

# Journal Impact Factor

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## Introduction

The battle between quantity and quality in research paper publication has been raging for a long time – but in the end, quality always is the winner. In this respect, academies too are bound by quality, which is not solely the bane of manufacturers. All researchers strive for quality in research. Research excellence may not come easily but without a good reputation in research, it is also many steps backward. In the field of scientific/non-scientific research, the most common output is research papers – publications. There are other schools of thought that sideline publications for the sake of more tangible forms of output. However, the best is one where there is a written record. The question then arises, as to what is the level or standard of publications? Herein is the importance of Journal Impact Factor (JIF).

The origin of JIF can be traced back to 1955 [1] – to the basic concepts of Science Citation Index (SCI) by Eugene Garfield, an American scientist and one of the founders of bibliometrics and scientometrics, as well as the founder and chairman emeritus of Institute for Scientific Information (ISI). The basic definition of JIF is that it is a measure of the importance of scientific journals. Along with the related immediacy index measure, it is calculated on a yearly basis by the ISI [2], for the more than 9000 science and social science journals from 60 countries. The journals which it indexes are given impact factors and these indices are published in the Journal Citation Reports (JCR). Today, the ISI Impact Factor (IF) is an established measurement of quality in research via paper publications.

## The Institute of Scientific Information (ISI) Impact Factor

The Thomson ISI Impact Factor (ISI IF) is generally accepted as the indicator of journal status, and is defined as the mean number of citations a journal receives over a two-year period [3]. The ISI IF is based on the number of citations to a journal, and does not take account of the prestige of the citing journals; it is based on the popularity factor and – not directly on the prestige factor. As a simple formulation, the ISI IF corresponds to a journal's in-degree [4, 5] normalized by the total number of papers to the journal published in that period. The impact factor, IF, of journal,  $x_i$ , in the year,  $y$ , is represented by

$$IF(x_i, y) = \frac{\sum_j a(x_j, x_i, y)}{n(x_i)}$$

where  $a(x_j, x_i, y)$  is the number of citations from journal  $x_j$  to journal  $x_i$  in year  $y$ . The number of publications published in journal  $x_i$ , denoted,  $n(x_i)$ , during two-year previous to  $y$ , normalizes the resulting citation count, leading to a mean, two-year citation rate per article.

There are some nuances to this: ISI excludes certain article types (such as news items, correspondence, and errata) from the denominator. New journals that are indexed from their first published issue will receive an Impact Factor after the completion of two years' indexing; in this case, the citations to the year prior to Volume 1, and the number of articles published in the year prior to Volume 1 are known zero values. Journals that are indexed starting with a volume other than the first volume will not have a IF published until three complete data-years are known. Table 1 lists the top 20 journals in Electrical and Electronic Engineering under IEEE with 2005 IF [6].

**Table 1: Top 20 journals in Electrical & Electronic Engineering.**

No.	Journal	2005 Impact Factor
1.	Progress in Quantum Electronics	5.176
2.	IEEE Transactions on Medical Imaging	3.939
3.	Proceedings of the IEEE	3.887
4.	IEEE Transactions on Pattern Analysis	3.810
5.	IEEE Transactions on Circuits and Systems for Video Technology	3.022
6.	IEEE/OSA Journal of Microelectromechanical Systems	3.005
7.	IEEE Electron Device Letters	2.825
8.	IEEE/ACM Transactions on Networking	2.811
9.	IEEE Network	2.792
10.	IEEE Signal Processing Magazine	2.714
11.	IEEE Journal on Selected Areas in Communications	2.698
12.	IEEE Wireless Communications Magazine	2.638
13.	IEEE Intelligent Systems Magazine	2.560
14.	IEEE Journal of Quantum Electronics	2.452
15.	IEEE Transactions on Image Processing	2.428
16.	IEEE Journal of Selected Topics in Quantum Electronics	2.404
17.	Journal of Cryptology	2.280
18.	IEEE Transactions on Microwave Theory and Techniques	2.275
19.	IEEE Photonics Technology Letters	2.266
20.	IEEE Transactions on Neural Networks	2.205

## In Cites : Malaysia

In Malaysia's case, there are 8 journals, mostly from biological and tropical agricultural fields, as shown in Table 2 from the ISI Thomson journals [1] lists. Only one has an IF of 0.113 (in 2005) - Journal of Tropical Forest Science from Forest Research Institute Malaysia (FRIM), which should be an inspiration for other institutions to produce scientific journals with IF. Presently there are many national journals in our country published by national societies and universities. A development and advancement programme aimed at improving the quality of research through publications should be initiated in order to nominate our journals in the ISI Thomson and internationalization of Malaysian R&D.

