

Project Completion Report

Measuring Scientific Value of Indian Journals:

A Pilot Study on
Physics-Chemistry-Biology Journals

~: Sponsored by :~

**National Science and Technology
Management Information System (NSTMIS)**
Department of Science & Technology
Government of India

~: Implemented by: ~

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Associate Professor,
Department of Library & Information Science
Banaras Hindu University, Varanasi
(Uttar Pradesh)

October 2015

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The National Science and Technology Management Information System (NSTMIS), a division of Department of Science and Technology (DST) has been entrusted with the task of building the information base on a continuous basis on resources devoted to scientific and technological activities for policy planning in the country.

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LIST OF ABBREVIATIONS

APC	- Article Processing Charges
API	- Academic Performance Indicator
ASSAf	- Academy of Science of South Africa
CA	- Closed Access
CAPES	- COORDENAÇÃO DE APERFEIÇOAMENTO DE PESSOAL DE NÍVEL SUPERIOR
CC	- Creative Commons
C/D	- Cites/Documents [developed by SCImago]
CSS	-Cascading Style Sheets
DOAJ	-Directory of Open Access Journals
DOI	- Digital Object Identifier
ESS	- Electronic Submission System
GS	- Google Scholar
GP	- Graduate Program
HTML	-Hypertext Markup Language
ICI	- Indian Citation Index
ICT	-Information Communication Technology
IEEE	- Institute of Electrical and Electronics Engineers
IF	- Impact Factor
ISI	- Institute for Scientific Information
Jr.	- Journal
JCR	- Journal Citation Report
JQII	- Journal Quality Indicator of India
MVC	-Model View Controller
NA	- Not Available
NAAC	- National Assessment and Accreditation Council
NISCAIR	- National Institute of Science Communication and Information Resource
NOPR	- NISCAIR Online Periodical Repository
NS	- Negative Score
NSTMIS	- National Science and Technology Management Information System
OA	- Open Access
OCLC	- Online Computer Library Centre
PCB	- Physics, Chemistry and Biology
PoP	- Publish or Perish
PHP	-Personal Home Page/ Hypertext Preprocessor
PS	- Positive Score
QR	- Quick Response Code
RAE	-Research Assessment Exercise
REF	- Research Excellence Framework
RePEc	- Research Articles in Economics
SCI	- Science Citation Index
SciELO	- Scientific Electronic Library
SJR	- SCImago Journal Rank
SNIP	- Source Normalized Impact per Paper
SPARC	-Scholarly Publishing and Academic Resources Coalition
WOS	- Web of Science

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 until 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 orinet 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 way may be worthwhile if any government organizations like NISCAIR take initiative towards its updation by taking financial assistance from government.

Chapter – I – Academic Journals & Their Scientific Value

1.1 Introduction

'Research' indeed is a self-curiosity which leads to generation of new ideas. There is always a desire among researchers to share new knowledge with others. As our state of understanding of nature and civilization advances following the application of the newer concepts, phenomena and processes, the quantum of new information and the need to share it also increases exponentially (Lakhotia, 2014). The desire to share is not only altruistic but, more commonly, is to impress others. This altruistic facet, on one hand, informs the social status of the researcher among peers, on the other hand, it also allows for the assessment and quantification of the creative capability of any researcher by various academic authorities. One of the common vehicles for carrying the outcome of these creative capabilities is the journal.

1.2 What is a journal?

The term 'journal' is loosely defined in the scholarly communicative domain. In 1665 the earliest recognised academic journal appeared in Europe. *Journal des Sçavans* edited by Denis de Sallo began publishing issues and pamphlets and the Royal Society started its monthly publication of *Philosophical Transactions* to promote the

Research is essential for the expansion and diversification of any subject field as well as for survival and sustenance of the existing subject.

enterprise of early modern science. Since then journals have served as a primary vehicle to share the new ideas among peers and also provide a platform to display the creative capability of researchers. In this study, we are concerned predominantly with scholarly and scientific literature— that is, periodicals containing accounts of research and which are published after academic peer review as opposed to journalistically based magazines. Schaffner (1994) identified five main roles that journals play in scholarly communication: 1) Building a collective knowledge base; 2) Communicating information; 3) Validating the quality of research; 4) Distributing rewards; 5) Building scientific communities. According to Guédon (2001) journals served almost like a patent office for ideas. By publishing in a journal, scientists or natural philosophers (as they were called at the time) could establish ownership of their intellectual property. Oded Goldreich in his 2003 article "The current role of journals" identified four roles of journals:

- **Timely dissemination of scholarly and technical work,**
- **Evaluation and verification of the contents of such work,**
- **Archiving such work, and**
- **Serving as basis for scholarly credits.**

He adds that the first role of journals has been abolished in light of conference discussions and new media such as online publication, however, it was the first role that made the journals so central to the scientific process. Gradually the journal's role has been shifted from only disseminating knowledge to

becoming a source of gaining greater prestige and merit within the scientific community by authors and academics who publishing articles in them. In Germany, for instance, the number of publications of an author in high impact journals and their number of citations stands as a measure of his or her research achievement. Similarly, in India the newly adopted Academic Performance Indicator (API) system of University Grants Commission (UGC) for appointments and promotions in teaching and research institutions requires a minimum number of publications in research journals.

1.3. Changing trends in journal publishing: From print to electronic and open access

The printed form of scholarly communication has dominated for some five hundred years. But there is a crisis in scholarly publishing in terms of information overload, printing delay, escalating prices of journals and some legal debates regarding intellectual property and access. In recent decades a new mechanism for journal publishing and distribution has gained popularity: e-journals. The term 'e-journal' can be defined as a publication, often scholarly, accessible in a computerized format and distributed electronically (Mukherjee, 2010). The development of World Wide Web was a boon to the electronic journal project (before the availability of the internet, electronic journals were ASCII text based) which is now reflected in terms of output and use of electronic publications. In the pre-web era, these ASCII text based e-journals appeared in four different forms. They were (a) newsletters; (b) un-refereed e-journals; (c) refereed e-journals (eg. *Mental Workload*); and (d) tailored and structured 'journals' (eg. *Legitech*) (Peek & Pomerantz, 1998).

With the arrival of the internet the number of e-journals in all disciplines has proliferated, finding widespread and enthusiastic acceptance by end users. Some electronic publications replicate existing print publications, others start only in electronic form. Kling and McKim (1997) have distinguished at least four kinds of e-journals in the post-web era. They are:

- a) Pure e-journals which are originally distributed only in digital form e.g. *Electronic Journal of Communication, Journal of Digital Information, Information Research*.
- b) E-p journals which are primarily distributed electronically, but may have very limited distribution in paper form. e.g. *Journal of Artificial Intelligence Research, Electronic Transactions on Artificial Intelligence*.
- c) P-e journals which are primarily distributed in paper form, but are also distributed electronically. E.g. *Nature, Science, Physical Review*.
- d) P+e journals which are initiated with parallel paper and electronic editions that may be widely distributed. e.g. *Organic Letters*.

The escalating cost of providing access to research materials, together with the license constraints placed on the use of digital contents by commercial publishers, are seriously eroding the ability of libraries to provide students and faculty with the resources. The Open Access (OA) movement has been an important catalyst for change in this regard, prodding publishers to re-examine their access policies and, in some cases, to move towards news access models. Presently, OA advocates two types of strategies for promoting the free availability of scholarly literature: self-archiving and open access

journals. These two strategies are also known as “Green” and “Gold” roads to OA, respectively. A green publisher (or journal) has given green light to its authors to self-archiving their papers (i.e make the research output open by depositing the full text on a toll free, publicly accessible web site). Initially, the self-archiving method created confusion among commercial publishers but the majority of publishers now permit authors to post their articles online in the form of a preprint (the version originally submitted to the journal) or post-print (the final, peer-reviewed and accepted but not yet edited version) or final a version as prepared for publication or even the final published version with all its formatting (typically in PDF format).

Gold OA publishers ask charges from author instead of users to publish articles. In this new publishing model, instead of charging a subscription fee from end user, OA journals either charge author(s) or their sponsoring bodies (universities, governments, etc.) for publication.

From not-for-profit societies publishing in the early days to well-organized commercial ventures, many lately riding on the many advantages of the internet, journal publishing and journal access has witnessed radical changes at both the publisher and user ends. Even though the medium has changed, the subscriptions based model continues to be dominant and the subscription costs of electronic journal, even through consortia access has been steadily increasing.

The emergence of open access journals has the potential to reverse the existing journal subscription model. Although it is free to the reader, there are direct and indirect cost involved in open access journal publishing. Thus came into being the author-pays model, the ‘gold’ open access model wherein the publishing cost is offset by charging the authors rather than the subscribers. There are now several journals available that collect article processing charges (APCs). However, the seemingly steep APCs of some journals and the emerging new breed of predatory open access journals that are exploiting the APC based model to make money in an unethical manner have placed open access journals in the spotlight for the wrong reasons.

There are now many APC-based journal publishers. Crow (2009) lists the prominent publishers of open access journals who charge article processing fees including: BioMed Central, Hindawi Publishing Corporation, MedKnow Publications, Molecular Diversity Preservation International (MDPI) journals, Public Library of Science, etc.

1.4 What is the scientific value of a journal?

The Belmont Report issued by the US Department of Health, Education, and Welfare in 1979 states that *“Scientific validity becomes an ethical issue when people are asked to participate in an experiment. Poorly designed human research is unfit for human subjects.”* Scientists and engineers generally adhere to an informal set of values that serve as the basis of ethical conduct in the disciplines. Although, development of modern society largely depends on the success in the implementation of new scientific knowledge, implementation of new knowledge without adhering to the ethical conduct in the discipline is untenable. Before implementation of knowledge, methods or data presented in published work it is necessary to understand whether the work can be trusted or whether the work is original,

unbiased, or free from any prejudice. In most industrialised countries, the process of measuring and evaluating the level and quality of research produced by universities and other research bodies has emerged as a key issue in higher education policy over the past few years (OECD 2012).

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; encouraging 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.

With the increasing number of journals in various formats, it has now become essential to judge whether the published journal has any significance in scholarly communication process. An author must question how long the journal has circulated among scholars and whether the journal maintains regularity in publishing. Also, an author must question whether the review process followed by the journal is authoritative, authentic, and follows consistent pattern or whether the journal has any impact in terms of citations received or recognition by the scholarly community

1.5 Global Indicators of measuring Scientific Value of Journal publishing

1.5.1. Regularity and Promptness in Publication

Regularity and promptness in publication are basic and fundamental criteria in the evaluation of quality of journal publishing. A journal must be publishing according to its stated frequency. The ability to publish on time implies a healthy supply of manuscripts which are essential for ongoing viability. It is not acceptable for a journal to appear chronically late, weeks or months after its cover date. For electronic journals (e-journals), the promptness in publication is also important. However, for an e-journal it is important to judge whether an e-journal publishes articles one at a time or whether articles are collected for release as an 'issue'. Further, how many articles a journal includes per issue and at what frequency particular types of articles appear in the journal is important to judge.

1.5.2. Peer-Review:

Peer-review is a process involving academic readers, mostly unpaid volunteers, to ensure manuscripts are accurate and of publishable quality, free of errors. What is known as 'pre-publication' refereeing

"For the lowest-quality journals, peer review merely puts a stamp on mediocre work that will never be read"

can be 'open', 'single blind' or 'double blind'. In the open system, both authors and referees are identified to each other during the process. In the single blind system (sometimes just known as 'blind'), authors are disclosed to reviewers, but reviewers are not identified to authors. This

form is commonly followed by journals in the sciences, including the journal *Nature*, for instance. In the double blind method, neither the reviewers' nor authors' identities are disclosed to one another.

The double blind system is meant to ensure objectivity and the fairness of the process (see Bochner 2008) and minimise any potential conflict of interest for reviewers.

Peer review is often considered the gold standard of scholarly publishing, but all that glitters is not gold. One problem with peer review is that many types of research cannot be validated by a reviewer. A reviewer can check the accuracy of a paper by reading the text without reviewing external evidence beyond other published sources. A reviewer is unlikely to replicate experimental results to review articles in medical science, computer systems, even pure mathematics, for example. Since a reviewer has not repeated the experiment, the review is mostly a comment on whether the research appears to be conducted properly. Further, the slow and deliberate process of peer review means that papers in the published journal are often historic record rather than active literature of the field. Coley (2008), explained the peer review of scholarly publications is a “broken” system because of the (often) lengthy timelines involved between submission, review and publication but believes “like the majority in our field, that peer review (even, and especially, blind peer review) provides certain checks and balances, collaboration, and prestige to our publications.”While” selecting where to publish important results, an established researcher is often more interested in establishing primacy through rapid publication than in the imprimatur of peer review” (Guthrie, 2001).

As the peer-review process is meant to assess the quality and accuracy of a manuscript, it is therefore pertinent to understand what qualities a peer reviewer should have. Key qualities a reviewer must include a sound scientific background, a good understanding of research methodology, a critical mind and an up to date knowledge of current advances in the field of interest (Polak, 1995). Callaham, Wears and Waeckerle found that training of the reviewer had no impact on quality of peer reviews. In an Indian context, Das Sinha et al. observed that the quality of reviewing was better by non-Indian reviewers. There was a negative but statistically non-significant association between academic rank and review quality. Pichappan and Buchandiran found that “many Indian journals claim that they do the reviewing of submissions and some journals even contain the term ‘international’ in their title. These claims lack credibility and validity”. Of the 1835 journals they analysed, 145 (7.9%) have listed their editorial board and 154 journals (8.39%) come under the category ‘peer reviewed’. They realized that many journals never use their expertise for review or content optimization.

Although “peer review remains the benchmark by which all the other approaches to quality are measured... for the lowest-quality journals, peer review merely puts a stamp on mediocre work that will never be read” (Arms, 2008).

Strength	Limitations
Peer reviewers are the “experts both in the presentation of academic arguments and the subject discussed by the individual article” (Day & Peters 1994, p.6)	“Individuals in the process are influenced in their task of reviewing by their own experience and knowledge, as well as their ignorance.” (Murphy 1996, p.12)

<p>“Quality of scholarly content itself is assured principally through the use of peer review in the selection of articles for publication, the status of the peer reviewer, and the rigour with which such review is conducted.” (Murphy 1996, p.1)</p>	<p>“There are significant variations in the levels of rigour of the review process.” (Murphy 1996, p.13)</p>
<p>A report entitled Key Perspectives (2002) found that “among their international sample of researchers, 74% strongly agreed that peer review was preferred [as a quality control measure]” (Houghton, Steele et al. 2003, p.63)</p>	

[Source: Tome, L & Lipu, S, Indicators of Journal Quality, R & D Discussion Paper #6, University of Wollongong Library, 2004, 14p. Accessible at: <http://ro.uow.edu.au/asdpapers/10>]

1.5.3. Citations & Impact

There is no universal definition for research impacts. The London School of Economics (LSE), through their Impact of Social Sciences project, defines research impact as “an occasion of influence and hence it is not the same thing as a change in outputs or activities as a result of that influence, still less a change in social out-comes” (LSE Public Policy Group, 2011, p. 21). They categorize research impacts into academic impacts, which are instances when research influences actors in academia or universities, and external impacts, or instances when research influences other actors outside of academia (LSE Public Policy Group, 2011).

The Thomson Reuter’s impact factor is a statistical technique which indicates “measures of esteem, performance, visibility and testimony of peers expert in relation to the activity that is being analysed” (Butler 2004, p.xii) and yet article citation count is often used synonymously with research quality (Najman & Hewitt 2003, p. 64). Swan and Brown (1999, cited in Houghton, 2003) found that authors tended to consider firstly the reputation of the journal by using the impact factor, followed by international reach and coverage by abstracting and indexing services. They also found that “Scientists are much more concerned about the availability of an electronic version of the journal than are workers in the arts. Publication speed is also significant to scientists, particularly chemists, whereas it is much less important to people working in social sciences or the humanities”.

"Impact of scholarly research is not always easily measurable by economic gains or losses, or in countable figures".

Journal Citation Report (JCR)

The Journal Citation Report is a service of Thomson Reuters which ranks journals that assists in assessing the academic importance of a journal in science, social science or arts and humanities. The ranking is based on citations and journals are assigned with impact factor (IF). IF is calculated by dividing the number of citations in the current year to articles published in the two previous years by the total number of articles published in the two previous years. The other two well used techniques are: the **immediacy index** which is calculated by dividing the number of citations to articles published in a given year by the number of articles published in that year. It is useful in comparing how quickly journals are cited. And the **citing half-life** is the number of publication years from the current year that account for 50% of the current citations published by a journal in its article references. This helps in evaluating the age of the majority of articles referenced by a journal, while dramatic changes in the citing half-life over time may indicate a change in a journal's format.

