

Chapter III – Scientific Publications Reviewing

Analysis and exploitation of scientific papers

III.1. Introduction

Scientists use multiple channels to share their information with their peers or with an informed public. Scientific publication is the major channel of scientific knowledge communication; it is considered the culmination of successful scientific research. The scientific articles are considered as the summit of the scientific publication, they are the main source of relevant information in the field of scientific research. Scientific publications are submitted to the test of scientific validation, with reading committees (reviewers), and to the strict observance of the scientific method in sciences and applied sciences (observation, experimentation, and reasoning). The preferred vehicle for communicating research results is the scientific article in an international peer-reviewed journal.

III.2. Scientific Journals

III.2.1. Definition

In academic publishing, a *scientific journal* is a periodical publication intended to further the progress of science, usually by reporting new scientific research results. These periodical publications appear at regular intervals (monthly, quarterly, annually ...etc.). Scientific articles are the forming units of scientific Journals, and they are a permanent source of information on scientific news.

Scientific journals represent the most vital means for disseminating research findings and are usually specialized for different academic disciplines or sub-disciplines. Often, the research challenges common assumptions and/or the research data presented in the published scientific literature in order to gain a clearer understanding of the facts and findings. Depending upon the policies of a given journal, articles may include reports of original research, re-analyses of others' research, reviews of the literature in a specific area, proposals of new but untested theories, or opinion pieces.

Examples:

Science : published since 1880 till today.

Nature : published since 1896 till today.

III.2.2. Bibliographic parameters of scientific journals

Scientific journals are characterized with some parameters that allow the verification of the authenticity and relevance of these journals.

a. Title (name)

The title of the scientific journal (the name of the journal) is the first mean that allows its identification; it reflects the specialization and the field of interest of the journal. The title of the scientific journal also makes it easier to find and refer to articles, in particular that most of these titles are conventionally abbreviated when they are referenced.

b. ISSN

Scientific journals are identified by a unique number, the ISSN (International Standard Serial Number) pour printed journals, or the eISSN for electronic journals (published only on web).

The International Standard Serial Number (website: <http://www.issn.org/>) is an internationally accepted code which identifies the title of serial publications. It is an eight digit number consisting of seven numbers plus a check digit which enables a computer to recognize when the number is incorrectly cited.

Examples:

Nature : ISSN 1476-4687

Science : ISSN 1095-9203

c. Issues and Volume

An **Issue** of a scientific journal is one edition of this journal, while the **Volume** is a series of Issues of the same journal. There is generally one volume per year; however the number of volumes per year depends on the publishing periodicity of the journal. For example, a monthly journal (one issue per month) will have 12 issues, while a quarterly (one issue is published every 3 months) will have 4.

Table I. Example of some scientific journals, their abbreviations and fields.

Journal	Abbreviation	ISSN	Periodicity	Fields of interest
Nature	<i>Nature</i>	Online : 1476-4687 Print : 0028-0836	Weekly	All life and Nature fields
Journal of Hepatology	<i>J hepatol</i>	0168-8278	Monthly	Liver diseases
Journal of Cell Biology	<i>J Cell Biol</i>	0021-9525	Monthly	Basic cell biology as well as applied cellular advances

d. Editorial board

The editorial board (sometimes known as an advisory board) consists of a group of prominent people in the journal's field. Having an editorial board is very important; they act as ambassadors for journals. To some extent the quality of a journal is judged by the members and academic credentials of its editorial board.

Editorial board members are peers whose judgment is highly regarded within the journal's main discipline; or their decisions may not be regarded as valid.

Editorial board functions may include:

- Identifying new topics for commissions, special editions and advising on direction for the journal, and giving feedback on past issues and making suggestions for both subject matter and potential authors
- Provide content by writing occasional editorials and other short articles
- Approaching potential contributors
- Peer review; also help to identify peer reviewers and provide second opinions on papers (i.e. where there is a conflict between reviewers)
- Identify appropriate conferences for editors to attend
- Endorse the journal to authors, readers and subscribers and encourage colleagues to submit their best work.

The **Editor**, sometimes called **Editor-in-Chief**, is the most senior editor who has overall responsibility for the journal; he is responsible for broad oversight of the journal, including performance of the editorial board. Journal editors also evaluate all manuscripts that are submitted to their journal, select those which they consider to be suitable for the journal to send for peer review, and consider peer reviewers' advice to make a final decision about what gets published. Therefore, it is important to know how they make their decisions.

