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Review Article

Scientometric analysis: A technical need for medical science researchers either as authors or as peer reviewers

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ABSTRACT

The nature of performing a scientific research is a process that has several different components which consist of identifying the key research question(s), choices of scientific approach for the study and data collection, data analysis, and finally reporting on results. Generally, peer review is a series of procedures in the evaluation of a creative work or performance by other people, who work in the same or related field, with the aim of maintaining and improving the quality of work or performance in that field. The assessment of the achievement of every scientist, and thus indirectly determining his reputation in the scientific community of these publications, especially journals, is done through the so-called impact factor index. The impact factor predicts or estimates that how many annual citations article may receive after its publication. Evaluation of scientific productivity and assessment of the published articles of researchers and scientists can be made through the so-called H-index. The quality of published results of scientific work largely depends on knowledge sources that are used in the preparation, which means that it should be considered to serve the purpose and the very relevance of the information used. Scientometrics as a field of science covers all aforementioned issues, and scientometric analysis is obligatory for quality assessment of the scientific validity of published articles and other type of publications.

Keywords: Scientific publications; scientific validity; scientometrics

INTRODUCTION

Performing a scientific medical research is the process of systematic study of well-defined aspects of physical, mental, and social well-being. There are several subtypes of these researches studies: laboratory research, clinical research, and research in the field of public health. These scientific researchers are essential for the welfare and well-being of communities and individuals in the community. They are also essential to improve clinical and sociomedical practices and policies, to identify health problems and/or development of methods for improvement of health and prevention of disabilities, dissemination of scientific literature that lays the foundation for future research, policy, and practice. In addition, for the scientists the adoption of new knowledge from the systematic study on topics is the development and improvement of new skills.

A scientific research is a process that has several distinct components.[1] These are: To identify the key research questions, choice of scientific approach for the study and data collection, data analysis, and reporting on results.[2] Science and technology play a key role in the development of modern society and scientific research, and if they stand on the ethical principles, they can certainly provide answers to

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many questions that modern man encounters in daily life.[3] The production and exchange of knowledge on important issues of human existence determine the relevant scientific communication, which is established and implemented by the relevant papers.

The reliability and soundness of the scientific knowledge of each of scientist and researcher should be important for him/her and for the professional community to which it belongs. In this way, the doors would potentially turn open for their successful scientific and possible academic career.

The source of scientific information, methods for their evaluation, and methodology of their use are critical for serious scientific research and publishing of the scientific research results. The society normally imposes to science some rules of conduct and rules of the game. But scientific knowledge still largely depends on the actions that are at least in the initial phase and basically individual. It generally depends, to a large extent, on the creativity, skills, and talents of individuals. Creativity and critical thinking are just some of the essential characteristics of the scientific research process. From the standpoint of content, in order to distinguish papers with scientific ambitions from those which are called professional, we must recognize some of their basic characteristics.

Professional papers are usually related to papers that do not have obvious research and do not address the scientific problems, but their primary goal is to acquaint readers with the facts and insights that are new to science, so their primary purpose is to transmit knowledge and to enable knowledge adoption.

Scientific papers are those that basically aim to solve a scientific question, with the use of scientific procedures, have a style of expression and presented arguments and attitudes which provide a solid base to ensure that they are treated as a scientific contribution to the scientific field.

According to the complexity of the topic and the time needed for preparation, research papers can be classified into several categories: monographs, contributions to journals, newspapers, conferences, critical review, peer review, and so on. Often, also, these articles sometimes contain some important innovations in science and technology, especially if they are published in reputable journals like science or nature.

ACADEMIC JOURNALS

Research activities during the past few decades have been given additional incentives for progress in information science and technology, which to scientists and researchers offered a series of innovative possibilities for action in new areas. Journals are one of the most important products and sources of information needed for scientific research communications and an important link for the advancement of science. Communication of knowledge, which can occur as a result of publishing the latest scientific research, is achieved mainly through scientific journals in print or electronic form. In order to ensure compliance with quality standards and scientific validity, these journals contain articles that in the process of acceptance for publication are being revised. Evaluating and monitoring the academic researchers and professors by the authorities of Universities, is another beneficial aspect of critical appraisal of the published literature.

A scientific journal is defined as a periodical with the purpose of improving the science, usually by publishing new researches and novel ideas. Most of the scientific journals are closely specialized in a distinct area of science, although some journals such as "Nature" cover a broad spectrum of scientific fields. The history of scientific journals began in 1665 when the French "Journal des sçavans" and English "Philosophical Transactions of the Royal Society" began to periodically publish research results. Since then, the number of scientific journals significantly increased. Articles in scientific journals also present the latest research results in the field which journal covers. They are often incomprehensible to all but the researchers in a specific area and advanced students.