Strengths and Limitations of Journal Impact Factors

Strength	Limitations
"The U.S. has demonstrated that publications that are highly cited in the research literature are much more likely to be cited in patents, suggesting strongly that research excellence and contributions to innovation go hand in hand." (Foreword in Butler 2004)	Citations "only indicate that other professionals working in the same area have found the ideas in a specific article valuable in some way to their own work (whether positively or negatively)." (Murphy 1996, p.10)
"They are quantitative." (Evans & White 2002, p.15)	"People with the same networks tend to heavily cite each other's work...[with] .. strong geographical and regional tendencies". (Najman & Hewitt 2003, p.69)
"They are continually updated (approx. on a two monthly basis." (Evans & White 2002, p.15)	Different disciplines vary in their profiles of research citation patterns and research quality, culture of citing (including one's own). (Najman & Hewitt 2003, p.77; Murphy 1996, p.8)
"They are collected by a disinterested international organisation" (Evans & White 2002, p.15)	Favours English speaking countries and regions – not all research output is reported in ISI databases. (Evans & White 2002, p.16; Royle & Over1994, p.78)
"Attempts to measure teaching quality across university sectors (eg. in the UK) have had poor success." (Evans & White 2002, p.15)	"Citation statistics cannot be used to judge a single article...only...an average article." (Kabala 1998, p.2)

<p>"Although, at the level of an individual publication, citations do not necessarily equate with quality, at a broad enough level it is impossible to sustain high citation rates without research quality." (Evans & White 2002, p.15)</p>	<p>"Impact factors are heavily influenced by subject field, document type and journal size; by the number of citations and by research level, shifting fashions and publication policy." "Journals containing a high proportion of review articles have often much higher impact factors than 'normal' journals." (Moed, van Leeuwen et al. 1998, p.416; Rowlands 2002, p.2)</p>
<p>"We take as axiomatic that research quality and teaching quality are linked – especially at late undergraduate and postgraduate levels" (Evans & White 2002, p.15)</p>	<p>"Being chosen as an ISI source journal may bring higher citation rates than for journals not listed in the ISI journal set. Citations may be attracted simply because journals are indexed in the citation indexes." (Murphy 1996, p.10)</p>
<p>"The quality of research outcomes is measurable not only for whole universities but also for individual departments" (Evans & White 2002, p.15)</p>	<p>"Only those classified as 'articles' or 'reviews' and 'proceedings papers' are counted in the denominator for the impact factor calculation, whereas citations to all papers (including editorials, news items, letters to the editor, etc) are counted for the numerator. This can lead to an exaggerated impact factor (average cites per paper) for some journals compared to others." (Amin & Mabe 2000, p.6)</p>
<p>Despite the limitations, "when data are used to compare like with like, on a broad enough scale, useful objective comparisons can be made." (Evans & White 2002, p.16)</p>	<p>"In several practical applications of impact factors, such as the use in the assessment of research performance in a university department or faculty covering several subfields rather than one, there is an absolute and urgent need to make cross comparisons among subfields. The ISI impact factor cannot be used directly for this purpose..." (Moed, van Leeuwen et al. 1998, p.416)</p>
<p>"Bibliometric assessment, in contrast to the subjectivity associated with peer review or evaluation, provides object specification of research performance." (Royle & Over 1994, p.77)</p>	<p>"The system of journal categories developed by ISI ...is known to have certain shortcomings. For instance some categories cover rather specialised sub-disciplines (eg. endocrinology or astronomy) while others relate to broad fields such as biochemistry and molecular biology,] (which includes the journals <i>Nature</i> & <i>Science</i>." (Moed, van Leeuwen et al. 1998, p.417)</p>

[Source: Tome, L & Lipu, S, Indicators of Journal Quality, R & D Discussion Paper #6, University of Wollongong Library, 2004, 14p. Accessible at: <http://ro.uow.edu.au/asdpapers/10>]

Source Normalized Impact per Paper (SNIP) & SCImago Journal Rank(SJR)

Source Normalized Impact per Paper (SNIP) is a metric to “measure contextual citation impact by weighting citations based on the total number of citations in a subject field. The impact of a single citation is given higher value in subject areas where citations are less likely, and vice versa”. It is defined as the ratio of a journal's citation count per paper and the citation potential in its subject field. It aims to allow direct comparison of sources in different subject fields. Citation potential is shown to vary not only between journal subject categories – groupings of journals sharing a research field – or disciplines, but also between journals within the same subject category.

On the other hand, SCImago Journal Rank (SJR) is a measure of scientific influence of scholarly journals that accounts for both the number of citations received by a journal and the importance or prestige of the journals where such citations come from. With SJR, the subject field, quality and reputation of the journal have a direct effect on the value of a citation.

Google Scholar

Launched in November 2004, Google Scholar is freely accessible web search engine that includes most peer-reviewed online journals of Europe and America's larger scholarly publishers. This search engine also indexed those invisible documents which even not indexed by Google or *Web of Science*. It was estimated that this search engine roughly contains 160 million documents as of May 2014 (Orduña-Malea, 2014) and approximately 80-90% coverage of all articles published in English. Publishers like ACM, Annual Reviews, arXiv, Blackwell, IEEE, Ingenta, The Institute of Physics, NASA Astrophysics Data System, PubMed, Nature Publishing Group, RePEc (Research Articles in Economics), Springer, and Wiley Interscience have heralded Google Scholar. Many websites from universities and nonprofit organizations are also included—most notably, the OCLC Open WorldCat, with millions of bibliographic records (Notess, 2005).

1.5.4. Predatory Impact Factor

In the context of open-access (OA) academic publishing, the mounting pressure across global academe to publish or perish has produced an exponentially growing number of untrustworthy academic e-journals charging high fees to authors, promising super-fast processing and publication open-access (OA) online. Jeffrey Beall on his personal website *Scholarly Open Access*, has characterized this phenomenon as ‘predatory OA publishing’.

With the growing expansion of and reliance on the Internet, a new form of impact factor metrics has also emerged, either due to regulatory limitations or due to difficulties in dealing with political correctness and sensitivity of these issues among scientific community. Jeffrey Beall on his scholarly blog terms it as ‘predatory impact factor’. Interestingly, these impact factor companies that claimed to calculate impact factors for scientific journals are not registered anywhere by anyone. However, some

of these companies when asking journal evaluation fees using Paypal, have made it easy to identify who is running this fake company, even when trying to hide their identity using "privacyprotect.org". More interestingly, these fake companies chose the name of their companies like "Institute for Scientific Information," which obviously attempts to mimic the reputation of Thomson Reuters, and calculate metrics for the journals including "Total Cites," "Impact Factor," "5-Year Impact Factor," "Number of calculated articles," "Cited Half- life," and "Article Influence TM Score." Beall, in his blog: "Impact Factor Confusion," claims that the competition among predatory publishers is increasing, especially among the hundreds of predatory publishers and journals originating from South Asia. There are so far 34 impact factor measuring system so far identified in Beall's misleading metrics (<http://scholarlyoa.com/other-pages/misleading-metrics/>). The recent research by Jalalian and Mahboobi (2014), uncovered that cybercriminals have cheated thousands of professors and Ph.D. scholars (mostly from developing countries) and those who were in the urgent need of publishing their articles in journals that are covered by the Journal Citation Report (a Thomson Reuters product). Fake scientific journals targeted their potential victims using smart ideas both in web development steps, e-mail marketing and victim selections, thus making themselves hard to distinguish from authentic journals. Usually, the target groups of the cyber criminals are journals with low impact factors, because it would be difficult for the hijackers to convince the authors that a high impact factor journal invited them to publish their research work, with peer review process done within just a couple of weeks. Unfortunately, claiming a low impact factor (> 0.0) on the fake website proved sufficient for authors who were trying to get their work published in a Thomson Reuters indexed journal in the shortest possible time (Jalalian & Mahboobi, 2013; 2014).

1.6. Journal Selection Process of various International Databases

1.6.1. Thomson Reuter *Web of Science*

Thomson Reuter is one of the information proceeding companies publishing Journal Impact Factor every year by selecting high quality peer-reviewed journals from all over the world and disciplines. They have followed certain evaluation processes to include journals in *Web of Science*. According to James Testa, Vice President of Thomson Reuter, the Thomson Reuters editors who perform journal evaluations have educational backgrounds relevant to their areas of responsibility. Because they monitor virtually every new scholarly journal published, they are also experts in the literature of their fields. The evaluation of a journal for coverage in *Web of Science* begins with the submission of current issues. The publisher must deliver three consecutive current issues, one at a time as they are published, to Thomson Reuters. Issues may be submitted in print, online, or both. According to Testa, each year, the Thomson Reuters editorial staffs review over 2,000 journal titles for inclusion in *Web of Science*. Out of which 10-12% of the journals evaluated are accepted for coverage. Moreover, existing journal coverage in Thomson Reuters products is constantly under review.

In order to evaluate journals, the journal's basic publishing standards, its editorial content, the international diversity of its authorship, and the citation data associated with it are all considered.

Basic publishing standards include timeliness, International Editorial Conventions, language of publication (only English), peer review are considered. Under editorial contents, Thomson Reuters editors determine if the content of a journal under evaluation will enrich the database or if the topic is already adequately addressed in existing coverage. For evaluating international diversity, editors look for international diversity among the journal's contributing authors, editors, and editorial advisory board members.

For citation counting, all cited references from every item in every journal covered in *Web of Science* are indexed whether or not the cited work is also covered as a source publication. While counting citations, disciplinary differences are taken into consideration. Further, for citation analysis Thomson Reuter looks for citations to the journal itself, as expressed by impact factor and/or total citations received. For new journals that do not yet have a citation history at the publication level, analysts examine the citation record of the contributing authors and editorial board members (Testa, 2016).

1.6.2. SciVerse's SCOPUS

The SciVerse Scopus is another leading indexing service which is maintained by Elsevier. International experts with a transparent selection processes and an independent review board reviews new titles using both quantitative and qualitative measures. The following criteria are evaluated for inclusion of journal in their database.

Category	Criteria
Journal Policy	Convincing editorial policy Diversity in geographical distribution of editors Diversity in geographical distribution of authors Consist of peer-reviewed content and have a publicly available description of the peer review process Cited references in Roman script English language abstracts
Content	Academic contribution to the field Clarity of abstracts Conformity with the journal's stated aims and scope Readability of articles
Journal Standing	Citedness of journal articles in Scopus Editor standing
Regularity	No delay in the publication schedule
Online availability	Online content available English language journal home page available Quality of journal home page

Source: <https://www.elsevier.com/solutions/scopus/content/content-policy-and-selection>

1.6.3. Indian Counterpart

Indian Citation Index:

The *Indian Citation Index* (ICI) was developed by "The Knowledge Foundation" in association with Diva Enterprises "to develop, preserve, disseminate and serve customized knowledge products and services to scholarly world". It includes nearly 1000 journals encompassing all disciplines of academic research with an intention to provide a platform for all local journals of India that are yet to be included in JCR. As claimed ICI, "The ICI database enables access and empowers users to search, track, measure and collaborate in the sciences, social sciences, arts, and humanities to turn raw data/information into the powerful knowledge one needs".

Journal impact factor is predominantly used as a measure of marking the quality of journal and article. Along with SJR, SNIP, a long list is available to measure the scientific quality of journals too, however, most of the scientific journals originated from India are yet to be indexed in JCR, SNIP, SJR. The *Indian Citation Index* only measures the citations of an article, the scientific quality or impact factor of any journal is not measured by ICI. Therefore, there is a need to develop an alternative mechanism. The present study attempts to develop a mechanism to calculate the scientific value of journals being published in India in the fields of physics, chemistry and biology.

1.7. Objectives of the present study

The specific objectives of the present project were:

- To trace, and track the growth of scientific journals of India under physics, chemistry and biology (PCB) disciplines, and to identify its present status;
- To evaluate the scientific value of PCB journals by developing an alternative mechanism which is not necessarily by counting citations;
- To develop a decentralized web-interface for delivering research output to a wide audience.

1.8. Scope of the Study

Physics, chemistry and biology have long tradition in Indian science. As per Thomson Reuter's *Bibliometric study of India's Scientific Publication outputs during 2001-10: Evidence for Changing Trends* (2010) chemistry, physics, materials science, engineering and clinical medicine are the active areas of research outputs from India during 2001-2010. As per SJR of SCOPUS, the relative position of Indian scientific research in 2013 as compared to 2003 is improving. Chemistry secures 3rd position in 2013, raised from 8th position in 2003. Physics holds 7th rank, raised from 12th position in 2003, however for life sciences slipped to 10th rank in 2013, one rank behind 9th in 2003. Keeping this in mind, for the purpose of the present study with the limited time span, we have selected three fields of pure science and identified journals of these three fields. These fields are: physics, chemistry and biology.

1.8.1 Extension of the fields of physics, chemistry and biology

All the fields of physics, chemistry and biology, are extended into a vast number of sub-fields and -disciplines. For the purpose of the present study we have considered journals that were published under following sub-fields of each main field:

Physics

- Acoustics, Applied Physics, Astrophysics, Atomic Physics, Classical Physics, Condensed Matter Physics, , Cryogenics, Energy, Geophysics, Mathematical & Theoretical Physics, Mechanics, Molecular & Chemical Physics, Nuclear Physics, Optics, Particles & Fields, Radiology, Radio and Space Physics, Solid, Fluids & Plasma Physics, Theoretical Physics, Water/ wavelet

Chemistry

- Analytical Chemistry, Applied Chemistry, Biochemistry, Electrochemistry, Environmental Chemistry, Experimental Chemistry, Geochemistry, Hetero-cyclic Chemistry, Inorganic Chemistry, Material Chemistry, Nuclear Chemistry, Organic Chemistry, Physical Chemistry, Polymer Chemistry, Theoretical Chemistry, Spectroscopy

Biology:

- Anatomy, Animal Sciences, Botany, Cell Biology, Ecology and Evolutionary Biology, Genetics, Molecular Biology/Biochemistry, Physiology, Zoology, Entomology, Mycology, Palynology, Virology

1.8.2. Categories of scientific publications included

The purpose of the project is to analyse *scientific value* of Indian journals being published in India. We have limited the study to articles in international peer-reviewed journals only. Therefore, we have only included full papers (regular articles), publications such as letters, editorials, corrections, book-reviews, meeting abstracts, books and articles in books published by publishing houses, popular science articles, reports, and book reviews are outside the scope of our study. We have also excluded articles in conference proceedings, due to the fact that it is often difficult to determine whether a conference contribution has been published or not and whether it has been published as an abstract or a full paper. The articles in conference proceedings are also often published as journal papers later, although this is not always the case, particularly in technology-oriented fields. To our understanding, journals represent the channel where the large majority of the original research results are published.

1.9. Data & Methods

In order to reach the objectives of this study, a number of methods have been tried out during the course of this study. Since this study has been designed to assess the availability, quality, and scientific value of Indian origin journals in the field of physics, chemistry and biology, we applied survey techniques for three occasions: identification, verification and evaluation. For identification we have consulted:

- IndianJournals.com,
- Indian Citation index,
- Web of Science,
- SCOPUS,
- EBSCOhost,
- J-Gate,
- Database of Indian Journals of DST and
- DAOJ.

For verification we have visited libraries of 10 Academic/Special institutions and verified the journal collections of those libraries. These Libraries are:

- Banaras Hindu University, Varanasi,
- IIT, Kharagpur,
- Guru Ghasidas Vishwavidyalaya, Bilaspur,
- Dr. H.S. Gour Vishwavidyalaya, Sagar
- Pt. Ravi Shankar Shukla University, Raipur,
- Kalyani University, Kalyani
- Hyderabad University, Hyderabad
- Nagpur University, Nagpur
- Jiwaji University, Gwalior
- Purvanchal University, Jaunpur

By consulting these sources and libraries we have identified 45 physics journals, 47 chemistry journals and 104 biology journals.

In order to develop a mechanism for evaluation of Indian journals, we have consulted several international databases and studied their policies for inclusion of journals in their database. Databases like WoS, SCOPUS, Indian Science Abstracts, DOAJ, SciELO, etc. were consulted for this purpose. The consultation of various databases led to a better understanding of the essential issues for evaluation of journal and accordingly to develop a conceptual framework for measuring quality of Indian journals.

These databases also help to:

- provide an overview of the different types of actions carried out and objectives of these actions;
- provide information about what can be measured, and what cannot be measured; and
- provide an idea that although the database is a useful tool for analysis, it is not a 'holy grail' for measuring scientific value for Indian journals

In addition, we have also consulted various web sources to understand the indicators of judging open access quality publishing. These web resources are:

- a. Grand Valley State University Indicators [<https://www.gvsu.edu/library/sc/open-access-journal-quality-indicators-5.htm>].
- b. Boatwright Memorial Library Quality Indicator [<http://libguides.richmond.edu/journalquality>]
- c. Boston College Libraries Journal Ranking [<http://www.bc.edu/libraries/newsletter/2012summer/quality/>]
- d. The University of Chicago Library's Evaluating a journal for quality [<http://guides.lib.uchicago.edu/journal-article-evaluation#s-lg-box-6058592>]

On the basis of our observations, we have developed a set of 30 criteria. All these criteria are stored in a MS-Excel sheet. The details of these criteria are explained in Chapter 2. For the purpose of our study we have conceptually grouped our criteria into four general categories: 1) Basic Information, 2) Essential Information, 3) Subsidiary Information and 4) Publisher Information. All the 30 criteria are divided under these four categories.

After developing these criteria, we have tested our criteria with 3 highly reputed (having top range impact factor in JCR) journals, 1 each from physics, chemistry and biology and 3 comparatively low reputed (having least range impact factor in JCR) journals 1 each from physics, chemistry and biology to judge how far these criteria are useful and applicable.

Of the total identified 196 journals in the fields of physics, chemistry and biology as mentioned earlier, 32 physics journals, 43 chemistry journals and 60 biology (out of 83 journals) journals were considered for detailed analysis. All these journals were live at the end of 2014. The official website of these 135 journals was consulted and we gathered data as per developed criteria. Journals which have at least an ISSN number have been considered as eligible to be included in our investigation. All the evaluations are based on the characteristics of publications observed during the last five years. We tried to include as many factors as possible, which are likely to affect the quality of publishing.

Simultaneously, we have also developed a decentralized website, the Journal Quality Indicator of India, accessible at the: www.jqii.in. The functionality of the website is described in Chapter 2.

The criteria we developed were both qualitative and quantitative in nature. For the purpose of calculating the scientific value of the Indian journals we have developed a scoring mechanism and quantify all qualitative features in certain scores. We believe that:

- **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.
- By publishing an article, authors usually gain some value (e.g. better career opportunities and advancement, CV fortification, etc.), but authors should also be aware of the costs and quality control involved in the publishing process, as those also play a role when judging the value gained from that publication.

- **In the scholarly communication process, transparency in publication is essential as it is often subject to human and computer flaws. No publisher is born experienced or perfect; nor is the author born knowledgeable.** So, there is always a place and need for improvement for both the authors and the publishers.
- **Among the factors for measuring quality, there are no neutral factors. Every factor has a relative weight, as well as positive and negative value. Just because a publisher or publication has a negative score this does not necessarily imply that the publisher and publication is poor.**

1.10 Limitations of the Study

The limitation of the present study may be presumed to be as follows:

The present analysis is based on 32 physics journals, 43 chemistry journals and 60 biology journals that we were able to trace within the stipulated time of research. However we expect that there will be a much higher number of journals currently being published in each of these three fields. Therefore, findings of the present study cannot be generalized for whole PCB field. However, we expect that our study has an indicator of the overall status of the PCB journals in India.

We believe that checking originality of any research article is only possible with the subject experts of the field. Therefore, our attempt to measure the scientific value of journals is not based on article's quality rather qualitative features of any journal. Attempts were only made to develop a mechanism to understand the facets that are essential for qualitative journals.

