Inclusion of journals in conventional databases–Whether the journal has been included in bibliographic databases like WoS, Scopus, Chemical Abstracts, Biological Abstracts, Physics Abstracts, Indian Science Abstracts, Indian Citation Index etc. or whether the journal falsely or misleadingly advertises its inclusion in various bibliographic databases. Is the journal included in various predatory impact factor services?

(9) Minimum publishing time the journal takes in publishing an article – Whether the journal promises to publish articles in an unrealistically short period of time (within 48 hours or 7 days, for instance).

(10) Ethical procedures followed –Whether the journal mentions ethical policies of publishing or whether the journal requires authors to sign an ethical policy agreement before publishing articles.

Status of PCB Journals in India

One of the major objectives of our study was to know the status of PCB journals in India. For that we have analysed 135 journals (32 physics journals, 43 chemistry journals and 60 biology journals) in the fields of PCB and evaluate them according to the newly devised mechanism. A snapshot of the analysis by using 10 key indicators is mentioned in table below. The other modalities of PCB journal publishing is explained subsequently.

Criteria	Physics	Chemistry	Biology
1. No. of Journals alive at the end 2014	32	43	83
Percentage of Journal suspended during 2013-2014	29%	11%	21%
Percentage of journals available in Open Access	72%	74%	65%
<i>Number of journals studied in detail</i>	32	43	60
Percentage of OA journals follow Article Processing Charges (APC) publishing model	74%	68%	72%
2. Percentage of journals maintain regularity	72%	89%	59%
3. Percentage of journals maintain Uniform format in published articles	78%	73%	72%
4. Percentage of journals mention Review Policy of the Journal	88%	84%	82%
Percentage of journal's Editors does not belong to the subject of journals	12%	23%	25%
Same editor for more than two journals	15%	34%	36%
Overall percentage of editorial members from foreign	30%	53%	38%
5. Percentage of articles contributed by International Authors	29%	20%	43%
6. Average number of articles published per issue	47	82	62
7. Ratio of Cited / Uncited articles	78:22	69:31	71:29
8. Percentage of journals included in WoS & Scopus	25%	16%	15%
9. Percentage of journals having option of publishing articles Rapidly or within a week	3%	2%	3%
10. Percentage of journals followed ethical standard while publishing articles	31%	16%	28%

- There is a phenomenal difference in quantity of journals published in last 60 years especially during the period up to year 2000 and beyond. While in last sixty years before the year 2000 there were only 31 journals in physics, 21 journals in chemistry and 105 journals were in biology, by only 15 year after the year 2000, it reached to 63 journals in physics, 60 journals in chemistry and 236 journals in biology. One of the possible reasons may be technology another may be the Government's policy for awarding degree & promotion; evolving of new model of publishing, i.e. open access; and a new business model of OA, i.e. gold OA.

- Over the last few decades preceding 2011, we observed a similar growth pattern of journals in PCB fields. However, between 2011 and 2014 the growth has been tremendous and it was more in biology than physics and chemistry. For biology, the annual addition was on an average 60 journals per year, i.e. four times greater than of physics and chemistry (15 journals per year).
- Although the growth was quite impressive, the yearly discontinuation/ ceasing was on the other hand was quite disappointing. Between 2013 and 2014, i.e. in a single year, 29% of physics journals, 11% of chemistry journals and 21% of biology journals were suspended or stopped compared with the previous year (page 40). If anybody publishes an article in a journal that later ceases publishing, the likelihood that other scholars will be able to readily access it is very low indeed unless the journal had developed an archival database for its back issues. This is one of the risks of scholarly publishing. It is also observed that most of these journals suspend their publishing within 5-7 years of their first issue appeared and the publishers of these journals are either individual or newly emerged commercial firms. Prospective researchers, therefore, should avoid such journals which are comparatively new and being published by individual publishers. It is better to choose journals being published by publishers like Indian Academy of Science (IASc) or Council of Scientific and Industrial Research (CSIR) who are maintaining back volumes of their journals in digital archives.
- It is well known that quantity over quality never wins at the end. This may be quite appropriate in terms of regularity and promptness issue of PCB journal publishing. Although the number of journals in biology is higher than physics and chemistry, almost 42% of biology journals do not maintain publishing frequency as it is stated in the journal's documentation.
- Collaborating with international publishing firm (eg. Springer, Sage International) is probably one of the ways to increase access to the research output which in turn helps in attracting more citations. However, for collaboration with such publishers it is essential that journals maintain regularity in publishing and adhere to the international standard of review process. Of the total identified journals, almost 18% journals of physics and biology are published in collaboration with one of the leading international publishers Springer. Whereas in chemistry, only 4.7% journals are published in collaboration with such publisher. All these journals in each of these three fields are being published by governmental organization or learned society and available in open access.
- Commercial bodies and societies, as compared to academics, are putting more interest in publishing PCB journals in India. While more than 50% of publishers in PCB journals of India belong to commercial publishers, only 15% of publishers are affiliated to government. Although, globally, commercial firms are leaders in publishing, however, the business model adopted by the commercial firms should not be only with an intention to make more profit without adhering to international standards.