Sometimes the "Editor" may also refer to **Publisher**, who is the person or the institution (university, company, organization, association, ... etc) who owns or publishes the journal.

III.2.3. Bibliometrics and scientific journals evaluation

The authenticity and credibility of scientific journals is highly considered by all the scientific community. Not all publications have the same notoriety or the same visibility, and this has repercussion on papers published in a given journal or review. Thus, an article published in a well-rated journal will normally carry more "weight" than an article published in a more confidential or less scientific journal.

Many tools have been created to classify, compare and measure the performance and notoriety of scientific journals. They also serve, ultimately, to classify institutions and evaluate researchers. These

tools and measurements are known as “Bibliometrics”, sometimes referred as “scientometrics”. The term ‘bibliometrics’ was first introduced in 1969 as a substitute for statistical bibliography used up until that time to describe the field of study concerned with the application of mathematical models and statistics to research, and quantify the process of written communication. Evaluative bibliometrics is a term coined in the seventies to denote the use of bibliometric techniques, especially publication and citation analysis, in the assessment of scientific activity.

The evaluation is based on statistical analysis of data related to the publications of journals (number of publications, number of citations, publication history ...etc.) to build a set of indicators that help to define and evaluate journals quality.

III.2.3.1. Bibliometrics indicators

a. Indexation: it consists in listing (repertorying) the journal in one of the reliable databases dedicated to the evaluation of scientific journals. If the journal is listed in one of these databases, it is called “Indexed”. The most trustworthy Indexation databases are:

- Thomson-Reuters[®] (<http://ip-science.thomsonreuters.com/mjl/>) (actually called “Clarivate Analytics”) that is developed by Web of Science (WoS) database. Thomson-Reuters[®] indexation is annually reviewed in Journal Citation Report (JCR) for ranking peer-reviewed journals.

- Scopus[®] (<https://www.scopus.com/home.uri>) which is one of largest abstract and citation database of peer-reviewed literature: scientific journals, books and conference proceedings. Scopus features smart tools to track, analyze and visualize research. Scopus[®] Indexation is based on CiteScore[™] metrics used to evaluate journals.

Besides Thomson-Reuters[®] and Scopus[®], many other indexation databases are available, such as: Index Medicus/PubMed/MedLine[®], EMBASE[®], EBSCO[®] Publishing’s ...etc.

Indexation of a journal is considered a reflection of its quality. Indexed journals are considered to be of higher scientific quality as compared to non-indexed one's. To check the indexation of a journal, it suffices to enter its Title or its ISSN in the indexing database. It should be noted that some databases are chargeable (not free).

b. Ranking: It consists of a classification of scientific journals based on their impact in their specialty field. Journal ranking is widely used in academic circles in the evaluation of a scientific journal's impact and quality. Thus, Journal rankings are intended to reflect the place of a journal within its field, the relative difficulty of being published in that journal, and the prestige associated with it.

Currently, the most widely used metric to rank journals is Clarivate Analytics' "Impact Factor" (IF) (used by WoS database and reported in JCR), a measure based on citations of articles published in the given journal. Another indicator widely used is CiteScore (CS) which was launched in by Elsevier as an alternative to the generally used JCR impact factors (calculated by Clarivate®), it is based on the citations recorded in the Scopus database rather than in JCR.

SCImago Journal Rank (The SJR), which is developed by the SCImago Research Group at the University of Extremadura in Spain, is a highly considered metric in journals ranking. The SJR uses a page-rank algorithm to determine which widely considered in journals ranking, citations are from more widely read journals, with these citations being given more weight. Even though, SJR relies on the Scopus database.

c. Citation impact: "Citation" refers to the use of an article as reference by other researchers, when author uses his own paper as reference then we talk about "Self-Citation". This indicator takes both the number of articles produced and the citation impact of these articles into account.