In spite of our several efforts we were unable to gain opinions from prospective authors and publishers of PCB journals in India. Non-availability of such figures left us unable to fully understand the problems and prospect of publishing in India in the fields of PCB.

Chapter II – Measuring Scientific Value of Indian Science Journals through JQII

2.1 Scientific Publishing in India

India, has a vibrant publishing industry and has 15,000 registered publishers with an annual production of 22826 journals (as on July 2016) in 24 official languages (ISSN National Centre). To meet the emerging challenges, to find suitable solutions, and to explore new frontiers, research in India has emerged as a vital dimension in different spheres of national endeavor since independence (Mangi, 2014). On the basis of Thomson Reuter's *Bibliometric study of India's Scientific Publication outputs during 2001-10: Evidence for Changing Trends* the growth rate of scientific publication from India is about "66% between 2006-10 relative to 2001-05 period and average growth rate of about 13% per year". The study also reveals that "chemistry, physics, materials science, engineering and clinical medicine are the active areas of research outputs from India during the study period". The report also promulgated that India has a 3.5% of global share in scientific articles and holds 9th rank in the world with respect to scientific articles in SCI journals.

Similarly, as per Elsevier Report 2016 "India's scientific publications grew 13.9%, as against the global average of 4.1%, between 2009 and 2013. The study looked at the publication output of researchers covered under Elsevier's Scopus database, which covers 60 million documents published in over 22,000 journals, book series and conference proceedings by nearly 5,000 publishers. The study looked at the work of 366,455 active researchers who are working with or are affiliated to Indian institutions [<http://www.livemint.com/Politics/Sy9JEwRdWoviwnxHIB4u4N/Engineering-is-most-impactful-field-of-research-in-India-re.html>].

As per country ranking of SJR, overall ranking of India in the world in scientific publication is counted at 7th position in 2013. If we check for specific subjects, in chemistry India secures 3rd position raised from 8th position in 2003. In physics it holds 7th rank, raised from 12th position in 2003 and for life sciences it gained 10th rank in 2013, one rank ahead 9th in 2003. This shows slow but steady improvement of India in its position in sharing scientific research around the globe.

As per the SCOPUS database, research output increased by 85% from 35,419 in 2005 to 65,487 in 2010. Similarly, it increased by 56% from 26,093 in 2005 to 40,711 in 2010 as per the SCI database. During 2006-2010, India's growth rate of scientific research publication was 12% and 10% as per the SCOPUS and SCI database respectively as against the world average of 4%. (Research and Development statistics at a Glance, 2011-2012, DST, Govt. of India).

2.2 Need for knowing 'scientific value' of Indian journals

Although in the past two decades India has been rapidly increasing its share in global scientific publications, the actual number of journals included in the reputable databases like Thomson Reuters (*Science Citation Index Expanded*) and Scopus is quite unsatisfactory. The table given below explains the coverage of Indian journals in WoS and Scopus Database in 2011 and compared with 2015.

Coverage of Indian journals in Web of Science and Scopus in 2011.

No. journals indexed in WoS	No. journals indexed in Scopus	No. journals repeated in WoS and Scopus	No. of unique journals indexed in WoS	No. unique journals indexed in Scopus.
269*	298	98	171	200

*As per SCIE, 2015, total number of Indian Journals are 112 Source: Nagaraja and Vasanthakumar (2011).

There are big differences between fields too. Only 4 physics journals, 3 chemistry journals and 7 biology journals in the Science Citation Index Expanded (up to August 2015), and 14 physics journals, 24 chemistry journals and 52 biology journals are indexed in Scopus. Of these journals, 3 journals of physics, 2 journals of chemistry, and 4 journals of biology are indexed in both SCIE and Scopus. On the other hand, in the present investigation we have identified 45 physics journals, 47 chemistry journals and 104 biology journals that were live up to 2013. For this reason it is vital to know what scientific value these journals have that are not indexed in either of these two databases. As the existing policies of Thomson Reuters and Scopus may not benefit most of these journals, there is a need to develop an alternative mechanism so as to understand the quality or scientific value of these journals.

2.3 Developing a new system 'Journal Quality Indicator of India' (JQII) for measuring scientific value

Journal Quality Indicator of India (JQII) is an outcome of a research project aimed at introducing a mechanical system for assessing the scientific value of India journals. It does provide an opportunity to identify the scientific value of those journals which are yet to be indexed in JCR. The mechanism of the scientific journal value assessment that we adopted here is based on certain criteria. As these criteria are mostly qualitative in nature, so it is named as Journal Quality Indicator. Additionally, we have attempted to convert the qualitative features of any journal into quantitative values (either a positive or a negative value) by attributing the appropriate scores (ranging from 0.001 to 0.1).

The table, below, indicates the criteria we have developed to measure the quality of Indian journals irrespective of the whether they are included in *Web of Science* or *Scopus*. As mentioned earlier all these criteria are grouped in to four categories: 1) Basic Information, 2) Essential Information, 3) Subsidiary Information and 4) Publisher Information. While basic information provides general information related to publication history, availability, pricing type etc. of a journal, the essential information enables the reader to decide how far the journal is qualitatively strong. It includes regularity and promptness in publication, actual review policy followed, number of articles published in each issue, originality of article, expertise involved in editorial process, coverage in indexing and abstractive databases and ability to attract citations. The subsidiary and publisher information helps to indicate what policy journal publishers followed to receive, deliver and archive articles.

2.4 Criteria & Scoring Techniques of JQII for deriving scientific value of Indian Journals

S. No.	Criterion	Explanation	PS	NS	Remarks
A. Basic Criteria					
1	ISSN	Print			Journals without an ISSN are not considered. No score is assigned for journals having no ISSN number.
		Online			
		Same ISSN for Print and Online both		-0.01	Negative score of (-0.01) if the ISSN is same for both print and online versions of the journal.
		Whether available for "Online first"(once all proof process complete, publishing article online first without assigning volume no., issue no. page no. etc. of the article, usually 2-4 months, prior publishing in standard format with volume no., issue no and page detail	0.01		0.01 assigned if 'Online First' available. Two conditions are required for considering an issue as 'Online First'. 1. The full text article should be available (may be on authentication); 2. There should not be any pagination, volume and issue for the articles, however may have DOI. No marks assigned for those articles where only the abstract is treated as 'Online First'.
2	Name of the journal	Does the title of the journal is the verbatim or mimic any other journal?		-0.01	On searching the web if the name of the journal appears verbatim on another reputed journal (comparatively old), negative score of (-0.01).
		Whether the journal is multidisciplinary in nature?		-0.01	Negative score of (-0.01) if the name of the journal is from one discipline but it covers other broad subject areas.
		Does the title match the scope/mission?		-0.01	Scope of a journal has been given a negative score of -0.01 if the title does not match with the scope of the journal.
3	Brief About the journal	Whether at least a very brief detail about the journal including its history, scope and coverage is available clearly and accessible clearly?		-0.1	If brief about the journal (objectives; aims; about the publishing history) is not available then negative score of (-0.1) has been assigned.
4	Longevity	Years of existence of a journal since its beginning.	Open		0.5for 10 years of existence, 1 for 30 years of existence and 1.5 for >50 years of existence.
5	Presence over internet	Does the journal have website or not?	0.01	-0.01	If the journal has a web address then a 0.01 score is given and if not negative score (-0.01) is given.
		If the web address given for the journal is functional or not?	0.01	-0.01	On randomly searching if all links found are functional, especially for archival links then positive score added. In case where 30% or more of such links are found non-functional then negative score of (-0.01) has been assigned.

PS = Positive Score, NS= Negative Score

6	Accessibility	In what format is the journal is available? Whether Print only or Online only or in both formats?	0.01	-0.01	If the journal is available only in print form then negative score of (-0.01) has been assigned. However, if the journal is available in print and electronic and articles can be accessible on web in full text, positive score added. The accessibility of a closed access journal has been confirmed through the tab .pdf/.html of the articles.
7	Availability	Open or Closed Access	0.1	-0.1	Positive score for open access and <i>vice versa</i> a negative score if closed access.
8	Pricing Type	What is the Pricing type of the journal? Whether the journal is available for free or subscription based; or online free but print subscription based or both subscriptions based or APC based?			
8.1		If APC based, does it clearly mention the amount and mode of payment in the journal documentation? Does the journal ask for payment to a personal account?		-0.1	In both the cases if the amount is not clearly mentioned or the journal asks money after publishing then a negative score of (-0.1) is assigned. Further if the journal asks for payment to a personal account a separate negative score is also assigned.
B. Essential Information					
9	Regularity & Promptness	Missing Issue? Combined Issue? Late issue?	0.1	-0.01	In case the publication pattern, over the last 5 years the publication is found to be uninterrupted, 0.1 added. However, if any of such case is found in last five volumes of a journal then a negative score of (-0.01) is assigned for each case.
10	Review Policy of the Journal				
	Whether the Review Policy of the Journal is mentioned or not?			-0.1	If review policy of the journal is not mentioned clearly in the documentation of the journal then a negative score of (-0.1) has been assigned otherwise no score.
	If mentioned, whether it is in detail or short?		0.01		If the review policy is mentioned in detail then a 0.01 score is added.
	Review policy is mentioned for all or author only?		0.01		If the review policy of the journal is mentioned for all (editors; reviewers and authors) then a 0.01 additional score has been assigned however if not mentioned for all then no score has been deducted.
	Whether there is any false information about the reviewers?			-0.1	Journal's reviewer information is mostly unavailable. However, if any falsified information about reviewer is found then negative score of (-0.1) has been assigned.

11	What is the nature of the journal's review policy?				Confirming review policy as claimed by the journal in its documents is a difficult task. An alternative mechanism is adopted by cross-checking of the article, abstract, reference.																																								
11a	Cross Checking of Review policy	Deviation in text length?	0.1	-0.01/ -0.1	Of the total of 20 selected articles (through systematic sampling) if the abstract length, article length and reference number of 50% articles comes below the corresponding lower boundary of the quartile then a negative score of (-0.01) has been assigned, otherwise 0.1 is added. Here higher bound has not been considered for scoring.																																								
		Deviation in abstract length?																																											
		Deviation in reference number?																																											
		Uniformity in reference pattern?	0.1	-0.01		On checking 20 randomly selected articles, if references are found asymmetrical by each other, either in same article or two different articles of a same journal, then a negative score of (-0.01) has been computed, otherwise if such uniformity found a 0.1 positive score has been assigned.																																							
	If any standard pattern is followed for references?		-0.1	On checking 20 randomly selected articles, if references are not found as per the declared format of the journal then negative score of -0.1 is assigned, otherwise no score.																																									
12	Articles per issue	Verify number of the articles per issue with its stated frequency			Scoring have been performed on the basis of number of articles per issue against the frequency of the journal: <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Monthly</th> <th>Four Issue per year/Quarterly</th> <th>Three issues</th> <th>Half-yearly</th> <th>Yearly</th> </tr> </thead> <tbody> <tr> <td>Articles (Score)</td> <td>Articles (Score)</td> <td>Articles (Score)</td> <td>Articles (Score)</td> <td>Articles (Score)</td> </tr> <tr> <td>0-4 (0.02)</td> <td>0-4 (0.01)</td> <td>0-4 (0.005)</td> <td>0-4 (0.001)</td> <td>0-4 (0.001)</td> </tr> <tr> <td>4-10 (0.03)</td> <td>5-10 (0.02)</td> <td>5-10 (0.01)</td> <td>5-10 (0.005)</td> <td>5-15 (0.005)</td> </tr> <tr> <td>10-15 (0.01)</td> <td>11-15 (0.03)</td> <td>11-15 (0.02)</td> <td>11-15 (0.01)</td> <td>16-25 (0.01)</td> </tr> <tr> <td>>15 (0)</td> <td>16-25 (0.01)</td> <td>16-25 (0.03)</td> <td>16-25 (0.02)</td> <td>26-40 (0.02)</td> </tr> <tr> <td></td> <td>>25 (0)</td> <td>25-40 (0.01)</td> <td>25-40 (0.03)</td> <td>>40 (0.001)</td> </tr> <tr> <td></td> <td></td> <td>>40 (0)</td> <td>>40 (0)</td> <td>0-4 (0.001)</td> </tr> </tbody> </table>	Monthly	Four Issue per year/Quarterly	Three issues	Half-yearly	Yearly	Articles (Score)	Articles (Score)	Articles (Score)	Articles (Score)	Articles (Score)	0-4 (0.02)	0-4 (0.01)	0-4 (0.005)	0-4 (0.001)	0-4 (0.001)	4-10 (0.03)	5-10 (0.02)	5-10 (0.01)	5-10 (0.005)	5-15 (0.005)	10-15 (0.01)	11-15 (0.03)	11-15 (0.02)	11-15 (0.01)	16-25 (0.01)	>15 (0)	16-25 (0.01)	16-25 (0.03)	16-25 (0.02)	26-40 (0.02)		>25 (0)	25-40 (0.01)	25-40 (0.03)	>40 (0.001)			>40 (0)	>40 (0)	0-4 (0.001)
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		>40 (0)	>40 (0)	0-4 (0.001)																																									

PS = Positive Score, NS= Negative Score

13	Originality in articles?	If the articles of the journal are original or plagiarized?	0.5	-0.1	On checking 20 randomly selected articles, if the percentage of duplication shows less than 20% then 0.5 is added. However, if such duplication shows more than 30% of an individual article (excluding self-citation, quotations, references), a negative score of (-0.1) has been assigned.
14	Editorial Quality				
	Configuration of the editorial board				
		Separate editors for each section?	0.01		If there are separate editors for different sections then additional score of 0.01 is added, otherwise no score has been assigned.
		Address of Editorial Board is searchable through Search Engine or not	0.01	-0.01	If the full identity (designation, affiliation and contact details, etc.) of board members is obtainable or searchable, 0.01 is added and if not then a negative score of (-0.01) has been assigned.
		Any falsified information about the members of editorial board?		-0.01	On cross checking if any falsified information related to designation, affiliation etc. about the editorial members is found then a negative score of (-0.01) is added. (Randomly selected 10 names have been considered for cross checking and scoring).
		International members in the editorial board?		-0.01	In case the journal's editorial board consists of members from foreign countries, then 0.01% of the total percentage of the foreign member has been added under positive score.
		Belonging countries of the international members?	Open		On grouping countries in three categories, following score is assigned: Category A - 0.03, B- 0.02, C- 0.01, D- NIL. No score is assigned when only name of the editor is mentioned however, the belonging country is not mentioned.
	Members from same organization?		-0.03 to -0.01	If there are >50% members are from same organizations then negative score of (-0.03), and if in between 21-50% then 0.02 is assigned. And if <20% but greater than 10% then 0.01 and within 10% then no deduction has been made.	
15	Editor-in-Chief				
		Identity of the Chief Editor		-0.01	If the name of the chief editor is mentioned then no score is given but if the name is unavailable then negative score of (-0.01) has been assigned.

	Designation/ Organization	0.01		If the affiliation of the Chief-editor is academic and working as at least in the rank of Associate Professor then a positive score of 0.01 has been augmented otherwise no score.
	Name searchable	0.01	0.01	If the name of the chief editor is searchable through search engine (Google) and of the total first 10 results, his/her name appears except from social networking websites then positive score of 0.01 added. If the name appears only from social networking websites and does not appear in first ten results then a negative score of (-0.01) has been assigned.
	Expertise in year and Subject expertise	0.01		If the Editor-in-Chief is qualified (at least a Ph.D. holder in the concerned subject of the journal) and he/she have a sound experience in editing journal of more than 5 years then a positive score of 0.01 otherwise no score has been assigned.
	Does the Editor-in-Chief have any h-index?	0.1		If the Editor-in-Chief has h-index in Publish-Perish service then a positive score of 0.1 has been assigned.
	Publication profile of Chief Editor	0.01		If the publication details of the Editor-in-Chief is available then additional positive 0.01 score, if not then no score.
	Publications are indexed in conventional databases?	0.01		If randomly selected 10% of the total publications of chief-editor of a journal are found published in journals indexed in ISI then additional positive score of 0.01 has been assigned, otherwise no score is given.
	Total no. of publications in the same journal		-0.01	If more than 10% of the articles of the chief-editor of any journal published in the same journal where (s)he serves as editor, a negative score of (-0.01) has been assigned.
	Whether Editor serve as Editor in more than two journals		-0.1	If same editor servers as editor of more than two journals negative scoring has been assigned.
16	Indexing Database Coverage & Citation Impact			
	Conventional Databases included?	Open	-0.1	The entire subject databases are categorized into three categories (A, B and C). In cross checking if the journal is found included in the databases mentioned in documentation then positive score for Category A - 0.3, Category B - 0.2, Category C - 0.1 has been assigned. Any falsified information leads to negative score of (-0.1).

	Citation received by the total articles published in journal in last three years?	Open		10% of the average citation received by the articles published in last three years (2011-2013)
	Foreign contributors in the journal.	Open		The score has been calculated by taking 0.1% of the average foreign contributors in last five years (total contribution others than India/Total Contributors * 100).
	Whether any falsified information is available?		-0.1	If any falsified information found regarding inclusion in database of the journal then negative score is assigned.
C. Subsidiary Information				
17	Journal Quality			
	Standard pattern (Expressive Title, Author name with address & Email ID, Abstract, Keywords, Introduction/Background, Objectives, Methodology, Results, Findings, References)of article		-0.01	If most of the articles (>90%) follow standard pattern then no score and if not then a negative score of (-0.01) is assigned.
	Author guidelines available or not		-0.01	If author guideline available then no score and if not available then negative score of (-0.01).
	If available, original or copied from somewhere else?		-0.01	If the author guideline is original then no score and if copied then negative score (-0.01) is assigned.
	Process of article submission	0.01	-0.01	If ESS process is available for submission then positive score of 0.01 and if only print submission is allowed then a negative score of (-0.01) is assigned.
	Article tracking process	0.01		If article tracking facility is available then 0.01 and if not available then no score has been assigned.
	Acceptance and rejection rate	0.01	-0.01	If acceptance and rejection rate is mentioned of the journal then 0.01 score and if not then negative score of (-0.01).
18	Article Quality			
	Expressive titles of the articles		-0.01	If most of the articles (>90%) have expressive titles then no score and if not then negative score of (-0.01) is assigned.
	Keywords of the article		-0.01	If most of the articles (>90%) have keywords then no score and if not then negative score of (-0.01) is assigned.
	Authors address and email		-0.01	If most of the articles (>90%) have author address and email then no score and if not then negative score of (-0.01) is given.