- Of the total identified journals in PCB, a major portion, i.e. 72% journals in physics, 74% journals in chemistry and 65% journals in biology are open access journals. Of these open access journals, 74% physics journals, 68% chemistry journals and 72% biology journals are article processing charge (APC) based journals. Of these total APC based journals, nearly 50% of biology journals do not disclose APC charges in journal documentation and two journals are asking APC in the personal account of the editor/publisher. This is one of the indicators of predatory as identified by Jeffrey Beall.
- Beall in his writing explained that “many of the journals and their publishers use adjectives such as 'world', 'global' and 'international' in journal title. Some sites looked amateurish or gave little information about the organization behind them.” In our investigation it was observed that 7 physics journals, 15 chemistry journals and 18 biology journals contain such terms as ‘international’, or ‘global’ in the titles. However, on analysing the addresses given in the links of these spurious publishers, mimicking the legitimate journal, we noticed the “Aim/Scope/Mission” of these journals tend to be incredibly broad and the content bridges unrelated domains. These journals do not have appropriate distribution of editorial members across the globe, or do not have any articles published by foreign authors which denotes their false claim about ‘international/global’ as well. It appeared that the publisher wants to accept as many papers and receive as many publication fees as possible. Interestingly most of the publishers of these journals was individual publisher.
- In order to check whether open access journals include more articles per issue than non-open access journals, we observed that during the last 5 years (2010-2014) the number of articles per issue in open and non-open access journals is almost same, in of PCB fields. On average physics, chemistry, biology OA journals contain 11, 13, 17 articles per issue, while physics, chemistry, biology non-OA journals contains 13, 17, 12 articles per issue, respectively. Except a small number of OA biology and chemistry journals each of which contains 50-70 articles per issue, most of the journals contain 10-20 articles per issue in both open and non-open access form.
- The review policy of a journal reflects its quality. In our study we observed that 18% of biology journals, 16% of chemistry journals and 12% of physics journals do not mention their review policy clearly in their journal documentation. The lack of this information is evidence of the low quality of such journals. Between 22 and 28% of journals in the PCB fields do not maintain uniformity in terms of reference pattern or uniformity of article display format which indicates a poor review process of those journals.
- In a general sense it seems that in today’s context, where growth of any individual field is quite diversified, it is difficult to gain expertise in various sub-fields at an equal pace. Interestingly we observed that editors of 36% of biology journals and 34% of chemistry journals were also the editors of other journals either in different subfields or even in a different field of the

science altogether. Furthermore, editors of 25% of biology journals and 23% of chemistry journals do not have any specialization in the fields on which he or she is serving as an editor.

- A journal's quality is established by its editorial board, along with its editor-in-chief. In our study we observed that the percentage of journals having foreign members in editorial boards was highest in physics than biology and chemistry. However, overall foreign members in editorial board was highest in chemistry journals than biology and physics. While ninety percent physics journals having 30% members from foreign in editorial board, seventy percent biology journals having 38% foreign members and seventy three percent chemistry journals having 53% foreign members in the editorial board. On the other hand, of the total published articles in PCB journals, 43%, 29% & 20% articles in biology, physics & chemistry respectively, have at least one author from foreign countries. And of the total authors who have contributed articles in these journals, overall, 26%, 19% & 16 authors were from foreign countries in biology, physics & chemistry respectively.
- Internationally, citation is considered as an indicator of research quality and treated as a benchmark in measuring scientific value of one's research. A considerable number of sources have already documented that the number of citations per article in Indian journals is modest. In our study we tracked citations between 2011-2015 for the articles that were published between 2011 and 2013 and observed that physics articles received on average 1.49 citations per article, followed by biology with 1.26 citations and chemistry with 0.45 citations. Almost 40% of physics journals, 39% of chemistry journals, and 43% of biology journals did not receive any citations during last three years. The upper limit of citations received by any journal in the PCB fields from 2011 to 2015 was 50 for their articles published between 2011 and 2013.