The citation impact of a journal is calculated by dividing the total number of citations by the total number of publications during a period of time (2 years, 3years, 5years ...etc.). Citation impact shows the average number of citations that a document has received.

$$\text{Citation Impact} = \frac{\sum \text{Citations}}{\sum \text{Publications}}$$

Different Citation Impact metrics have been developed to evaluate the impact of journals:

☞ **Impact Factor (IF):** The Journal Impact Factor (IF or JIF) is defined as all citations to the articles of a journal in the current JCR year to items published in the previous two years, divided by the total number of items publication in the journal in the previous two years.

$$\text{Impact Factor}_{2021} = \frac{\sum \text{Citations}_{2019} + \sum \text{Citations}_{2020}}{\sum \text{Publications}_{2019} + \sum \text{Publications}_{2020}}$$

Recently, a variant of **IF** have been introduced as a supplemental metric to evaluate scientific journals; the *5-years Impact Factor*. Its calculation is factored in the same manner as the Journal Impact Factor, but considers a five-year window of citation data. It evaluates the average number of times articles from the journal published in the past five years have been cited in the JCR year. It is calculated by dividing the number of citations in the JCR year by the total number of articles published in the five previous years.

☞ **CiteScore:** It is a measure reflecting the yearly average number of citations to recent articles published in a journal. CiteScore is based on the citations recorded in the Scopus database rather than in JCR, and those citations are collected for articles published in the preceding 4 years instead of 2 or 5 (for IF). CiteScore metrics calculate the citations from all documents in year one to all documents published in the prior three years for a title. This offers a more robust and accurate indication of a journal's impact. As an example, to calculate a 2021 value, CiteScore counts the citations received in 2021 to documents published in 2020, 2019, 2018 and 2017. This number is divided by the number of documents indexed on Scopus published in 2020, 2019, 2018 and 2017.

$$\text{CiteScore}_{2021} = \frac{\sum \text{Citations}_{2017} + \sum \text{Citations}_{2018} + \sum \text{Citations}_{2019} + \sum \text{Citations}_{2020}}{\sum \text{Publications}_{2017} + \sum \text{Publications}_{2018} + \sum \text{Publications}_{2019} + \sum \text{Publications}_{2020}}$$

☞ **h-Index:** The h-index (also known as Hirsch-Index) is defined as the maximum value of 'h' such that the given author/journal has published at least 'h' papers that have each been cited at least 'h' times. The index is designed to improve upon simpler measures such as the total number of citations or publications. The h-index can be applied to any level of aggregation (author, institution, journal, etc.) and it can reveal information about how the citations are distributed over a set of documents.

Another metric indicator derived from h-index is **h5-index**, which is the h-index for articles published in the last 5 complete years. It is the largest number 'h' that 'h' articles published in last 5 years have at least been cited 'h' times.

Beside these three most used Citation impact indicators, we find many others metrics indicators that aim to efficiently evaluate the impact of journals, such as *Eigenfactor*[®], *Google Scholar Metrics* ...etc.

Impact plays an important part in understanding the performance of a journal over time and making decisions about its future. It is impossible to get a true picture of impact using a single metric alone, so a basket of metrics is needed to support informed decisions.

d. Peer reviewing: it is a process in which other scientists (the professional peers of the authors) evaluate the quality and merit of research before recommending whether or not it should be published. The reason for this thorough evaluation by peers is that a scientific article is more than a snapshot of what is going on at a certain time in a scientist's research, but it is a part of scientific knowledge.

Peer-reviewing is an indicator of the seriousness and authenticity of a scientific journal. It can ensure a high reliability of published scientific data and thus reflects the quality of the scientific journal. Thus, all highly considered databases only index journals with serious and verified peer-reviewing.

This list of bibliometric parameters is not exhaustive; other significant metrics are also used in the evaluation of scientific journals. In addition, these indicators are not used individually, but rather grouped together for a better and more efficient evaluation of scientific journals.

Table II. Comparison between IF and CiteScore metrics.

Parameter	IF	CiteScore
Evaluation period (years)	2	4
Database	JCR	Scopus
No. indexed journals (2016)	11,000	22,000
Access	Subscribers	Anyone
Evaluated items	Articles, reviews	All publications

III.3. Scientific Articles (Papers)

III.3.1. Definition

A scientific article (also called “scientific paper”) is a manuscript that represents an original work of scientific research or study. It can be an addition to the ongoing study in a field; can be innovative, or a comparative study between different approaches. Scientific paper can also support a hypothesis with original research, describe existing research or comment on current trends in a specific field. Thus, types of scientific research include: Original Research, Descriptive, Analytic, Methods Papers, Meta-analysis, Commentary ...etc.