	Article publishing history (submission, revision, acceptance)	0.01	-0.01	If the articles (>90%) have article publishing history then 0.01 score and if not then negative score of (-0.01) is assigned.
	Digital Object Identifier (DOI)	0.01	-0.01	If DOI/QR is available for the articles then 0.01 score and if not then negative score of (-0.01) is assigned.
	Time lag in publication		-0.01	If the time lag in publication for 20 articles is more than 3 months (for online) and 6 months (for print) then negative score of (-0.01).
	Rapid publication facility available		-0.01	If the journal have a facility of publishing article in less than 4-5 weeks then negative score of (-0.01)
19	Data handling process of the Journal			
	Text handling			Only to record how many formats are .doc, .pdf, .rtf are available.
	Graphics handling			Only to record how many formats for graphics are available.
	Colour Illustrations in the journal accepted	0.01		If colour illustrations are accepted for the print edition then positive score of 0.01 otherwise no score.
	If yes, does it accept charges for colour illustration		0.01	If the charge, accepted for colour illustrations is very high (>1000 INR/per object) then -0.01 otherwise no score.
	Number of scholarly forms of text available in the Journal	0.01		In case more than one format is available then positive score of 0.01 has been augmented.
	Name of the scholarly forms of text available in the Journal			Only for gathering data.
20	Search Facility	0.01	-0.01	If searching facility is available then 0.01 score otherwise negative score of (-0.01) has assigned.
	Simple or advanced	0.01		If advanced search facility is available then 0.01 score and if only simple search facility is available then no score is given.
21	Journal usage statistics	0.01		If journal usage statistics is available then 0.01 score and if not available then no score is assigned.
22	Publication ethics	0.1	-0.01	If publication ethics is available in the documentation of the journal and if is a standard code of ethics then 0.1 score, otherwise negative score of (-0.01) is assigned.
	Journal's own ethics or standard code of ethics is followed?			
23	License agreement of article is available for OA?	0.01	-0.01	If the journal has an open access license agreement (Creative commons) then 0.01 score and if not then negative score of (-0.01) is assigned.
24	Excessive advertising		-0.01	If there are excessive advertisements in the journal then negative score of (-0.01) and if not then no score is added.

PS = Positive Score, NS= Negative Score

25	Email Id of the chief-editor/Journal		-0.01	If the email address of the editor-in-chief or journal is available for contact then no score and if not mentioned then negative score of (-0.01) is assigned.	
26	Commercial server for email		0.01	If the email address of the chief-editor is from journal's server then 0.01 score and if it is from commercial server then no score is assigned.	
D. Publisher's Information					
27	Name of the Publisher	Clearly mentioned or not?		-0.1	If the publisher's name is not mentioned clearly as "published by" then score is -0.1.
	Collaboration of the publisher	Collaboration with reputable publisher.	0.1		0.1 additional point has been assigned, if the publisher has joint collaboration with ISI indexed publisher.
	Nature of publishing body	What is the nature of the publishing body of the journal: Govt; Semi-government; Private; Society; Govt with commercial publisher.			No scoring, only for filling data.
	Registration information	And if is private in nature then its registration, purpose etc. details are available or not?	0.01	-0.01	In case the publisher belongs to private body, then availability of registration number of the society leads to positive score of 0.01 otherwise negative score of (-0.01) is assigned.
28	Activity of publisher	What activities are performed by the publisher of the journal? Does the publisher is involved in other academic activities rather publishing journals only?	0.01		0.01 point, if any other academic activities are performed by the publisher except journal publishing.
29	Archiving policy	Whether the publisher is registered with the Sherpa/Romeo Project for archiving policy.		-0.02	If the publisher is not listed in Sherpa/Romeo project then negative score of -0.02 has been assigned. If listed then positive scoring has been done according to its colour code: Green- 0.03, Blue-0.02, Yellow- 0.01, While- Nil.
30	Server/Website visibility and clarity				
	Top page hit of Google	Of the total 10 search results from Google the name of the publisher appears on which place.	0.01		On searching the publisher name on the search engine, of the total first 10 results, if name of the journal's publisher appears among the first two results then 0.01 score, otherwise no score.
	Total hits from Google	Of the total first 10 search results from Google the publisher gets how many hits.	0.01		Of the total of 10 search results, if the total hits for the name of publisher is more than 5 then positive score of 0.01 has been assigned otherwise no score is given.
	Number of In-Links	How many inbound links of the publisher's website has? This is calculated by putting a simple command link:domain.name.	0.01		0.01 point is added for every 20 in-links received by the web address of the journal.

2.4 Functionality of a newly designed Website of Journal Quality Indicator of India (JQII)

The web interface of the newly designed website of JQII features with pleasant look, and easy to use for all – prospective authors, librarians, policy makers and journal publishers. This web enabled decentralized system has the facility to capture factual data available in various journals and this system automatically count the final score. The system's technology stack comprises of 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 modules comprise sub-modules such as add, edit and activate operations for individual entities. The system also provides authority to activate / deactivate users. In this system, physics, chemistry and biology journals have been included, however we believe that these indicators can also be used to assess and analyse journals from any other scientific domain.

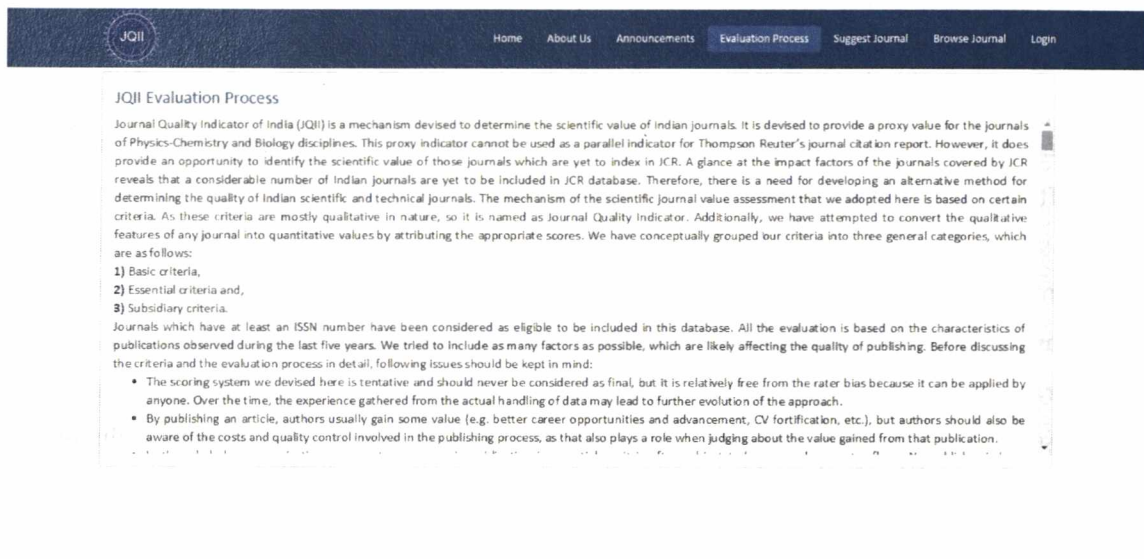
Screenshot 1: First Screen of Website – Journal Quality Indicator



This first screen provides a snapshot of our newly designed indicator. Through the 'Browse Journal' button one can search and understand the qualitative features of inputted journals. One tab browsing features helps the searcher to find a journal through any metadata like name, ISSN, publisher, keyword etc. The searched results appear with ISSN, journal name, publisher along with score (scientific value) of any journal. In this portal one can also suggest other journals for

evaluation and inclusion in the database. The administrator and moderator login menu is also available on the page.

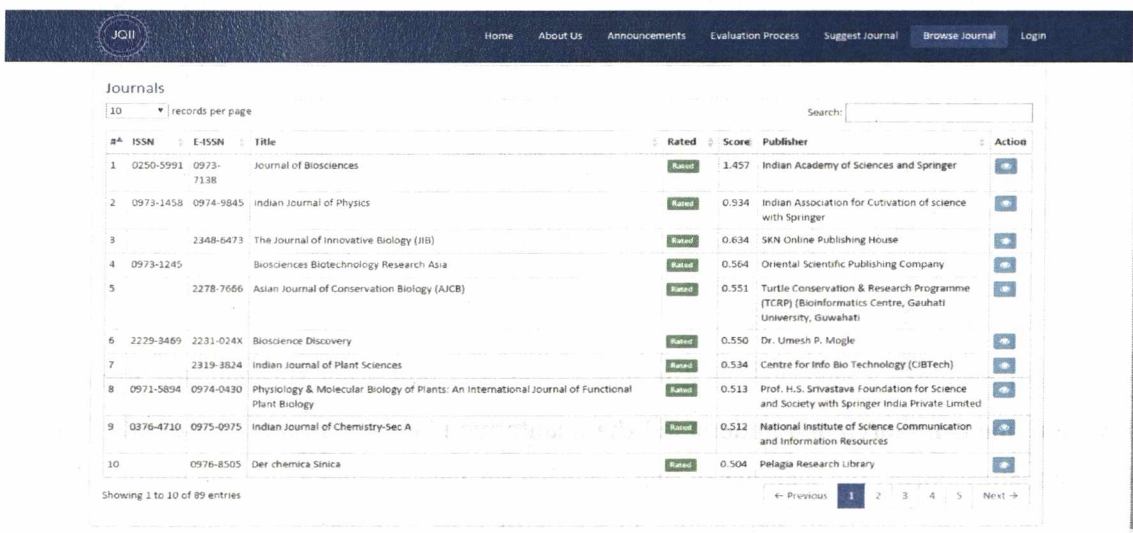
Screenshot 2: Describing the Journal Evaluation Process



The above screenshot belongs to the evaluation process tab. One can see the detailed methodology followed to measure the qualitative features of a journal in this tab. The scoring technique is also explained in this tab in detail.

Screenshot 3 shows the display screen of the browsed journals. It displays the ISSN, journal name, and publisher name along with score.

Screenshot 3: Showing Journals and their score



On clicking the view button on an individual journal the detailed data of any metadata (facet) becomes visible (screenshot 4). Here the qualitative features appear under four screens: Basic information, essential information, subsidiary information and publisher information.

Screenshot 4: Detail about Journal

View Journal - Journal of Biosciences Print

Title Journal of Biosciences
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Description Journal of Biosciences is a quarterly journal (March, June, September and December) published by the Indian Academy of Sciences, Bangalore, India. It covers all areas of Biology and is the premier journal in the country within its scope. Journal of Biosciences began in 1934 as Proceedings of the Indian Academy of Sciences (Section B). From January 2007, Journal of Biosciences is being co-published with Springer. (Source from journal website)

Web Address of the Journal <http://www.ias.ac.in/biosci/>

Whether Journal links are functional All Functional

Basic Information | Essential Information | Subsidiary Information | Publisher Information

Whether "Online First" available **yes** **Accessibility** Print & Online

Starting Year 1934 **Availability** Open Access

Frequency of the Journal Quarterly **Pricing Type** Online Free but Print subscription

Publisher Indian Academy of Sciences and Springer **If Online Free but Print Subscription based (Rs.)** 700

Status of the Journal Live

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To change/edit/modify/delete the value of any qualitative feature one has to login in the system (screenshot 5). There are two type of users. One is modertor who can only input the data but is not allowed to change data. The other type, i.e. the admistrator, have the capability to change, edit or delete the data as well as accept a request or suggesstion for inclusion of a new journal in the database, or to create new user, if needed.

Screenshot 5: Administrative Login Screen

Administrative Login Screen

Username

Password

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The screenshot 6 explains the various features of administrator screen.

Screenshot 6: Administrator's Dashboard

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#	ISSN / EISSN	Title	Score
1	0250-5991 / 0973-7138	Journal of Biosciences	1.457
2	0973-1458 / 0974-9845	Indian Journal of Physics	0.934
3	N/A / 2348-6473	The Journal of Innovative Biology (JIB)	0.634
4	0973-1245 / N/A	Biosciences Biotechnology Research Asia	0.564
5	N/A / 2276-7666	Asian Journal of Conservation Biology (AJCB)	0.551
6	2229-3469 / 2231-024X	Bioscience Discovery	0.550
7	N/A / 2319-3824	Indian Journal of Plant Sciences	0.534
8	0971-5894 / 0974-0430	Physiology & Molecular Biology of Plants: An International Journal of Functional Plant Biology	0.513

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2.5 Strategy to determine Journal quality

In the section 2.4, we have explained the detailed criteria through which an Indian journal may be studied for measuring its scientific value. In fact to know the correct score, or scientific value, it is recommended to analyse the journal thoroughly and accordingly a final score can be calculated. Below are a few crucial things for authors to consider during the pre-submission process:

- Have any of the colleagues from author's respective institution read, reviewed or published in that specific scientific journal?
- Where is the journal indexed? Can it be found via databases which stand as usual tool to access, use or find specific scientific information?
- Is it associated with a scholarly society familiar to the author?
- Are there any reliable metrics associated with the journal (traditional or alternative)?
- Who is the editor? Who is on the editorial board? Are the members of the editorial board familiar to the author itself? Is there any available information about them?
- Does the scientific journal come with the regular trappings of a serial publication (e.g. ISSN's, DOI's, etc)?

Below are other strategies important for the evaluator to evaluate the journal:

Select a journal → Identify at least 5 print issues of different volume number, if available in print, otherwise directly visit the official website of the journal and simultaneously open five issues in

different tabs → check whether the appearance of the five issues, format, style of printing articles, and quantity of articles in each issue are similar or differ significantly (a qualitative journal will always maintain its appearance, include roughly the same number of articles or follow an unique style manual) → check whether the journal claims to have an impact factor (IF of JCR not any other services) quite bold or in colour, if so, verify its indexing and abstracting coverage and confirm whether their claim is valid or inconclusive (in the case of inconclusive, or a false claim, it is unlikely to be a good journal) → check the year of first publication and confirm whether the journal has existed for more than five years, if the age of the journal is less than five years, check who the publisher of the journal is, whether it is being published by a reputable commercial publisher, or university or any academy. → Verify the regularity of its publication and number of times issues disappear or appeared in combination with more than one issue (every such instances indicates its improper management policy) → check the academic portfolio of the editor, experience in the field, and publication profile, if any → check the geographic diversity of the contributors and amount of foreign authors contributed articles in the journal in the last five years → check indexing and abstracting databases of the journal → verify the amount of citations it has received in the last 3 years.

Chapter III: Status of PCB Journals in India

3.1 Growth of PCB Journals in India

Table 2 explains the growth of physics-chemistry-biology (PCB) journals in India during the last seven decades. As indicated in table 1, the growth of journals in these three fields is almost equal or higher than previous decade, except from period 1991 to 2000. And, the growth rate from 2011 up to 2014 onwards is tremendous. It is expected that about 17 new journals will be added in physics, 52 new journals in chemistry and 145 new journals in the field of biology in the second decade of 21st century. This may be because of publication of journals in almost all fields in open access form.

Table 2: Cumulative Growth of PCB journals in India

Year of Publication	Physics	Chemistry	Biology
Up to 1950	3	3	13
1951-70	6	7	33
1971-90	24	16	82
1991-2000	31	21	105
2001-2010	59	39	178
2011 onwards	63	60	236

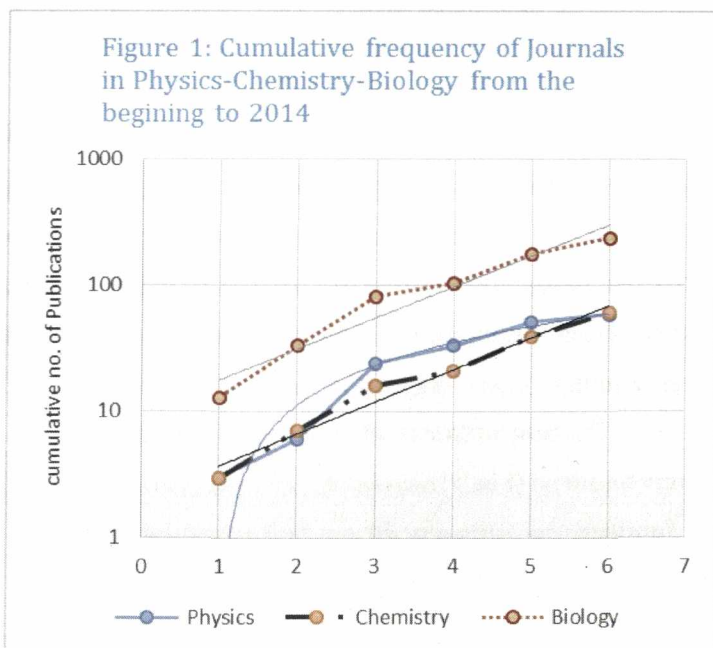


Figure 1 gives a semi logarithmic presentation of the cumulative number of the total number of journals in the fields of PCB from prior 1950 to 2014. The slope observed for physics is linear while for chemistry and biology, the slope is exponential. On the other hand, while the annual growth rate of journals for physics and chemistry is smaller, i.e. 11 and 11.4 per year respectively, for biology the annual growth rate is almost 43 journals per year. The finding of our study

contrast with the study of De Sola Price's *Little Science Big Science*, where he identified that the annual growth rate of scientific publication all over the world was 4.73% and there is an indication of decreasing of publication after 1950-1960. However, we observed that publication in peer-reviewed journals is still increasing. There are no indications that the growth rate has decreased in the last 50 years in the context of Indian science.

Table 3 presents the current status of publishing in PCB. As indicated in table 3, between 2013 and 2014, i.e. in a single year, 29% of physics journals, 11% of chemistry journals and 21% of biology journals have been suspended or stopped publication. Of the total living journals up to

2014, more than 50% of journals in two disciplines (except biology) are now available in open access form. Considering the fact that open access is a model for publishing that began in mid of 1990s, it is interesting to note that the growth of open access journals has been much faster than for subscription journals.