Types of academic publications

There are several types of articles in a scientific journal, although the exact terminology and definitions vary depending on the areas of which they discuss in the journal. Besides, scientific journals often include so-called "communications," which are short descriptions of authors' current research and are included in the current release since they are considered urgent. The other type is "research notes," which is considered less important or less urgent than "communication" and describe the current research findings.

Scholarly papers which extend from 5 to 20 pages represent a complete description of the current research findings. In "papers" there are considerable variations between scientific fields and journals. "Additional articles" contain a large proportion of tabular data that are the result of current research and can be short or in the hundreds of pages with mostly numerical data. Some scientific journals publish that kind of data electronically on the Internet.

"Review articles" does not cover a specific research but collects the results of many other articles with

a particular topic in a coherent text on the state of the scientific field in question. Review articles are providing information about a topic and allow the creation of scientific notifications on original research and are usually written by well-established scientists of the field and are normally invited by the editorial board members of journals.

Form of the scientific journals

Formatting and style of scientific articles may vary from journal to journal, but most of them follow IMRAD scheme, which is recommended by "International Committee of Medical Journal Editors." These articles start with a brief overview (so-called abstract), which takes from one to four summarized paragraphs. The introduction describes the background of the research, including discussions on similar studies. Experimental part or the so-called materials and methods show how the research was carried out. Results and discussion are part of the scientific journals that show the consequences and meaning of research. Finally, the conclusion of particular scientific research will come in the context and describes the ways of further research. Some journals like "Science" included in the form of the journal also the news section describing the scientific changes. These articles are usually written by scientific journalists and not scientists themselves.

Electronic form of academic journals

Electronic publishing is usually considered equivalent to normal journal papers. Since 2006, almost all scientific journals have published their electronic version and some have even opted only to electronic publishing of their scientific journal. Many libraries purchase only the electronic version of the journal, and the hard copies are asked only in the case of the most wanted titles. In general, there is a certain delay of several months before the journal is published in its usual printing way, which makes "paper" journals a less desired format of publication for the latest research. Therefore, many publishers now publish the electronic-only version of the journal, because it is not necessarily have the delay of printed journal format.

THE TERM OF REVIEW

Review (review, rating, and critical review) is originated from the Latin of "recensare," which means carefully examined, show and is one of the main forms for taking a critical attitude toward a document.

The main purpose of a review is to "evaluate the originality and scientific acceptability, and check the references from the literature with regard to the relevance and recency of adequacy." When reviewing an article two points should be kept in mind: language and the style in which manuscript is written. A review consists of two main parts - one for the editor and the other author.

"Manuscripts of articles are subject to professional, linguistic, and editorial review in terms of general professional and publishing standards of the journal. A manuscript would be accepted for publication if provided reviews are positive." These patterns certainly should be carefully fulfilled. In addition, there is usually one blank page for comments to the editor, and one or more blank pages on which are written comments to the author. No part of the review should be written by hand, because of illegibility of some important observations can remain unnoticed or be ignored.

Despite its shortcomings, peer-reviewing is still an essential part of the scientific publication.[4,5] It is useful not only for editors and authors of articles but also for the reviewers. Reviewers receive the privilege of an insight into the latest research and unpublished results of colleagues who deal with their field of work. By reviewing they improve their skills to critically evaluate scientific papers, which can be useful in their own professional work and training.

A good review is the one that penetrates in the depth of research, and is clear, and finally increases the scientific value of the article being assessed. A reviewer plays the role of an educator: its remarks and comments should enrich the author's knowledge and ability to conduct future researches and have a scientific report for them.

The truth is that the review process has many limitations and somehow flaws. Critics for the process of peer-reviewing argue that the review process has been slow, expensive, biased, and vulnerable to abuse. But the fact is that without peer-reviewing of manuscripts editors could not publish the journals.

Peer-reviewing is the backbone of the article publishing, while articles' publishing is the basis for the collection of human knowledge. Our experience shows that whoever wants to publish his/her scientific reports automatically accept in the same time that has to be a journal reviewer as well. But these assessments also bring direct benefits for the reviewer. It is an opportunity for learning, the source of the latest information and really exciting work. Rating expands and increases reviewer's knowledge and information, brings joy and beauty of scientific debate, and the exchange of information while creating a sense of fulfilled responsibility.

Reviewers get the privilege of insight into the latest research and unpublished results of colleagues dealing

with his or her area of work. It also increases their personal skill to critically evaluate scientific papers, which can be useful in their contemporary professional work and training. In order to prepare a good peer-review process, the reviewer must appraise the article objectively and point by point, even if personally does not like it. In order to achieve this, reviewers have to respect certain rules of assessment and evaluation. By writing quality reviews, reviewers strengthen their scientific reputation, and this seems to be a very valuable item in the curriculum vitae. There is an international initiative to recognize reviewer as professional training.