III.3.2. Characteristics of Scientific articles

Scientific papers are a special type of written work that have particular characteristics:

- Standardized style of writing and data presentation.
- Usually published in a periodical journal, or occasionally compiled in book form.
- Peer reviewed which means that the paper has been subjected to the scrutiny of several experts in the field who verify the quality of the writing and the accuracy of the analysis and conclusions drawn by the authors.
- Citable, which means that the content is stable, the journal is readily available in libraries and (usually) through the Web, and there are standardized methods of identifying a particular article? Thus, an author can refer to a paper with confidence that a reader can easily look up that reference at any point in the future.
- Include citations, which means that the paper frequently makes reference to previous publications that are relevant to the work being discussed. All cited works are listed in a reference section at the end of the paper. Footnotes at the bottom of each paper are not used to make citations.

III.3.3. Types of Scientific Articles

There are numerous types of articles to be found in scientific journals, all of which contribute to the individual journal's scope. Information on the format, style, and purpose of each type of article are usually detailed in a journal's instructions to authors or author guidelines.

III.3.3.1. Primary articles (Original)

Primary articles communicate knowledge arrived at or discovered by the author(s). They include theoretical articles, which present new or established abstract principles (e.g. mathematical modeling of biological and physiological processes), as well as observational and experimental research.

The research articles are the most important type of scientific papers; they provide unique information based on an original-research design. They are usually detailed studies that report original conducted research. The articles can be descriptive or analytical in nature, and report on studies that are retrospective (examining past outcomes) or prospective (looking for new outcomes). Generally, these academic articles will include a hypothesis, the context, methods, results and an interpretation or discussion of those results.

These articles are typically long, ranging anywhere from 3,000 to 8,000 words and may extend to 12,000 words for some journals. The format of the body of a research article usually follows the **IMRAD** structure (for **I**ntroduction - **M**aterial and **M**ethods- **R**esults **A**nd **D**iscussion). A structured abstract usually precedes the article. Examples include randomized controlled clinical trials, before-and-after studies, cohort studies, case-control studies, cross-sectional surveys, and diagnostic test assessments.

Primary (research) articles can take different forms depending on the data and the knowledge communicated in within:

a. Research article (experimental)

The most important type of paper, it provides new information based on original research. This category of paper is usually prospective and is supported by in-depth statistical analysis. The conclusions should be supported by the data provided in the results. Thus, original research article is a detailed account of research activity written by the scientists who did the research (not by someone else who is reporting on the research). Some instructors may refer to these as "scientific research" articles or as "empirical" research.

b. Clinical articles

In medicine and other types of clinical practice, like clinical psychology, clinical case studies are common. These publications describe details of real cases that involve patients and are typically chosen

for publication because they contribute something to existing knowledge in the field. This type of paper can include a discussion of symptoms, diagnosis and treatment of a disease or disorder. Clinical trial papers are also typical in the field of medicine and describe methods and results of controlled studies usually undertaken with large patient groups that have been randomly assigned to treatment and control groups.

Clinical articles are typically similar in length and format to original research articles.

c. Case-reports:

A case report (sometimes called a clinical case study) describes a single study, documenting unique features discovered during the research process. Notable features can include previously unreported observations of a known disease; the unique use of imaging or diagnostic testing to reveal a disease; or an undocumented clinical condition, treatment, or complication. Case reports are usually short and focused with a limited number of figures and references. Their format generally includes a short abstract (or none at all), a brief introduction, an account of the case study, and a discussion giving context to the research findings. If relevant, a limited review of the literature might be included in a case report.

III.3.3.2. Secondary articles or Synthesis Articles

Secondary or synthesis articles expand on knowledge that has been previously communicated by others. That includes revisiting, reviewing, analyzing, or synthesizing existing research, and presenting it in a new light. Secondary articles might come in the form of a monograph (a detailed study of a single subject or aspect of a subject), a descriptive review, or commentary.

a. Review Articles (Literature Reviews): presents the current knowledge including substantive findings as well as theoretical and methodological contributions to a particular topic.

b. Systematic reviews: identifies, appraises and synthesizes all the empirical evidence that meets pre-specified eligibility criteria to answer a specific research question. Researchers conducting systematic reviews use explicit, systematic methods that are selected with a view aimed at minimizing bias, to produce more reliable findings to inform decision making.

c. Meta-analysis: a quantitative, formal, epidemiological study design used to systematically assess the results of previous research to derive conclusions about that body of research. Typically, but not necessarily, a meta-analysis study is based on randomized, controlled clinical trials.

III.3.3.3. Specific Articles

This includes some scientific writing that are specific in their forms and contents; such as Editorial, Commentary, Letter to Editor, Short-Notes, Short-Communications ...etc.