Table 3: Present Status of Journal Publishing

Status	Physics	Chemistry	Biology
Live up to 2013	45	47	104
Live up to 2014	32 (71.1%)	43 (89.3%)	83 (79.8%)
Open access journals	23 (71.87%)	32 (74.4%)	39 (65%)
Journal considered for analysis	32	43	60

In order to perform further analysis in our limited time period we have considered journals in each discipline as mentioned in table 3. For selecting journals in biology, we have adopted a mechanism so that there must be at least 5 journals from each decade and there should be an equal number of open and closed access journals in the total sample. Whenever possible, we choose journals that are being published by different publishing groups rather than journals that are being published by same publisher. By this way our sample in biology reached to 60 journals.

3.2 Regularity and Promptness of Publishing

The table 4 shows the regularity and promptness in publishing. As indicated in table, biology (44%) journals are more irregular than physics (29%) and chemistry (11%) and published combine issue several times (29 times). On the other hand, 13 journals (30%) of chemistry almost missed 48 times to publish issue in the stated publication cycle. It is important to note that publishing journals regularly without delays, without combining issues and maintaining periodicity are important towards enhancing the quality.

Table 4: Regularity and Promptness of Publishing

Status	Physics (journals)	Chemistry (journals)	Biology (journals)
Number of journals not maintained publishing frequency as stated (last two issues)	09	05	25
Number of times combined issues came (during last 5 years) [irrespective of journals]	6 (5)	16 (6)	29(11)
Number of times issues missed [irrespective of journals]	14 (5)	48 (13)	65(12)

3.3 Authority & Publishing Format of PCB Journals

In table 5, some important trends of publishing are shown. As indicated in table 5, 4.76% of chemistry journals are being published in collaboration with highly reputed publishers, while almost 18% of physics journals and biology journals are being published in such internationally reputed publishers. Collaborating with journals with ISI indexed publishers 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 of the international standard of review process.

Journals were categorized by publisher type based on information found at the publisher's website. A publisher was considered commercial if the language on the publisher's site clearly indicated a for-profit commercial organization such as a corporation or registered company. Similarly, a publisher was considered a university, society, government, or not-for-profit if the publisher's website indicated this as the publishing body. In some cases journals were clearly produced by partnerships (e.g., universities/societies). The mixed types are likely to be underestimated as no attempt was made to identify any society partnerships of clearly commercial publishers; such partnerships are a common practice in traditional scholarly publishing. In our study it was observed that commercial bodies (private organizations) have shown a greater interest in publishing PCB journals in India than governmental organizations. While more than 50% of publishers in PCB journals in India belong to commercial publishers, only 15% of publishers are government affiliation. In order to develop a sustainable platform of publishing, participation of governmental bodies, academic institutions in publishing is probably beneficial.

It is not easy to move from one successful system to another because of concurrent need. However, if such a moves become essential for the betterment of the industry it is desirable. Since their inception journals have been published in print form and libraries have been maintaining records of their subscription by these print-versions of journals. However, because of ICT's intervention in publishing, it has now become essential to publish journals in web-enabled form, too, for wide dissemination and reducing publishing cost. As indicated in table 5, only a small percentage of journals, almost 10%, in PCB fields are still available only in a print version; otherwise most of the journals are maintaining both forms of publishing, probably because of concurrent needs, i.e. print and online form. However, on cross-checking the functionality/accessibility of articles available in the back volumes of the journals since last 5 years, we observed that almost 13-15% archival link of the PCB journals were non-functional. This may be the one of the most serious issues to consider —if links become non-functional the availability for article for future reference will not be possible. There is possibility of loss of knowledge which will be detrimental to the advance science.

The mimicking of nomenclature of legitimate journals is a serious issue. Beall in his writing explained that “many of the journals and their publishers were not quite what they claimed. The names often sounded grand — adjectives such as 'world', 'global' and 'international' were common — but 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 functions across the globe, contributions from foreign authors etc. which denotes their false claim as well. It appeared that publisher wants to accept as many papers and receive as many publication fees as possible. Interestingly most of the publisher of these journals were individual publishers.

Table 5: Basic Issues of Journal Publishing

Issues	Physics (32)	Chemistry (43)	Biology (60)
Publisher's name mentioned clearly	100	78.57	80.0
Journal published in collaboration with reputable publishers (eg. Springer)	18.07	4.76	18.33
Nature of Publishing Body			
Private	50.0	59.52	50.57
Society	31.25	27.90	25.71
Individual	3.12	9.30	17.14
Governmental	15.62	4.65	5.71
Publishing only in Online	9.37	18.60	28.33
Publishing only in Print	6.25	16.27	6.66
Publishing both Online & Print both	84.37	65.11	65.0
Journal available in 'Online First' version	18.75	6.97	11.66
Articles (back issue) link in Journal's archive found non-functional (last 5 years article)	15.62	13.22	13.33
Journals with mimics nomenclature of legitimate journals	6.45	23.52	8.33
Journals with differed Scope/mission	0 jr.	1 jr.	1jr.

3.4 Availability & Pricing Issues of Journal Publishing

In table 6, attempts have been made to explore the availability and journals pricing of PCB journals. As indicated in table 6, most of the journals, accounting for 72% journals in physics, 74% journals in chemistry and 65% of journals in biology are now available at free of cost, either through free access to electronic version of journal or through open access. In present scenario, open access is a complex landscape in publishing. Peer-reviewed open access journals with new titles are emerging rapidly using a variety of models. While there are many high-quality, peer-reviewed open access publications, there are also journals/publishers that engage in unprofessional or unethical practices.

In the popular subscription-based model, journals manage cost largely through selling print copies or through pay-per-view access. But in the open access model, publishers charge an up-front 'author fee' (sometimes processing fees) to cover costs — and to turn a profit, in the case of commercial publishers — then make the papers freely available online, immediately on publication.

Although, open access journals are free to the readers, there are direct and indirect cost involved in journal publishing. Thus came into being the author-pays model which is also called the 'gold' open access wherein the publishing cost is offset by charging the authors rather than the subscribers. In an editorial in *PLoS Biology* - 'who pays for open access?' Doyle, Gass, Kennison commented that publication fees are not a phenomenon born of the open-access movement. Many authors regularly pay several thousands of dollars in page charges, colour charges, correction costs, reprint costs, and other fees to their publisher, even when such costs are entirely voluntary. Giving an example in the *EMBO Journal*, they commented that authors are allowed six pages of text free, but are then charged \$200 per page beyond that. They also concluded that the real misconception about the unfair burden that open access places on authors resides in the terminology—the term “author charge” is itself misleading. Publication fees are not borne purely by authors, but are shared by the many organizations whose missions depend on the broadest possible dissemination and communication of scientific discoveries. Some of those may provide funding for open-access publication as intermediaries between authors and journals, as Open Society Institute does (Doyle, Gass & Kennison, 2004). Others—including government financed funding agencies—do so directly through their research grants to scientists. In both cases, funding open access is an effective way to fulfil mandates for public access to and accountability for scientific research and to ensure that all worthy research is published.

Of the total open access journals 74% of physics journals, 68% of chemistry journals and 72% of biology journals are APC based journals. The findings of our study differ from recent study of Crawford (2014) where he estimated that by the end 2014, there were 8,760 OA journals in the world, and publishing in 73% (6,395) of them was free for authors (no APC charged) [<http://walt.ishost.org/2015/08/72-and-41-a-gold-oa-2011-2014-preview/>]. Of these total APC based journals, nearly 57% of biology journals do not disclose APC charges in journal documentation and two journals ask APC in the personal account of the editor/publisher. This is one indication of predatory publishing, as identified by Jeffrey Beall.

Table 6: Availability & Pricing Issues of Journal Publishing (No.)

Availability of Journals	Physics	Chemistry	Biology
Online Free, Print Subscription based	10	19	22
Completely free	13	13	17
Only subscription based	09	11	21
Pricing issues			
APC based journals	17	22	28
Journals hide Account number of submitting APC	01	04	16
Journals hide publishing cost	01	04	8
APC Call on personal account of publisher/editor	NIL	01	2

3.5 Quantity of Articles in Open and Close Access PCB Journals

Attempts were made to count the total production of articles in PCB journals in India during last 5 years. Each issue of the journal has been examined manually to determine the total production of article (excluding review articles, short communications, editorials etc.). As indicated in table 7, on average 82 chemistry articles, 62 biology articles and 47 physics articles appeared per year in the selected journals. The average number of articles in open access journals and closed access journals are almost the same except one journal in chemistry that contained 1845 articles in its 78 issues in the last five years, with an average production of 123 articles per issue. Similarly, one journal of physics also contains average of 123 articles per issue. The publisher of both of these journals is the same and both are available on open access. We have excluded articles of these two journals while counting average number of articles per issue. From the table 7 it can also be concluded that during last 5 years the number of articles per issue in open and non-open access journals are almost same, irrespective of PCB fields. On average physics, chemistry, biology OA journals contain 11, 13, 17 articles per issue, respectively, while physics, chemistry, biology Non-OA journals contains 13, 17, 12 articles per issue. 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.

Table 7: Quantity of Articles Produced

Criteria	Physics	Chemistry	Biology
Average yearly production of Articles /Journal	47	82	62
Average number of articles in Open Access	14	18	14
Average number of articles in Closed Access	12	10	18
Articles Per Issues			
1-10			
Open Access	16	14	21
Closed Access	04	04	09
11-20			
Open Access	06	13	09
Closed Access	04	04	11
20-50			
Open Access	01	03	06
Closed Access	01	02	01
< 50			
Open Access	-	02	02
Closed Access	-	01	-

3.6 Review Policies of PCB Journals

A clear review policy is very important for the long life of a journal. What type of review policy is practiced by the journal, i.e. peer review/ blind peer review/ double blind peer review etc. is an important criteria to judge the quality of journal. At present there is a trend that every journal claims that their journal is 'peer-reviewed' and mentions this phrase quite prominently in their journal documentation. However, these journals do not explain how the review process they conducted for their journal. From our experience we gained be that prestigious/reputed journals (of physics, chemistry and biology) never bother to mention such phrase so intelligibly, rather they explain how they conduct the review process in detail. They also explain their review policy for reviewers (how to review); for authors (how the paper will be reviewed); for editors (how to handle the process of review) separately. They only accept article which are submitted only through ESS. This kind of detailed description of review policy for different levels of users brings a transparency to the review process and increases the authenticity of the journal.

Table 8A: Review Policies, Reviewers & Contributors (Percentage of journals)

Issues	Physics	Chemistry	Biology
Review policy not mentioned	12.5	16.27	18.33
Review policy explained in detail	32.25	13.95	35.0
Separate review policy mentioned for authors, reviewers and others	18.12	6.97	10.0
Uniformity in reference pattern, text length, abstract length differ significantly	22.13	27.43	28.03
Journals without clear author guidelines	9.37	11.62	5.0
Journal with copied author guidelines from other journals	9.37	27.90	11.66
Editor's name, address, designation mention clearly	87.5	58.13	86.67
Falsified information noticed in editor's information	2.23	4.65	1.66
Editors do not belong to the subject of journals	12.5	23.25	25.00
Editor's publication profile available	32.55	46.87	51.04
Percentage of publications of editor in same journal where he/she is editor	2.32	8.0	13.14
Editor's H-index searchable	31.25	18.75	30.0
Same editor for more than two journals	15.62	34.88	36.66
Internationality of editorial board			
Not identified	3.8	16.31	20.00
Without any international members	6.21	11.62	5.0
<10%	25.0	2.32	6.66
<25%	25.12	11.62	18.33
<50%	18.23	20.93	35.0
<75%	12.50	23.25	6.66
>75%	9.14	13.95	8.33
Common editorial board for more than one journal	3.12	4.33	6.21
No. of journals do not have any foreign author	02	15	18
% of articles contributed by foreign authors	29.04	20.84	41.23

As indicated in table 8A, there are 18% of biology journals, 16% of chemistry journals and 12% of physics journals which do not mention their clear-cut review policy in their journal documentation. The lack of such information reflects the quality of such journals. Further, on cross-checking of published articles in terms of uniformity in reference pattern, text length, abstract length, reference style in last few issues, it is observed that almost 22 to 28 percent of journals in the PCB fields do not maintain uniformity. Non-uniformity of such reference pattern, abstract size and pattern indicates the poor review process of those journals. Furthermore, in 27% of chemistry journals we found to have copied author guidelines from other journals. Although information about editor's qualification, affiliation, and credential was found less falsified, editors of 25% of biology journals and 23% of chemistry journals do not have any specialization in the subject of the journal he/she is serving as an editor. There are 36% of biology journals and 34% of chemistry journals where the editor is serving as an Editor-in-chief for more than two journals. Although, in our study we found 90% physics journals, 75% biology journals and 73% chemistry journals claimed that they have foreign members in editorial board; in most cases we were unable to verify such claim because of non-availability of any further detail like mail address, CVs, web-pages of those members. On the other hand, although most of the journals in PCB fields have at least one article contributed by foreign authors, most cases these foreign authors are not the corresponding author of the article.

Regarding the speed of review, from experience, we learnt that a well-conducted and thorough peer review process takes 2-4 months from submission. Greater than 6 months is slow, less than 1 month is excessively fast and might reveal either an excellent manuscript, of a fake review, or a rushed job. In table 8B we have attempted to display the time required to publish an article in PCB journals. We have traced these data from articles publishing history, including date of submission, date of review and date of publication. In most of the reputed journals these data are available in published articles. As indicated in table 8B, most of the PCB journals in India used to take 4-6 months in publishing including submission, review and printing. However, there are few journals in PCB fields too, where authors can publish their article by a month only, which is quite unrealistic.

Table 8B: Time spent on Review/ Publication Process

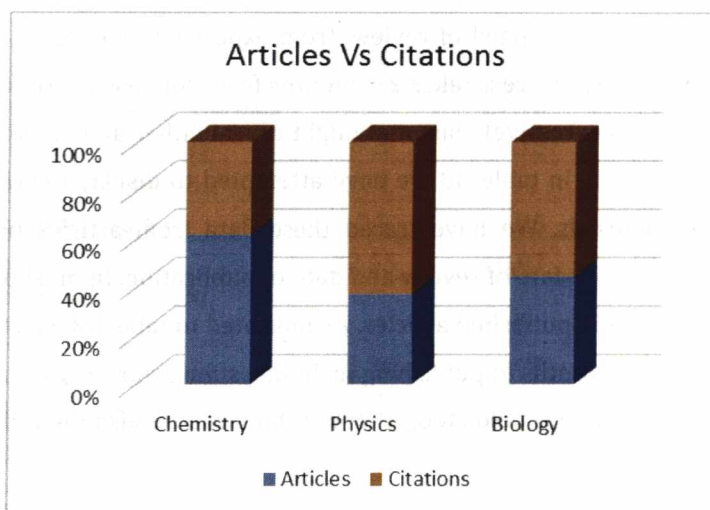
Subject	Not Identified	Rapid/ Less than one month	1-3 months	4-6 months	< 6 months
Physics	9	3	3	16	1
Chemistry	10	4	6	21	2
Biology	18	6	12	22	2

3.7 Citation and Indexing-Abstracting Coverage of PCB Journals

Citation data is empirical in nature and popularly has been used to study the extent to which a paper or a journal was cited. It has been used to quantify a wide range of things, ranging from the evaluation of research quality and impact to the mapping of science. For the purpose of the present study, we tracked citations between 2011-2015 for the articles that were published between 2011 and 2013. In the citation indicators we have used accumulated citation counts and calculated an overall (total) indicator for the whole period. This means that for the articles published in 2011, citations are counted over a 5-year period, while for the articles published in 2013, citations are counted over a 3-year period (or more precisely a 2-3 year period: the year of publication). It is generally not advisable to use citation windows of only one or two years. Nevertheless, we have not included the recently published articles (between 2014-2015) in the citation analysis. It is "expected" that the articles then are uncited or very poorly cited. It is worth noting that in the citation indicators the oldest publications will have relatively more weightage than the recent publications. This is due to the fact that the 2011 publications, for example, will have assembled citations over a longer time period than articles published in 2013. Nevertheless, our method has some advantages compared to the alternatives. In particular, it reduces the problem of the poor reliability of citations as indicators when very short time periods are considered. It is, however, important to notice that the citation indicators presented here hardly reflect the citation rate of the more recent publications.

In our study it has been identified that the average number of citation

received by PCB journals of India is poor. Overall, one article of physics received on average 1.49 citations, 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 citation. A major portion of journals in each of these fields received at most 50 citations during 2011-2015 for their articles published during 2011-2013. At micro-level, 31% of articles in chemistry, 29% of articles in biology and 22% of physics articles were not indexed in Google Scholar, in spite of the fact that **all these journals claimed in their official journal website that their journals is completely indexed in the Google Scholar database.** Such falsified



information is a negative sign of journal quality. There are only 15.6% of physics journals, 6.97% of chemistry journals and 11.66% of biology journals are indexed in Web of Science and bit higher percentage of journals in SCOPUS. Most of the journals are indexed in either Google scholar or various predatory impact factor databases (as identified J. Beall). This may prove to be one of the most disappointing factors if citation count is considered as an important criteria of judging the quality of journals.

Table 9: Citation Statistics and Database of coverage of Journals

Citation	Physics	Chemistry	Biology
No. of journals not received any citation	13	17	26
No. of journals received citation in range of (2011-13):			
1-50	6	17	21
51-100	2	1	9
100-200	3	3	1
200-500	2	0	1
>500	4	5	2
Citation per article	1.73	0.45	1.26
Percentage of articles not indexed in search engine	22.63	31.23	29.45
Inclusion in Bibliographic databases (in percentage)			
At least in Web of Science (Category A)	15.6	6.97	11.66
At least in Scopus (Category B)	18.75	20.93	11.66
At least in Google Scholar (Category C)	56.25	55.81	66.66
Not identified	9.38	16.27	10.02
Falsified information about journal indexing	3.12	4.21	8.33

3.8 Subsidiary Issues of Journal Publishing

Table 10 explains other issues related to journals publications. As indicated in table10, there are still many journals in PCB fields which do not provide searching facility in journal's website. Only a small percentage of journals mentioned licensing policy. Of the total open access journals, only 17% journals of physics, 18% journals of chemistry and 26% journals of biology mentioned Creative Commons licencing while publishing articles to the peers. In remaining cases it is unknown or undisclosed. On the other hand, 31% journals of physics, 28% journals of biology or even less i.e. only 16% journals chemistry followed any publication ethics. Even fewer journals in each of the PCB fields falsified information about publication ethics. It is needless to mention that at present almost all high reputed PCB journals mention publication ethics clearly in their journal. International publishers also appeal to the leaders of academic research groups to inform their students and research associates about the ethical responsibilities of authors of scientific publications and to insure that, when they are given the responsibility for submitting a paper, they are fully aware of the potential consequences, to themselves and to their co-authors, of violations in these ethical guidelines.