Accountability

A good reviewer has a clear sense of responsibility toward the colleagues (authors of the manuscripts) and thus will try to do his best on-time and fair. The real quality of the published scientific articles is dependent on the level of general reviewer responsibility toward this job.

Knowledge of the literature

The reviewer has to have a good knowledge of relevant literature and be able to apply the general principles of scientific research on the problem at hand. A good reviewer knows how to locate the article in the context of previous work in this field, identify the limitations and weaknesses of a particular approach to the problem, and to understand how the conclusions of the article may affect clinical practice. The reviewer should also be familiar with the style of the journal and know the instructions to authors for specific types of journal's articles.

Time

Depending on the complexity of the report, which assesses the compatibility of its topic with the expertise of reviewer, the time required for an honest review of an article is about 3 h. Vaguely written articles increase this time.

Knowledge of the journal for which the article is being assessed

Scientific journals are distinguished by the editorial policy, the priorities in publishing, and the percentage of rejected papers. A good manuscript reviewer should be familiar with these features of the journal and by its assessment help identify the most appropriate articles.

Peer-reviewing is very subtle and delicate because it is the normal basis of the decision of the editorial board about the article publication. By its suggestions and evaluations, reviewers contribute significantly to the quality of the article. Thus, the reviewer needs to answer several key questions:

- Is the work original? (What is the informational value of the work, or is it scientifically valuable?)
- Is the work relevant to majority of journal readers (To whom the article is intended to?)
- What are the results of applied research reported?
- What are the results of experimental research offered?
- What is the practical value?
- Is the level of presented materials acceptable, in order that it is:
  - Scientifically acceptable (methodology, results, discussion, and citation)
  - Documentary acceptable (the quality of tables and figures, statistical analysis)
  - Language acceptable (user-friendliness of the text is correct, terminology, stylistic, and orthographic orderliness) and
  - Formally acceptable (does the title corresponds to the content of the article, is the manuscript composed according to the rules of the journal, whether it contains all the required parts, etc.).

Every editorial of better medical journals sent to reviewers the forms, which they must complete.

FIRST ROUND OF READING FOR PEER REVIEW

In the first reading, the reviewer should try to understand the story and ask questions about all ambiguities. They are best recorded in the manuscript, on the edge, or on the back of the pages. The first reading is like triage during which the reviewer makes a decision about the importance and relevance of the research.

Reading the summary

In the summary section, authors reveal the most important things inside their article. Therefore, reading the summary suggests to reviewers what will be important to look in the study design, methods, results, and conclusions. At that time, it is good to write some general issues arising from the abstract on the first page, such as "Is this really double-blind, randomized trial?" Or "What is offered here new?" "Is the sample size too small?" "This is a diagnostic investigation and would have to be written according to the STARD scheme." Upon next rounds of readings, add new big questions.

Reading the article

In the first reading of the article, the reviewer should focus on science and research issues in the article. The reviewers must be able to understand all scientific research messages that the author suggests. Sometimes it is difficult to discern vague view from the author's unclear thinking. About any item that reviewer does not understand, needs to think deeply,

to review the literature, and discuss the problem (but not on the article) with a colleague who knows more about it.

SECOND ROUND OF READING FOR PEER REVIEW

The second reading should be carried out after a few hours or days, depending on the available time, own time, and deadline determined by the editor. The second reading of the article begins by checking the questions and remarks written on the first page and margin, which the reviewer made during first reading. Then follows the assessment of the article value.

- First, what the reviewer does not understand, in principle, will not understand the readers and reviewer should be free to object to everything that hinders the reading and understanding of the article. It does not need to criticize the general style of the article because this is where tastes may differ. They do not need to correct mistakes in grammar, spelling, and punctuation, as with this deals the language editor, not the reviewer. However, the overall assessment of linguistic quality of the work may be useful to the editor
- The second criterion is assessment of article scientific power, particularly the excellence of thought and respect for scientific principles and knowledge in the field
- Finally, it is estimated that how important report is. There should not be governed by the current fashion in the area of research, but it should rely on the assessment of the power of research methods, data, and conclusions. Articles that are scientifically powerful and with a novel message inside are considered important ones. The value of the article is not estimated according to its origin if it is from the areas of basic medical research or it is clinical (public health). Clinical based researches are normally more attractive than the basic ones because of the possibility of applicability, and this should not cause extra temptation for the reviewers.

SIGNIFICANCE OF THE REVIEWS

Publication of the results of any scientific research is a crucial phase of scientific activity, and the standard way to do this is to publish an article in a prestigious scientific journal, domestic or foreign. Of course that it is preceded by the assessment and review of such contributions, regardless of the thematic area to which it belongs. One of the earliest documented examples of the evaluation process is one which started in 1665 by Henry Oldenburg, founder and editor of the journal "Philosophical Transactions of the Royal Society" in London, which was the earliest scientific publication of this kind in English language.