Way Forward

The phenomenal increase in number of journals (*not necessarily scholarly journals*) in every discipline in the past few years is alarming. On the other hand the number of inclusion of journal titles in international databases is quite disappointing. To the best of our knowledge, in last few years, only a few Indian journals have touched the benchmark as designed by Thomson Reuter or Socpus. Not necessarily the benchmark of Thomson Reuter is the only criteria of determining quality, other criteria like citation per article for Indian journals is also not satisfactory. Only a few journals are the indices of the reflection of Indian scholarly exercise in the global market. Therefore, it is high time to orient our approach towards quality scholarly publishing and take few initiatives for the betterment of scholarly communication.

- The mere criterion of having ISSN must not be a benchmark of treating journal as peer-reviewed, refereed or scholarly. It will be worthwhile to establish a national accrediting agency [may be subset of NAAC or NSTMIS] for monitoring quality of Indian scholarly output. The focus of

accreditation, may be of twofold purpose of assuring minimum quality and furthering continuous improvement, with a strong emphasis on the latter. The Accreditation of Academic Journals requires a team of experts to evaluate the journal. The experts may be chosen in close fit to the expertise requirements of the contents of the journal as defined in the aim and scope. The job of the accrediting agency is to keep watching all publication and grade them according to score (may be as devised in this project) and levels (Level 1-Developing Journal; Level 2 Developed Journal; and Level 3- Advanced Journal).

- Either Academic Journals Accreditation Council or the journal publisher should ensure that:
 - The contents of the journal contribute to new knowledge of the discipline with acceptable readability levels that are consistent among the articles.
 - The journal should clearly express its review policy, and a statement of publication ethics and malpractice. It should have geographically diversified editorial board, reviewers as well as authors.
 - It should have licensed software for its technology-based quality assurance, web interface and using Digital Object Identifier for individual article.
 - The Journal publishes regularly as its stated frequency.
 - The journal standing is strong with editors and authors having h-Index. Journal's citation strength is reflected by the number of citations per article.

- Institutions should insist that their scientists and faculty members opt for publications in peer-reviewed open access journals. One important feature distinguishing the scientific journal domain of OA from other publishing industries such as books, film etc. is that scientific knowledge is public good produced mainly with public funding and that the author who generate scientific information usually do not get any financial benefit in terms of sales royalty. Hence from author's viewpoint there is no problem with potential piracy; on the contrary as wide a dissemination of article as possible is desirable. Therefore, prospective authors should choose OA platform for disseminating their research to the global audience. Furthermore, funding agencies should also ensure that the output generated by the funded research must be available in open access repositories. Presently, a number of research funding agencies worldwide, now require or request authors to submit the post-print version of their article (the version after peer review and acceptance but not the final published article) to a repository that is accessible online free of charge.

- In order to track the scientific output of India, initiative taken by few other nations may be considered. For example, Brazilian government has assigned the responsibility of maintaining quality in publication to the CAPES. CAPES has developed a system for evaluating scientific publications, known as Qualis, which rates journals based on two related parameters – the scope of

distribution (international, national or local) and the quality (A-high, B-medium, C - low) of the publication.

- Similarly, Academy of Science of South Africa (ASSAF) at the request of the Department of Science and Technology (DST), produced a new strategic framework for South Africa's research journals. ASSAF in regular intervals reports the country's research publishing profile, the availability and practices of local research journals, and the global e-research trends and their implications for South Africa, and advance a number of recommendations. The recommendations include the adoption of best practice by editors and publishers in the country, the undertaking of an external peer review and quality audit of all research journals in 5-year cycles, and the adoption of an open-access publishing model enhancing the visibility and accessibility of the country's research.
- One of the biggest challenges to gauge the scientific value of regional journals is to track the real citing source data of published articles. The coverage of regional publications is poor in *Science Citation Index Expanded* or *Scopus*. In order to overcome such hurdles some countries have their national citation systems, for example, China has *Chinese Science Citation Database* and the *Chinese Sci_Tech Paper* and *Citation Statistical Database*. The Russia has *Russian Science Citation Index*. Likewise India also has *Indian Citation Index (ICI)*. Although journal coverage of ICI is quite excellent, the citing source coverage of the ICI is quite poor. In most of the articles ICI indicates "Times Cited: 0" in spite of the fact the same article has been received a considerable number of citations in WoS, Scopus or even Google Scholar database. In China and Russia the citation index is maintained by government organization. In India, it may be worthwhile if any government organizations like NISCAIR take initiative towards its updation by taking financial assistance from government.