SHERPA/RoMEO is a service run by SHERPA to show the copyright and open access self-archiving policies of academic journals. It helps the authors to know how far a publisher allow to self-archive the accepted articles of their journals in institutional or other archives either pre-print or post-print. Under SHERPA website one can search journal and accustomed the archiving policy of the journal. Inclusion of journal in this directory also indicates the quality of journal. However, in our investigation we found only a small percentage of PCB journals, ranging in between 15 to 30%, included in SHEPRA/RoMEO website.

However, most of the journals contains keywords in articles, accept colour illustration for printing articles only in web-enabled form and mentioned article publishing history. These may be treated as positive signs for publishing.

Table 10: Subsidiary Issues of Journal Publishing (Number)

Issues	Physics	Chemistry	Biology
Journal without any search facility	18	38	41
Journals having extensive search faculty	11	01	13
Journals maintain Creative Common license (CCC)	04	06	10
Journals with DOI (Digital Object Identifier)	12	07	18
Journals with publication ethics	10	07	17
Falsified information about ethical information	04	02	03
% of journals included in SHERPA/Romeo	15.62	30.23	16.66
Journals with individual journal server	8	9	17
Journals with more than 100 in-links	0	0	0
Journals permits colour illustration	28	26	23
Journals showing article publishing history	16	22	27
Journals with having keyword in articles	25	33	33

Chapter – IV – Findings, Conclusion & Recommendations

4.1 Findings of the present Study

Impact factor is an accepted marker of journal quality is widely in use. However, empiric studies on impact factor's validity as an indicator of quality are lacking. Moreover, as a considerable number of Indian journals do not have any impact factor, it is difficult to understand the quality or scientific value of most of the Indian journals in every discipline including disciplines like physics, chemistry and biology. In the present study, therefore, an attempt has been made to understand the quality of Indian journals in the field of physics, chemistry and biology through a newly developed alternative mechanism by using various quality characteristics of a journal. A considerable number of journals have been evaluated by this mechanism. The overall findings of the present study are:

- **Discontinuity in publication** - Although the quantity of yearly additions of new journals in each of the three disciplines is quite impressive, at the same time the yearly discontinuation is also alarming. **Almost 29% of physics journals, 11% of chemistry journals and 21 % of biology journals that were live in 2013 stopped publishing by 2014.** There were 45, 47, 104 PCB journals alive at the end of 2013 which reduced to 32, 43, 83 respectively by the end of 2014. Most of these terminated journals only started their publication from 2005 onwards. 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. This is one of the **risks** of scholarly publishing and the risk of such discontinuations happening is higher with **newly established journals**. One possible way to overcome such scenario is to submit articles only to those journals which maintains digital archiving for their back volumes or at least allow authors to submit articles in institutional repositories. Many government funded institutions like NISCAIR, IASc, have developed journal archiving repository and retrospectively digitised early hard copy journals back to the first volumes. NPOR is one of such open access journal repository of NISCAIR where all publications of this organization is available. Present day, most of the highly reputed commercial publishers (like *Nature*, *Wolters Kluware*) allow authors to submit pre-print or post-print to institutional and/or centrally organized repositories. 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. Therefore, **prospective authors should submit their scholarly writings only**

those journals where such open access journal repository is available or journal permits to submit pre-print post-print to institutional repositories.

- **Availability of Journals** - In this study we observed that of these total live journals, 72%, 74%, and 65% journals of PCB, respectively, are accessible without any subscription fees, i.e. end users can access journals free of cost. It is interesting to note that a **major portion of chemistry journals in India are now available free of charge, while a major portion of biology journals is available on subscription basis.** Each format has a separate benefit and we believe that open access is a very positive component. At the same time it is also important to note that making journals **open access does not mean publishing anything of any quality.** While many OA journals have been emerged in major disciplines in India one should keep in mind that quantity does not always translate into quality.
- **Irregularity in publication** - It was observed that of the total 60 **biology** journals we considered, **25 journals did not maintain the frequency as stated in their documentation.** It was one of the notable drawbacks of the biology journals we have noticed.
- **Collaboration in publishing** - Collaborating with highly reputed publishers is probably one of the ways to increase access to the research output which, in turn, helps in receiving more citations. However, we observed, only 4.76% of chemistry and bit higher percentage i.e. almost 18% of physics and biology journals each are being published in collaboration with internationally reputed publishers.
- **Affiliation of publishing bodies** - In the PCB journals publishing domain in India we observed that commercial bodies (private organizations) have shown greater interest in publishing than governmental organizations. While more than 50% of publishers in PCB journals of India belong to commercial publishers, only 15% of publishers are government affiliation. Although, globally, commercial firms are leaders in publishing, however, in order to **develop a sustainable platform for publishing in India, involvement of governmental bodies in publishing is probably beneficial.** It is expected that as governments become more participative in publishing, the quality of publishing will improve significantly.
- **Review Policy** - The peer review process is most likely the most important quality control aspect of the publishing process, and thus how it is conducted is important. However, it is difficult to ascertain, as the system of peer review of journals is not explicit. Declaring review processes as 'double blind' in journal documentation does not prove that the journal seriously follows the process. Similarly not explaining review processes in detail

also does not prove that the journal does not have proper review policy. In our study we observed that at least **12 to 18 % journals in PCB did not correctly inform how the article evaluation process occurs and what criteria are used in the assessment of submitted articles**. Furthermore, at least 22 to 28 % of journals did not complete the basic task of review as the reference style differs significantly from article to article.

- **Publication fees** - Paying for real open-access publications is a reasonable thing to do, but the money should go to reputable, not spurious journals. The extent to which thousands of authors have incurred strong negative impacts as the result of having been duped into publishing in spurious journals is disappointing, both for those authors and the scientific community at large. In our study we observed 73, 81 and 67% of journals in PCB in India are charging authors for publishing their articles and of these journals, nearly 50% of biology journals do not disclose APC charges in journal documentation and two journals asked for the APC in the personal communication of the editor/publisher, an indicator of predatory publishing as identified by Jeffrey Beall.
- Heather Joseph, (quoted in Straumsheim, 2015) executive director of the Scholarly Publishing and Academic Resources Coalition (SPARC), in her report quoted that "The practice of judging authors on where an article is published rather than on the quality of the information in the article itself is clearly one that needs to be challenged. And while this study illustrates what happens when this practice is systematized on a national level, the reality is that it is a persistent problem in academic institutions around the world, and needs to be addressed." Although this sounds intuitively plausible, in a study by Shen and Bjork (2015) observed that of the sample 617 journals they studied, 34.7% authors from India contributed articles in predatory journals. In our study we are unable to trace such repetition for journals in PCB fields.
- **Quantity of articles per issue** - A considerable number of studies concluded that there has been a consistent growth in the number of articles per issue in open access journals as compared with non-open access journals. However, in our study such repetition was not seen. Average number of articles per issue in open access and non-open access PCB journals in India is almost same, i.e. 12-18 articles per issue.
- **Editorial members quality** - How the editor or publisher communicates with scientific community is important. The use of false names, generic or illusive titles or hidden identities are all perceived as 'hiding' something and thus are a negative sign. In our study we observed at least 4% of chemistry journals contained falsified information about their editors. Aggressively campaigning for academics to submit articles or serve on editorial boards (Butler, 2013) and not allowing academics to resign from editorial boards (Kolata, 2013) are uncommon in qualitative journals. Beall (2012) in his study explained that

listing academics as members of editorial boards without their permission is an indicator of predatory practice. He also pointed out few more issues that are indicators of poor quality journals. They are:

- a) Enlisting members of editorial boards that are not expert in the field;
- b) Having board members who are prominent researchers but exempt them from any contributions to the journal except the use of their names and photographs;
- c) Provide insufficient contact/affiliation information about board members;
- d) Do not hold at least Ph.D. in the subject where s(he) is serving as editor etc.

In our study we observed editors of at least 25% of biology journals and 23% of chemistry journals did not belong to subject on which they served as editor. Nearly 40% of biology journals did not provide sufficient information about their editors, either their affiliation or contact details was insufficient to trace their identity.

- **Time Delay in Publishing** - Regarding the speed of review, from experience, a well-conducted and thorough peer review process can be realistically completed within 2 months and each round of reviews will also take 2 months. Thus, considering the review process of two rounds of peer-review and edit, 4-6 months would be considered to be reasonable. **Greater than 6 months is slow, less than 1 month is excessively fast and might reveal either an excellent manuscript, of a fake review, or a rushed job.** In this study we observed that almost 50% journals of physics and chemistry each and 33% of the biology use to take 4-6 months in publishing including submission, review and printing. On the other hand, **almost 10% journals in PCB fields, where authors can publish their article by a month only, which is quite unrealistic.**
- **Internationalization of editorial members & contributors** - While the nationality of contributors/editors is not a perfect indicator of measuring quality of articles and journals, it is a reasonable proxy for the type of research and sources of data that are likely to be included. Although, in our study we found 90% physics journals and almost 75% biology and chemistry journals each claimed that they have foreign members in editorial board; in most cases, however, we were unable to verify such claim because of non-availability of any mail address of the members. On the other hand, of the total published articles in these PCB journals, 41% articles of biology, 29% articles of physics and 21% articles of chemistry have been contributed by foreign authors.
- **Citation pattern & bibliographic database coverage** - In terms of citations received by PCB journals being published in India, it has been observed that one article of physics received on an average 1.49 citations, 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 received any citations. The possible reasons may be

the multiple factors responsible for this sorry state. A major cause, as identified by Prof. Lakhotia "is the official policies that directly or indirectly buttress the common perception that the quality of research reported in papers published in journals from outside India (international journals) is better than that of the papers published in "national" journals" (Lakhotia, 2013) and, therefore, publication of one's findings in an "Indian" journal is believed to imply poor quality by default. Indian scientists and consequently the quality of journals published in India have thus been trapped in the vicious circle of poor impact factor and, therefore, poor journals which together result in overall poor ranking in science" (Lakhotia, 2015). Finally, it must be remembered that, while it is true that science that is not visible does not exist, visibility alone is not enough. Effective presence requires being in such a state of visibility that anyone neglecting it will be faulted for carelessness, incompetence or ignorance.

4.2 Recommendations

- **Balanced Editorial Board** - Journals covering overlapping fields of science may provide an excellent platform for publishing articles among diversified audiences, however, it is essential for an author to confirm whether such journals have unique, well-balanced editorial boards. Adhering to proper review process, identifying proper reviewers, understating the comments and suggestions of reviewers that are the experts in their field make it unjustifiable if such activities are being performed by a single person for different subject domain. **Therefore, it is essential to check whether the editor of any journal is exclusively editor of one journal or a group of journals covering different subject fields. If so, search for better one!**
- **Clear detail of members in Editorial Board**- The acceptance rates of a quality journal would typically be low and the editorial board would be dominated by the field leaders, including many from top institutions. **Journals mentioning their editorial board clearly with full detailed information and affiliations of the editors can be considered as a qualitative journal.**
- **Realistic Peer-Review process**- The peer review process for journal publication is essentially a quality control mechanism. Generally, a minimum of 2 peer reviewers (up to 6) are chosen for the peer review. Peer reviewers are ideally experts in their field. The peer review is completed once all the reviewers send the journal a detailed report with their comments on the manuscript and their recommendation. In practice, peer review is not always ideal, nonetheless, no better or viable alternative exists. Typically, reputed journals ask reviewers to complete their reviews within 6-8 weeks. Therefore **the**

phenomena of 'Rapid publication within a week' or by '48 hours of submission' seems an unrealistic process. Prospective authors, therefore, should avoid of such journals for publishing articles.

- In general, new faculty staff, inexperienced investigators or those in dire need of fulfilling the quantitative requirement of certain number of published papers and/or of enhancing the academic performance index (API) score choose those journals having dubious distinction to their credit. **Institutions should insist that their scientists and faculty members opt for publications in peer-reviewed journals and consider the publications in peer-reviewed journals only.** Similarly, peers may assess the contributions of a scientist either by quality of the published research or by the quality of journal in which the research is published. The first approach, although direct and more reliable, demands greater understanding and patience on part of the assessor/s, while the 2nd approach appears "objective" and quantitative and which demands least effort on part of the assessor/s (Lakhotia 2014).
- The mere criterion of having ISSN should not be benchmark of treating journal as peer-reviewed, refereed or scholarly. It will be worthwhile to establish a national accrediting agency [may be sub-set 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 assembles 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 a journal should have:
 - A journal should clearly express the review policy of the journal, and a statement of publication ethics and malpractice.
 - It should have licensed software for its technology-based quality assurance.
 - The contents of the journal contribute to new knowledge of the discipline with acceptable readability levels that are consistent among the articles.
 - The Journal published promptly and regularly as stated.
 - Journal should have independent web interface and Contents are available online. There should be a Digital Object Identifier for individual article.

- The journal should have international reviewers, the editorial board and writers have continental geographic distribution to guarantee impact and world readership.
- The journal standing is strong with editors and authors having H-Index Citation strength is established by the number of citations per article.

In order to track the scientific output of India, initiative taken by few other nations may be considered. For example, the evaluation of graduate level education in Brazil is under the responsibility of CAPES, which annually receives reports issued by the graduate programs (GP) describing, among other aspects, the scientific productivity of affiliated researchers. 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. The Qualis evaluation system is considered a key factor in the growth of the country's scientific output, as it stimulated GPs to publish their research in journals with a strong impact factor (CAPES, 2015). Along with the development of Qualis, CAPES has proposed a system for evaluating the overall scientific productivity of GPs, known as Results Indicator System (SIR). Bringing together both journal quality and number of articles, SIR weighs articles differently, multiplying the total number of articles in each Qualis category by different factors. For journals rated as International A, B or C these values are 1, 0.7, 0.4, respectively (Gonçalves et al. 2009).

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 2006, published the results of its investigation related to research publishing in South Africa. This publication reported on 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 advanced a number of recommendations. The recommendations included 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.

Further, ASSAf, with the support of the DST, established a forum of editors of national scholarly journals – the National Scholarly Editors' Forum (NSEF). The NSEF, through annual meetings, has reached the following decisions: (1) A mandate was given to sustain the NSEF as a consultative and advisory body managed by ASSAf; terms of reference for

the NSEF were drafted and adopted, (2) a National Code of Best Practice in Editorial Discretion and Peer Review was drafted and adopted and (3) a mandate was given for the envisaged quality assurance regime of ASSAf, based on peer review of discipline-grouped journal titles. NSEF also held plenary consultations on topics such as copyright issues, open access conversion, open-source software, and economies of scale in publishing logistics. ASSAf, following on its recommendations, initiated an external peer review and associated quality audit of all South African research journals in 5-year cycles. The panels carrying out the reviews comprise six to eight experts, at least half of whom are not directly drawn from the disciplinary areas concerned. The reviews focus on: the quality of editorial and review processes; fitness of purpose; positioning in the global cycle of new and old journals listed and indexed in databases; financial sustainability and scope and size issues. The approach comprises a detailed questionnaire which is sent to the editors, independent peer review of the journals in terms of content and a panel meeting to review these materials and all other available evidence in order to make appropriate findings and recommendations. The reports with recommendations are considered by the ASSAf Committee on Scholarly Publishing and are released to the publishers and editors of the journals concerned as well as other relevant stakeholders and the public (Pouris, 2015).

- **Promotion towards open Access** – 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 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.
- **Clear-cut Article Charging policies** - Journals maintaining clear-cut policies of processing charges of articles can be considered as a platform of scholarly publishing, however, journals that do not disclose the APC charges or tend to ask for APC changes into private saving accounts should be ignored as a potential platform for publishing.
- Journals must fulfill normal international academic standards, i.e. selection of articles is based on objective review policy, use of anti-plagiarism software for checking originality of submitted text, following a common, uniform style pattern for writing references, defined policies about what forms of text are accepted and what are on.
- One of the biggest challenges to gauge the scientific value of regional journals is to track the real citing source data of published article. The coverage of regional publication 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 way may be worthwhile if any government organization take initiative towards its updation.

- Dependence on single numbers, i.e impact factor, to quantify scientists’ contribution and make administrative decisions can affect their career progression or may force people to enhance quantity of low quality papers instead of focusing on their more important activity —doing good science. Considering the complex issues associated with the calculation of scientific performance metrics, it is clear that a comprehensive approach should be used to evaluate the research worthy of a scientist. **We should not rely excessively on a single metric.**

4.3 Suggestion for the Further Study:

Peer review serves as one of the most important mechanisms for determining the quality of journals. Therefore, further investigation may also be undertaken to know that do review policies of journals have impact on their growth? And if so, are these different in different subjects?

The present study was restricted to analyse the scientific value of journals being published in India. How far the quality of these journals is comparable with the journals being published from nation like the United States, United Kingdom, China, Japan etc. can also be studied. It will help to understand that do inferior quality journals increase the overall number of articles written by authors in India, and if so to what extent is such publishing jeopardizing the quality of scientific communication in our country? Due to constraint of resources and time our study was restricted to some selected subjects only. Similar study may be repeated for journals of other disciplines too.