As in the 9th century, based on the available data is possible to detect the practice of the respective authors, Arab philosopher Abu Yusuf al-Kindi (800–870 AD) gave his written paper-Risala to colleagues for their critical assessment of what is written, which is evidence of the long history of reviews. On the other hand, in our time, according to the conclusions of the Association of American Historians, peer-reviewing is described as a process in which the manuscript or research proposal is read and evaluated by experts in the given period of time, in the subject area, and language and document that deals with the author. In other words, a committee of experts, consisting of prominent experts in the field of knowledge that deals with the author, prepares analyzes and evaluates his work.

For the scientific significance of the article it is important to keep in mind the answer to the following questions:

- Does the author demonstrate knowledge of current developments in the field?
- Are the process and the research process in accordance with professional standards?
- Does the author offers original arguments and provides valid facts for its work?

If the article does not meet all the criteria, the reviewers should suggest a revision that will correct the article prior to its acceptance and approval of financing the project.

Generally, peer review is a series of procedures in the evaluation of creative work or performance by other people, who work in the same or related field, with the aim of maintaining and improving the quality of work or performance in that field. The reviewers also perform identification of the value and drawing attention to the errors, one's article gets a chance to be published, they carry out the assessment on which article will be released in more or less prestigious publications and appropriately evaluate these articles. This process is important not only as a recommendation for advancement in an academic career, but also to improve the social status of the author.

The review process is particularly rigorously applied when including some journal in a suitable base, for example, as manufactured by Thomson Reuters, Medline, EBSCO, Scopus, Google, and other bases. Manuscript reviews are conducted in many professional fields, such as academic and scientific research, biomedicine, and engineering. It is especially important to select the projects that have been financially supported by governmental funds.

Review serves as mechanism of decision-making for publishers who intend to issue any kind of scientific books and journals, reviews from time to time, often with good reason, are the subject of critical remarks, especially because they can sometimes slow down the process of publishing one's findings, and is a particular handicap when it comes for scientific contributions in prestigious scientific journals.

RATING OF ARTICLES IN ACADEMIC JOURNALS

Evaluation of the quality and relevance of articles, after they have been accepted and published as scientific papers, which should be the result of serious research work, relies mainly on the qualified members of the academic community, who are of the same or similar professional interests.[7-9] Being a part of the academic community we often encounter terms such as indexing and citations. According to the Tibor Toth, who wrote in an article published on the website of open encyclopedia of information: "Indexing is a term that derives from the concept of index of publications such as index medicus, science citation index (SCI), and current contents."

The assessment of the achievement of every scientist, and thus indirectly determining his reputation in the scientific community of these publications, especially journals, is done through the so-called impact factor.[1] Impact factor shows how many times a scientific article in a specific journal receives an average number of quotes (citations). The idea of impact factor for the first time is mentioned by the American Researcher Eugene Garfield in an article published in the journal of "Science" in 1955, which was the basis for the publication of the SCI in 1961. Today, the journal impact factor is extracted from publication under the title Journal Citation Reports, which is produced by Thomson Reuter's publishers. The best measure of the importance of the journal is its echo factor, which shows how many articles published in it are cited. For example, if the journal has impact factor from 0.10 to 0.30 in a certain period, it means that on average every tenth to every third article published in the journal is cited once.

Evaluation of scientific productivity and assessment of the published articles of researchers and scientists can be made through the so-called H-index [Figure 1].[10]

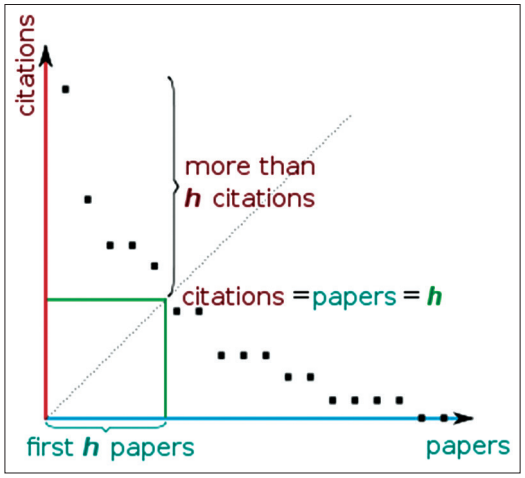

Figure 1: H-index from a plot of decreasing citations for numbered papers (This index is calculated on the basis of the list of publications ranked in order of the time when they are quoted. The quality of published results of scientific work largely depends on knowledge sources that are used in the preparation, which means that it should be considered to serve the purpose and the very relevance of the information used. Scientometrics as a field of science covers all aforementioned issues, and scientometric analysis is obligatory for quality assessment of scientific validity of published articles and other type of publications)[6]

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