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Appendix I
List of Physics Journals

S.N.	Name of the Journal	ISSN No.	Coverage in Database	Address of the Journal
1	Advances and Applications in Fluid Mechanics	0973-4686	S/G	http://www.pphmj.com/journals/aafm.htm
2	Advances in Dynamical Systems and Applications	P ISSN 0973-5321 E ISSN 0974-021X	G	http://www.ripublication.com/adsa.htm
3	Archives of Physics Research	0976-0970	N	http://scholarsresearchlibrary.com/archives-of-physics-research/index.html
4	Asian Journal of Physics	0971 - 3093	G	http://asianjournalofphysics.in/content
5	Bulletin of Laser and Spectroscopy Society of India	2229 - 3752	G	http://nebula.wsimg.com/54db0be598ad99bde904faaffba25182?AccessKeyId=91F7E06610F0753B0BB5&disposition=0&alloworigi n=1
6	Bulletin of Materials Science	ISSN: 0250-4707 (P) ISSN: 0973-7669 (E)	W/S/G	http://www.springer.com/materials/journal/12034
7	Bulletin of the Astronomical Society of India	ISSN0304-9523 E-ISSN2249-9601	S/G	http://www.astron-soc.in/bulletin/tables.php
8	Bulletin of Pure And Applied Sciences Sec. D - Physics	0970-6569	G	http://www.bpas.in/physics.php
9	Indian Journal of Cryogenics	P ISSN : 0379-0479 E ISSN : 2349-2120	G	http://www.indianjournals.com/ijor.aspx?target=ijor:ijc&type=home
10	Indian Journal of Physics	ISSN0973-1458 E-ISSN0974-9845	S/G	http://link.springer.com/journal/volumesAndIssues/12648
11	Indian Journal of Pure & Applied Physics	ISSN0019-5596 E-ISSN0975-1041	W/G	http://www.niscair.res.in/sciencecommunication/researchjournals/rejour/ijpap/ijpap0.asp
12	Indian Journal of Radio and Space Physics	ISSN0367-8393 E-ISSN0975-105X	S/G	http://www.niscair.res.in/sciencecommunication/researchjournals/rejour/ijrsp/ijrsp0.asp
13	International Journal of Applied Physics (IJAP)	2249-3174	G	http://www.ripublication.com/ijap.htm
14	International Journal of Current Physical Sciences	2249- 6351 (O)	G	http://bretj.com/journals/view/ijcps#tab2
15	International Journal of Dynamics of Fluids	0973-1784	G	http://www.ripublication.com/ijdf.htm
16	International Journal of Materials Sciences	0973-4589	G	http://www.ripublication.com/ijoms.htm

17	International Journal of Physics and Applications (IJPA)	0974-3103	G	http://www.ripublication.com/irph/ijpa.htm
18	International Journal of Physics and Mathematical Sciences	2277-2111	G	http://www.cibtech.org/jpms.htm
19	International Journal of Pure and Applied Physics	0973-1776	G	http://www.ripublication.com/ijpap.htm
20	IOSR Journal of Applied Physics	2278-4861	G	http://www.iosrjournals.org/iosr-jap/pages/v6(3)-3.html
21	Journal of Natural and Physical Sciences	097-3799	G	http://gkv.ac.in/?page_id=1236
22	Journal of Nuclear Physics, Material Sciences, Radiation & Applications	2321-8649 (P), 2321-9289 (O)	N	http://jnp.chitkara.edu.in/
23	Journal of Optics	ISSN0972-8821 E-ISSN0974-6900	S/G	http://www.springer.com/physics/journal/12596
24	Journal of Pure, Applied and industrial Physics	ISSN 0976-5727 (P) ISSN 2319-8133 (E)	G	http://physics-journal.org/current.php
25	Journal of Rajasthan Academy of Physical Sciences	0972-6306	G	http://raops.org.in/
26	Journal of Ultra Scientist of Physical Sciences Section A	ISSN 2231-346X	G	http://ultrascientist.org/IUSPS/indexA.htm
27	JP Journal of Heat and Mass Transfer	0973-5763	S/G	http://www.pphmj.com/journals/jphmt.htm
28	MAPAN	0970-3950 & 0974-9853	W/S/G	http://www.springer.com/physics/applied+%26+technical+physics/journal/12647
29	Material Science Research India	ISSN: 0973-3469 (E) ISSN: 2394-0565	N	http://www.materialsciencejournal.org/
30	Pramana: Journal of Physics	ISSN: 0304-4289 (P) ISSN: 0973-7111 (E)	W/S/G	http://www.springer.com/physics/journal/12043
31	Proceedings of the Indian National Science Academy : Sect A Physical Sciences	0369-8203 (P) 2250-1762 (E)	W/G	http://www.springer.com/life+sciences/journal/40011
32	Trends in Applied Spectroscopy	0972-4516	G	http://www.researchtrends.net/tia/title.asp?id=31

W= Web of Science, S= Scopus, G=Google Scholar

List of Chemistry Journals

S.N	Name of the Journal	ISSN	Coverage in Database	Web address
1	ActaCienciaIndica - Chemistry section	0253-7338	N	http://pragatiprakashan.in/?page_id=3387
2	Analytical Chemistry: an Indian Journal	0974-7419	G	http://tsijournals.com/toc/tables.php?journal_name=Analytical+Chemistry+%3A+An+Indian+Journal
3	Asian Journal of Chemistry	0975-427X (Online) 0970-7077 (Print)	S/G	http://www.asianjournalofchemistry.co.in/Home.aspx
4	Asian Journal of Experimental Chemistry	0976-8955 (Online) 0973-4783	G	http://www.hindagrihorticulturalsociety.co.in/ajec.HTML
5	Asian Journal of Research in Chemistry	0974-4169 (print) 0974-4150 (online)	G	http://www.ajrconline.org/volume.htm
6	Bulletin of Material Science	0250-4707 (print) 0973-7669 (elec)	W/G	http://www.ias.ac.in/matersci/
7	Bulletin of Pure and Applied Sciences section C-Chemistry	0970-4620	N	Website not available
8	Carbon Science and Technology	0974-0546	G	http://www.applied-science-innovations.com/cst-web-site/cst-content.html
9	Chemical Science Reviews and Letters	2278-6783	N	http://www.chesci.com/index.php?option=com_content&view=article&id=108&Itemid=466
10	Chemical Science Transaction	2278-3318 (Online), 2278-3458 (Print)	N	http://www.e-journals.in/title.asp?Issue=10
11	Clay Research	0255-7193 (Print) 0974-4509 (Online)	S/G	http://www.iospress.nl/journal/clay-research/
12	Heterocyclic Letters	2230 - 9632(Online) 2231 - 3087(Print)	G	http://www.heteroletters.org/
13	Indian Journal of Advances in Chemical science	2320-0898 (Print) 2320-0928 (Online)	G	http://www.ijacskros.com
14	Indian Journal of Agricultural Chemistry	0367-8229	G	Website not available
15	Indian Journal of Chemistry Sec. A	0975-0975 (Online), 0376-4710 (Print)	W/G	http://www.niscair.res.in/sciencecommunication/researchjournals/rejour/ijca/ijca0.asp
16	Indian Journal of Heterocyclic Chemistry	9711627	S/G	Website not available
17	International Journal of Advanced Chemical Research	2319-9504	G	http://www.wrpjournals.com/journal/international-journal-advanced-chemical-research
18	International Journal of Advanced Chemical Science and Applications	2347-7601 (Print) 2347-761X (Online)	G	http://www.irdindia.in/journal_ijacsa/index.html

19	International Journal of Analytical and Bioanalytical Chemistry	2231-5012	G	http://urpjournals.com/table_of_contents.php?journalID=6
20	International Journal of Applied Chemistry	0973-1792 (Print) 0973-9734 (Online)	S/G	http://www.ripublication.com/ijac.htm
21	International Journal of Chemical and physical sciences	2319-6602	G	http://www.ijcps.org/
22	International Journal of Chemical Research	0976-5689	G	http://www.ijcr.info/
23	International Journal of Chemical Science and Research	2249-0329	G	http://www.ijcsr.co.in/
24	International Journal of Chemical Sciences	0972-768 X	S/G	http://www.sadgurupublications.com/Journal.aspx?PageID=9
25	International Journal of Chemical Sciences and Applications	0972-768 X, 2278 – 6015 (online)	G	http://bipublication.com/IJCHA-chemical_journals.html
26	International Journal of Chemical, Environmental and Biological Sciences (IJCEBS)	2320 –4079 (Print) 2320 –4087 (Online)	S/G	http://www.isaet.org/pages.php?id=10&type=3
27	International Journal of Current Chemical Sciences	2320-8120	N	http://bretj.com/journals/view/ijccs
28	International Journal of current research in Chemistry and pharmaceutical sciences	2348 – 5213 (Print); 2348-5221 (Online)	N	http://www.ijrcrps.com/cissue.html
29	International Research Journal of Pure and Applied Chemistry	2231-3443	G	http://www.sciencedomain.org/journal/7
30	Iosr Journal of applied Chemistry	2278-5736	G	http://www.iosrjournals.org/iosr-jac.html
31	Journal of Applicable Chemistry	2278-1862	G	http://www.joac.info/JournalPapers.aspx?Year=2014&VolumeNo=3&PartNo=3
32	Journal of Applied Geochemistry	0972-1967 (Print) 2319-4361 (online)	G	http://www.indianjournals.com/ijor.aspx?target=ijor:jag&type=archive
33	Journal of Chemical and Pharmaceutical Sciences	0974-2115	S/G	http://jchps.com/
34	Journal of Chemical Sciences	0253-4134	W/G	http://www.ias.ac.in/chemsci/
35	Journal of Chemistry and Chemical sciences: an international research Journal	2229-760X (print) 2319-7625 (online)	N	http://chemistry-journal.org/listofvolumes.php
36	Journal of Electrochemical Society of India	0013-466X	G	http://www.ecsi.in/index.php/about/journals
37	Journal of Indian Chemical Society	0019 4522	G	http://www.indianchemsoc.org/jourindx.htm
38	Journal of Indian Council of Chemists	Not Identified	G	http://chemicc.com/journal_issue.php

39	Oriental Journal of Chemistry	0970 - 020X (print), 2231-5039 (online)	S/G	http://www.orientjchem.org/current-issue/
40	Rasayan Journal of Chemistry	0974-1496 (Print) 0976-0083 (Online)	S/G	http://rasayanjournal.co.in/current_issue.html
41	Research Journal of Chemical & Environmental Sciences	2321-1040	G	http://aelsindia.com/rjces.htm
42	Research Journal of Chemical Sciences	2231 - 606X (Online); 2250 - 9261(Print)	G	http://www.isca.in/rjcs/v4i1.php
43	Research Journal of Chemistry and Environment	22784527, 09720626	G	http://shankargargh.org/chemcurrentissue.aspx

W= Web of Science, S= Scopus, G=Google Scholar

List of Biology Journals

S.N	Name of the Journal	ISSN	Coverage in Database	Web Address of the Journal
1	Advances In Bioresearch (A Quarterly Peer Reviewed International Journal of Life Sciences)	0976 - 4585, 2277-1573	G	http://soeagra.com/abr.html
2	Annals of Biological Sciences : International Peer Reviewed Journal of Biological Sciences	:2348-1927	N	http://abiosci.com/index.php
3	Applied biological research	Print : 0972-0979, Online : 0974-4517	G	http://www.indianjournals.com/ijor.aspx?target=ijor:abr&type=home
4	Asian Journal of Biological and Life sciences	2278-747X, 2278-5957	G	http://www.pbsjournals.com/ajbbs/
5	Asian Journal of Conservation Biology (AJCB)	2278-7666 (Online)	G	http://www.ajcb.in/index.php
6	Asian Journal of Environmental Science	0976-8947, 0973-4759	G	http://www.researchjournal.co.in/online/AJBS.html
7	Asian Journal of Microbiology, Biotechnology & Environmental Sciences Paper	0972-3005	N	http://www.envirobiotechjournals.com/article_abstract.php?aid=1177&iid=46&jid=1
8	Bio Science Research Bulletin	Print : 0970-0889, Online : 2320-3161	G	http://www.indianjournals.com/ijor.aspx?target=ijor:bsrb&type=home
9	Biomirror	0976-9080	G	http://www.bmjournals.in/index.php
10	Bioscience Discovery	2231-024X(OL), 2229-3469(P)	G	http://www.biosciencediscovery.com; http://www.jbsd.in
11	Biosciences Biotechnology Research Asia	0973-1245	S/G	http://www.biotech-asia.org/

12	Bulletin of Pure & Applied Sciences- Botany	Print : 0970-4612, Online : 2320-3196	G	http://www.indianjournals.com/ijor.aspx?target=ijor:bpasbo&type=home
13	CIBTech Journal of Microbiology	2319-3867 (Online)	G	http://www.cibtech.org/cjm.htm
14	CIBTech Journal of Zoology (CJZ)	2319-3883 (Online)	G	http://www.cibtech.org/cjz.htm
15	Current Biotica: International Journal of Life Sciences	0973-4031	N	http://www.currentbiotica.com/Default.aspx
16	Ecology, Environment and Conservation	0971-765X	S/G	http://www.envirobiotechjournals.com/journal_details.php?jid=3
17	Genesis	2321 - 0966 (Print) & 2321 - 0974 (Online)	G	http://www.genesisjournals.org/index.php
18	GERF Journal of Biosciences	2229 6433	N	http://www.gerfbb.com/index.php
19	Indian Journal of Applied and Pure Biology	0970-2091	G	http://biology-journal.com/
20	Indian Journal of Energy	2278-926x(P), 2278-9278 (O)	G	http://ije.informaticspublishing.com/index.php/ije/pages/view/atj
21	Indian Journal of Environmental Protection	0253 - 7141	S/G	http://ijep.in/
22	INDIAN JOURNAL OF EXPERIMENTAL BIOLOGY (IJEB)	0019-5189 (P), 0975-1009 (O)	W/G	http://www.niscair.res.in/sciencecommunication/researchjournals/rejour/ijeb/ijeb0.asp
23	Indian Journal of Fundamental and Applied Life Sciences	2231- 6345 (Online)	G	http://www.cibtech.org/cjm.htm
24	Indian journal of insect sciences	0970-387 (P), 2250-2645 (O)	G	http://www.connectjournals.com/jis
25	INDIAN JOURNAL OF PLANT GENETIC RESOURCES	Print : 0971-8184, Online : 0976-1926	N	http://www.indianjournals.com/ijor.aspx?target=ijor:ijpgr&type=for_authors
26	Indian Journal of Plant Physiology	0019-5502 (print), 0974-0252 (electronic)	G	http://www.springer.com/life+sciences/plant+sciences/journal/40502
27	Indian Journal of Plant Protection	Print : 0253-4355, Online : 2249-7870	G	http://www.indianjournals.com/ijor.aspx?target=ijor:ijpp1&type=home
28	Indian Journal of Plant Sciences	2319-3824(Online)	G	http://www.cibtech.org/jps.htm
29	Indian Journal of Tropical Biodiversity	0971-4642	G	http://tfri.icfre.gov.in/journal.htm
30	Indian Journal of Virology	2347-3584 (Print) 2347-3517 (Online)	G	http://link.springer.com/journal/volumesAndIssues/13337

31	International Journal of Advanced Life Sciences	2320-1827, 2277-758X	G	http://ijals.com/
32	International Journal of Bioassays	2278-778X	G	https://www.ijbio.com/index.php/ijb
33	International Journal of Current Life Sciences	(online): 2249-1465	G	http://bretj.com/journals/view/ijcls
34	International journal of ecology and environmental sciences	0377-015X (Print); 2320-5199 (Online)	S/G	http://www.nieindia.org/Journal/index.php/ijeas/about , http://seedsindia.tripod.com/ind.htm
35	International Journal of Integrative Biology	(online): 0973-8363, (print): 0974-2816	S/G	http://www.classicus.com/IJIB/
36	International Journal of Life Sciences and Technology (IJLST)	0974-5335	G	http://www.ijlst.org/Home
37	International Journal of Systems Biology	0975-2900 (Print) E- : 0975-9204	G	http://www.bioinfopublication.org/journal.php?opt=index&jouid=BPJ000252
38	Journal of Biodiversity and Environmental Sciences (JBES)	e: 2222-3045, p: 2220-6663	G	http://www.innspub.net/journal-of-biodiversity-and-environmental-sciences-jbes/
39	Journal of Biological Control	2230-7281 (O), 0971-930X	G	http://journalofbiologicalcontrol.com/index.php/jbc/index
40	Journal of Biological Research and Development (JBRD)	(Print) : 2278-4918; (Online) : 2278-4926	N	http://www.tjprc.org/journals.php?type=1&id=103
41	Journal of Biosciences	0250-5991 (P), 0973-7138 (O)	W/S/G	http://www.springer.com/life+sciences/journal/12038
42	Journal of Bombay Natural History Society (JBNHS)	Print : 0006-6982, Online : 2454-1095	G	http://www.bnhsjournal.org/index.php/bnhs/index
43	Journal of Environmental Biology	0254-8704	W/S/G	http://www.jeb.co.in/
44	Journal of experimental zoology India	0972-0030 (P), 0976-1780	G	http://www.connectjournals.com/jez
45	Journal of Genetics	0022-1333 (P), 0973-7731 (O)	W/S/G	http://www.springer.com/life+sciences/journal/12041
46	Journal of Human Ecology		W/S/G	http://www.krepublishers.com/02-Journals/JHE/JHE-00-0-000-000-1990-Web/JHE-00-0-000-000-1990-1-Cover.htm
47	Journal of Indian water resources society	0970-6984	G	http://iwrs.org.in/journal.htm
48	Journal of Research in Biology: An International Scientific Research Journal	2231 -6280(P); 2231- 6299 (O)	G	http://jresearchbiology.com/Home.php

49	Physiology & Molecular Biology of Plants: An International Journal of Functional Plant Biology	0971-5894, 0974-0430	G	http://www.springer.com/life+sciences/plant+sciences/journal/12298
50	Proceedings Of The National Academy Of Sciences, India, Section B - Biological Sciences	0369-8211 (Print) 2250-1746 (Online)	W/S/G	http://link.springer.com/journal/40011
51	Research in Plant Biology	2231-5101	G	http://resplantbiol.com/
52	Research Journal of Biology (An International, Peer Reviewed, Open Accessed, High Indexed Online Journal)	2322-0066	S/G	http://researchjournalofbiology.weebly.com/
53	South Asian Journal of Experimental Biology	Online: 2230-9799	G	http://sajeb.org/index.php/sajeb/index
54	The Asian Journal Of Animal Science	09734791, (Print), 09768963 (online)	G	http://www.researchjournal.co.in/online/AJAS.html
55	The Bioscan	0973-7049	G	http://www.thebioscan.in/index.htm
56	The IIOAB Journal - Institute of Integrative Omics and Applied Biotechnology (IIOAB)	0976-3104	S/G	http://www.iioab.org/
57	The Indian Journal of Genetics and Plant Breeding	Print: 0019-5200, Online: 0975-6906	W/G	http://www.indianjournals.com/ijor.aspx?target=ijor:ijgpb&type=home
58	The Journal of Innovative Biology (JIB)	2348-6473	G	http://jibresearch.com/
59	Trends in Life Sciences: An International Peer Reviewed Journal	2319-4731 (p); 2319-5037 (e)	G	http://www.sciencejournal.in/aim-scope/trends-in-life-sciences/
60	WIDE SPECTRUM Research Journal	2250-2815	G	http://grd.org/grdcs/News_Current.aspx

W= Web of Science, S= Scopus, G=Google Scholar

Appendix II

QUESTIONNAIRE FOR AUTHOR

Full Name:

Highest Qualification:

Subject Area of research:

Organization belongs to:

Designation (If any):

Total Number of Publications till date:

Number of articles published in Indian Journals:

Number of articles published in Foreign Journals:

- 1) "Publication is considered usually as the key credential for survival and advancement in a research university. The scholar's career is greatly affected by his rate of refereed journal." Do you agree with this? If yes, to what extend?

If no, what is your purpose or need to publish articles in academic journals?

- 2) Name the Indian and foreign Journals which you feel are the best in your subject field?
- 3) Which Indian journal do you find of best quality in your subject field?
- 4) What is the ratio of your articles published in Indian and foreign journals?
- If most of your articles appeared in foreign journals
- i. What qualities of foreign journals motivate you to publish in those journals?
 - ii. What are the main differences you find in the publishing system of Indian and foreign journals in your subject area?
- 5) How do you assess that a journal is qualitative and a good place to publish research?
- 6) In a study it is mentioned that author mainly faces the problem of quality of English and grammatical mistakes in their text while publishing article, how you solve this problem?
- 7) What information do you expect to be available in journal's documentation as guidelines to the author?
- 8) Do author guidelines help in preparing text?
- 9) What difference do you find in the author guidelines of Indian journals *versus* foreign journals?
- 10) "Review policy is considered as the nerve system of any journal", do you agree? If yes, which type of review policy you feel works best?
- 11) What kind of review policy you have experienced for publishing your articles? Are you satisfied with the review policy the journal asked for?
- 12) Do the journals follow the same review policy as they mention in the documentation?

- 13) Have you faced any problems while submitting articles for review process in Indian journals? Specify the nature of review they asked for publishing.
- 14) Do you know about the archiving policy or Sherpa/Romeo Project?
- 15) Which type of archiving policy do you consider as the best archiving policy and why?
- 16) Do you spend time for overlooking who are the editors and their affiliations?
- 17) Does the composition of editorial board affect your decision to publish in a journal?
- 18) What submission systems have you encountered to date?
- 19) Do you know about the Electronic Submission System (ESS) process for article submission?
If yes, what benefits do you think it has than over other kinds of submission process?
- 20) Today the journal quality is assessed on the basis of the citation count it gets, which is used by JCR for evaluating of journals. Have you published any articles in journal with an Impact Factor calculated by JCR?
- 21) Is there any benefit of publishing article in a journal which has an Impact Factor (JCR)? And if no, do you want to publish in a journal with an Impact Factor? Why?
- 22) Have you faced any problem because of lack of publications or publications in journals having no Impact Factor (JCR)? If yes, what kind of problems you faced?
- 23) It is said that "*Time is money*," if an article is published on time then its good. However, if it is published late then the research may become obsolete. Have you faced problems of late publication?
- 24) If yes, what was the maximum time lag in publication of research in an Indian journal as well as in a foreign journal?
- 25) Have you any idea of APC (Article Processing Charge) in publication?
- 26) Do you feel APC is good enough for publishing article?
- 27) From which source you do cover the APC?
- 28) What amount of APC can be considered normal for accepting publication?
- 29) Does APC have any relation with quality? If yes to what extend?

Appendix III
QUESTIONNAIRE FOR EDITORS

Name of the Journal:

- 1) How long have you been actively engaged in publishing journal(s) in India?
- 2) Does your journal publish on time? If yes, what publishing mechanism have you adopted to manage publishing on time?
If not, what are the possible reasons behind it?
Have there been any missing issues since start of publication of your journal?
- 3) Are you satisfied with the standard of the articles you receive for publication in your journal?
If not, what shortcomings do you find in them?
- 4) In a recent study of biomedical journal publication it was reported that poor editing and bad English are major challenges in quality journal publishing. Do you agree?
If so, what measures do you use to overcome such challenges?
- 5) Who takes responsibility for editing articles for grammar and coherence? etc?
Do you have any mechanism to handle equations, elongated tables and graphs in a submitted article?
- 6) International collaboration of authors take down the boundaries of research and development in each field. What percentage of foreign authors submits articles to your journal?
- 7) We found in your documentation that you observe review policy for reviewing articles you received. What type of review policy have you adopted?
How much time do reviewers take to review articles?
If a reviewer does not respond on time what steps do you usually take to receive their comments?
Do you consult any international reviewers for reviewing submitted articles in your journal?
- 8) The number of journals in almost all fields in science & technology is quite high; on the other hand very few journals from India are indexed in well recognized databases like WoS, SCOPUS etc. In your opinion what may be possible reasons?
Is your journal indexed in any of them?
If not, what steps you are taking to get your journal indexed in them?

- 9) Which databases do you consider as very good places to index your journal?
- 10) What are the major sources through which you manage finance in publishing?
Do you have any financial constraints in publishing your journal? If yes, how do you manage?
If no, how have you overcome such constraints?
- 11) What are the other problems or issues you find in publishing quality journals in India?
- 12) At an international level major journals publishers follow some publication ethics which are available in codified form like COPE. Do you feel it makes any difference in publishing journals?
Do you follow any publication ethics? If yes, are they in codified form?
- 13) Current rejection and acceptance rate are mentioned in statistical details of a journal and low acceptance rates are considered as an indicator of good journal. Do you agree with this?
Do you follow this idea in your journal? If yes, what is the rejection rate in your journal?
Do you mention it in the documentation of journal?
- 14) What measures do you take to ensure that an article is original research before publishing it in your journal?
Do you use any plagiarism checking software?
If yes, what is the percentage of cases you detect plagiarism?

Annexure IV: Indexing/ Abstracting Databases under various categories

Category A		Category B		Category C		Category D	
Physics							
General	Subject	General	Subject	General	Subject	General	Subject
Thomson Reuter's JCR	Physics Abstract, INSPEC	SCOPUS, SJR	COMPENDEX	Google Scholar, ProQuest, Indian Science Abstract, Indian Citation Index,	Others	Ulrich Periodical Directory, DOAJ, EBSCO Indexing System, J-Gate	
Chemistry							
General	Subject	General	Subject	General	Subject	General	Subject
Thomson Reuter's JCR	Chemical Abstract (CAS)	SCOPUS, SJR		Google Scholar, ProQuest, Indian Science Abstract, Indian Citation Index,	Others	Ulrich Periodical Directory, DOAJ, EBSCO Indexing System, J-Gate	
Biology							
General	Subject	General	Subject	General	Subject	General	Subject
Thomson Reuter's JCR	Biological Abstract, BIOSIS,	SCOPUS, SJR	PubMed, Medline, Ecological Abstract, Embase Biological Abstract	Google Scholar, ProQuest, Indian Science Abstract, Indian Citation Index, CAB	Animal Science Abstract, Herbage Abstract, Plant Breeding Abstract, Proto Zoological Abstract, Review of Aromatic and Medicinal Plant, Weed Abstract	Ulrich Periodical Directory, DOAJ, EBSCO Indexing System, J-Gate	Global Health Databases, Paryavaran Abstract,

Annexure V: Selected PCB Journals and their Calculated Score

Sr. No.	ISSN	E-ISSN	Name of the Journal	Score	Publisher
1	0250-5991	0973-7138	Journal of Biosciences	5.948	Indian Academy of Sciences and Springer
2	0022-1333	0973-7731	Journal of Genetics	4.222	Indian Academy of Sciences and Springer
3	0019-5189	0975-1009	Indian Journal of Experimental Biology	2.636	National Institute of Science Communication and Information Resources
4	0369-8211	2250-1746	Proceedings of the National Academy of Sciences, India, Section B - Biological Sciences	2.276	National Academy of Sciences, India (Allahabad)
5	2347-3584	2347-3517	Virus Disease (Indian Journal of Virology)	2.082	Indian Virological Society (IVS) with Collaboration of Springer
6	0019-5200	0975-6906	The Indian Journal of Genetics and Plant Breeding	2.074	The Indian Society of Genetics and Plant Breeding, New Delhi with collaboration of indiajournals.com
7	0971-5894	0974-0430	Physiology & Molecular Biology of Plants: An International Journal of Functional Plant Biology	2.008	Prof. H.S. Srivastava Foundation for Science and Society with Springer India Private Limited
8	0253-4355	2249-7870	Indian Journal of Plant Protection	1.809	Plant Protection Association of India with collaboration of indiajournals.com
9	0006-6982	2454-1095	Journal of Bombay Natural History Society (JBNHS)	1.708	Bombay Natural History Society (JBNHS) Maharashtra, India
10	0377-015X	2320-5199	International journal of ecology and environmental sciences	1.668	NATIONAL INSTITUTE OF ECOLOGY (Department of Botany, University of Delhi, Delhi)
11	0254-8704	2394-0379	Journal of Environmental Biology	1.612	Triveni Enterprises
12	0970-8184	0976-1926	Indian Journal of Plant Genetic Resources	1.165	Indian Society of Plant Genetic Resources , New Delhi
13	0970-6984		Journal of Indian Water Resources Society	1.109	Indian Water Resources Society (Under Water Resources Development Training Center, IIT Roorky
14	0972-0979	0974-4517	Applied Biological Research	1.032	Centre for Advancement of Applied Sciences
15	0970-4612	2320-3196	Bulletin of Pure & Applied Sciences- Botany	1.025	BPAS Research
16	0970-2091		Indian Journal of Applied and Pure Biology	1.005	Indian Journal of Applied and Pure Biology Bhopal
17	0971-765X		Ecology, Environment and Conservation	0.982	EM International Pune

18	0971-930X	2230-7281	Journal of Biological Control	0.976	Society for Biocontrol Advancement, National Bureau of Agriculturally Important Insects Bangalore
19	0973-1245		Biosciences Biotechnology Research Asia	0.939	Oriental Scientific Publishing Company
20	0973-1458	0974-9845	Indian Journal of Physics	0.934	Indian Association for Cultivation of science with Springer
21	0973-8363	0974-2816	International Journal of Integrative Biology	0.918	International Society for Integrative Biology
22	0970-3837	2250-2645	Journal of Insect Sciences	0.76	Indian Society for the Advancement of Insect Science (Deptt of Entomology, Agri. University Ludhian
23		0973-7049	The Bioscan	0.728	The National Environmentalists Association Ranchi (Jharkhand)
24	2230-777X	2229 6433	GERF Bulletin of Biosciences	0.696	Green Earth Research Foundation
25	0253 - 7141		Indian Journal of Environmental Protection	0.692	Kalpana Corporation Banaras
26		0976-3104	The IIOAB Journal - Institute of Integrative Omics and Applied Biotechnology (IIOAB)	0.679	Institute of Integrative Omics and Applied Biotechnology (IIOAB)
27		2278-778X	International Journal of Bioassays	0.653	International Journal of Bioassays
28		2348-6473	The Journal of Innovative Biology (JIB)	0.634	SKN Online Publishing House
29	0972-2025		Plant Cell Biotechnology And Molecular Biology	0.611	Society for Biology and Biotechnology
30		2278-7666	Asian Journal of Conservation Biology (AJCB)	0.551	Turtle Conservation & Research Programme (TCRP) (Bioinformatics Centre, Gauhati University, Guwahati
31	2229-3469	2231-024X	Bioscience Discovery	0.55	Dr. Umesh P. Mogle
32		2319-3824	Indian Journal of Plant Sciences	0.534	Centre for Info Bio Technology (CIBTech)
33	0376-4710	0975-0975	Indian Journal of Chemistry-Sec A	0.512	National Institute of Science Communication and Information Resources
34		0976-8505	Der chemica Sinica	0.504	Pelagia Research Library
35		2319-3867	CIBTech Journal of Microbiology	0.48	Centre for Info Bio Technology (CIBTech)

36		2231- 6345	Indian Journal of Fundamental and Applied Life Sciences	0.457	Centre for Info Bio Technology (CIBTech)
37	N/A	2319-3883	CIBTech Journal of Zoology (CJZ)	0.421	Centre for Info Bio Technology (CIBTech)
38		2277-2073	International Journal of Basic and Applied Chemical Sciences (JCS)	0.395	Centre for Info Bio Technology (CIBTech)
39		2230-9799	South Asian Journal of Experimental Biology	0.379	South Asian Journal of Experimental Biology
40	2320-1827	2277-758X	International Journal of Advanced Life Sciences	0.37	Dr. G. M. Natarajan
41	0970-9274		Journal of Human Ecology	0.316	Indian Society for Human Ecology with Kamla-Raj Enterprises New Delhi
42	0972-768X		International Journal of Chemical Sciences	0.296	Sadguru Publications
43	0973-4759	0976-8947	Asian Journal of Environmental Science	0.29	Hind Institute of Science and Technology in Association with Hind Agri-Horticultural Science
44		2277-2111	International Journal of Physics and Mathematical Sciences (JPMS)	0.278	Centre for Info Bio Technology (CIBTech)
45		2320-0898	Indian Journal of Advances in Chemical Science	0.208	KROS Publication
46		2347-9825	Chemical Biological Letters	0.189	Integrated Science Publishing
47	0974-1496	0976-0083	Rasayan Journal of Chemistry	0.188	Rasayan Journals
48	0970-7077	0975-427X	Asian Journal of Chemistry	0.149	Chemical Publishing Co.
49	2322-0066		Research Journal of Biology (RJB)	0.147	Research Journal of Biology
50	2278-3318	2278-3458	Chemical Science Transactions: An International Research Journal of Chemical Science	0.145	World Wide Web Publications (P), India
51	0972-4508		Current topics in Catalysis	0.098	Research Trends
52	2319-4731	2319-5037	Trends in Life Sciences: An International Peer Reviewed Journal	0.091	DAMA International Publications Solapur
53	No	0976-0970	Archives of Physics Research	0.086	Scholars Research Library
54	0976 - 4585	2277-1573	Advances in Bioresearch: A Quarterly Peer Reviewed International Journal of Life Sciences	0.083	Society of Education, India

55	2231-6280	2231-6299	Journal of Research in Biology	0.027	Jresearch Biology
56	0973-4899	0976-8343	Asian Journal of Bio Science	0	Hind Institute of Science and Technology in Association with Hind Agri-Horticultural Science
57	2278-747X	2278-5957	Asian Journal of Biological and Life sciences	-0.032	PBS JOURNALS
58	2250-2815	No	WIDE SPECTRUM Research Journal	-0.256	Dr. G.R. Damodaran College of Sciences, Coimbatore
59	0973-4791	0976-8963	The Asian Journal Of Animal Science	-0.28	Hind Institute of Science and Technology in Association with Hind Agri-Horticultural Science
60	0973-4783	0976-8955	The Asian Journal of Experimental Chemistry	-0.521	Hind Institute of Science and Technology in Association with Hind Agri-Horticultural Science

Appendix VI: Glossary of Important Terms

Terms	Explanation
COPE	Committee on Publication Ethics is a forum for editors and publishers of peer reviewed journals to discuss all aspects of publication ethics. It also advises editors on how to handle cases of research and publication misconduct. [http://publicationethics.org/]
Foreign Authors/ Editors	Author or Editor does not belong to the country of origin of the journal.
Gold Open Access	Gold flavour of OA follows a business models that enable the end product (at least in its electronic format) to be made free for readers. These models can be made possible, on the one hand, by basing the journal publishing on open-source solutions and using volunteers to minimize costs, but also through funding the publication through article charges, advertising, grants and similar sources. Under this model the electronic version of the article is available directly from the publisher's site.
Green Open Access	Green road of OA is a form of OA where author can after the publishing (or before publishing) upload their manuscript to internet server where potential readers without subscription may access them freely. This approach is often called "green OA." [1] The three major options for such posting are on the homepages of the author or his department, in an institutional repository of the author's employer or in a subject-specific repository.
h-Index	The Hirsch index, or <i>h</i> index, quantifies as a single-number criterion the scientific output of a single researcher. "A scientist has index <i>h</i> if <i>h</i> of his or her N_p papers have at least <i>h</i> citations each and the other ($N_p - h$) papers have fewer than $\leq h$ citations each" [Wikipedia]
International Journal	Journal, where content, Editorial Board and/or Advisory Board, scope and philosophy of the journal reflects international quality and content.
Internationality in Editorial Board	The journal's editorial board consists of global scientific community. This does not mean one or two members of the Editorial Board being from another country that may or may not reflect the main language of the journal.
Open Access	The word open means a change in how publication is negotiated between author and publisher and access has an influx on how the audience can obtain the publication (Wikipedia). Simply it means access to those publications which are digital, online, free of charge and free of most copyright and licensing restriction (Peter Suber).
Predatory Publisher	Predator means organism that predates upon another, or upon prey. In publishing, the classification of predatory can be based on many aspects (eg. Price (does it hide author charges until after manuscript acceptance or hide its content from search engines?), editorial quality (does it falsely claim editorial board members or impact factors?), website structure, design and functionality, publishing practice (does it engages in spam solicitations or steal content from reputable journals?) and procedure (does it falsely claim editorial board members or impact

	factors?), technology used, quality control in ensuring academic standards etc.)
Publishing Delay	Publication delay traditionally refers to the time between the acceptance of an article and its publication and indexing in scientific databases.
Review Time	Review Time is the time-gap that entails since submission to acceptance.
Scholarly Communication	The term scholarly is generally used in academic domain for activities that entail research or investigation. Broadly, it means all form of communication between peers (Harnad, 2004). It also narrowly defined to include exclusively the peer-reviewed literature published upon completion of research (Rowlands et al., 2004).
SHERPA/Romeo	SHERPA/ROMEO is a service run by SHERPA to show the copyright and open access self-archiving policies of academic journals. The database uses a colour-coding scheme to classify publishers according to their self-archiving policy. [http://www.sherpa.ac.uk/romeo/index.php]