A division of Thomson Scientific, Essential Science Indicators (ESI) [2], offers citation rankings for scientists, institutions, countries, and journals from various fields of science. A citation threshold is applied to each field ranking; scientists and institutions are selected if they are in the top 1% by total citations in a given field, and countries and journals must be in the top 50%. A total of 10 years of Thomson Scientific citation data, plus some number of consecutive bimonthly periods during the current year, are used to determine the rankings.

Since ESI is updated every two months, it is possible to identify entities that are most improved from one update to the next; i.e., those scientists, institutions, countries, and journals that show the largest percentage increase in total citations. In Cites [7], has a column named Rising Star with ESI for 22 fields of research calculated bimonthly from 2002 to 2006 based on the highest number of publication.

**Table 2: Malaysian journals (all fields) under ISI Thomson [1].**

No.	Journals	Information	Fields	Impact Factor
1.	Malaysian Applied Biology	Malaysian Society of Applied Biology, Department of Botany, Faculty of Life Sciences, UKM [ISSN: 0126-8643] – semiannual <a href="http://pkukmweb.ukm.my/~msab/MAB%20JOURNAL.htm">http://pkukmweb.ukm.my/~msab/MAB%20JOURNAL.htm</a>	Biology	-
2.	Malaysian Naturalist	Malaysian Nature Society (MNS), KL. [ISSN: 1511-970X] – quarterly <a href="http://www.mns.org.my/section.php?sid=21">http://www.mns.org.my/section.php?sid=21</a>	Natural Sciences	-
3.	Asia-Pacific Journal of Molecular Biology and Biotechnology	Institute Postgraduate Studies & Research, University Malaya. [ISSN: 0128-7451] - semiannual	Biology & Biotechnology	-
4.	Pertanika Journal of Tropical Agricultural Science	Universiti Putra Malaysia (UPM) [ISSN: 0126-6128] – tri-annual	Agricultural Science	-
5.	Journal of Plant Protection in the Tropics	Malaysian Plant Protection Society (MAPPS), KL. [ISSN: 0127-6883] – semiannual	Tropical Science	-
6.	Journal of Tropical Forest Science	Forest Research Institute Malaysia (FRIM), KL. [ISSN: 0128-1283] - quarterly <a href="http://www.frim.gov.my/Korporat/2003Publications/Links/Frim14.htm">http://www.frim.gov.my/Korporat/2003Publications/Links/Frim14.htm</a>	Tropical Science	<b>0.113</b> (2005 JIF)
7.	Journal of Tropical Agricultural & Food Science	Malaysian Agricultural Research & Development Institute (MARDI), KL. [ISSN: 1394-9829] – semiannual <a href="http://www.mardi.my/main.php">http://www.mardi.my/main.php</a>	Agricultural & Food Science	-
8.	Tropical Biomedicine	Malaysian Society of Parasitology & Tropical Medicine, Institute for Medical Research, KL. [ISSN: 0127-5720] – semiannual <a href="http://www.msptm.org/index.html">http://www.msptm.org/index.html</a>	Tropical Physiology	-

Table 3 shows the statistics of Malaysian papers published in various fields. There are 12 fields of research performed between 2002 and 2006 which are based on number of paper published in citation journals under ISI Thomson. Computer science and microbiology appeared every year from 2002 to 2005. Compared to other countries under Rising Star, Malaysia is at par with neighbouring countries, namely Thailand, Philippines, Indonesia and Vietnam. The 2006 R&D output seems 'inactive' - there is only a token in social sciences. This may be caused by many reasons such as researchers publishing their work in conferences as well as the shrinkage of research grant 'amount' caused by the increasing number of universities. It is hoped that the statistics do not reflect a paradigm shift away from publishing their work in the cited international journals.

**Table 3: In-Cites of Rising Star - ISI Thomson for Malaysian publications in various fields of research.**

Month	2002	2003	2004	2005	2006
January	Computer Sci, Business & Economy	Materials Sci, Physics.	Mathematics	Computer Sci,	
March					
May		Microbiology		Microbiology	
July			Computer Sci, Microbiology		
September					
November				Microbiology	Social Sci, general

## Conclusion

A basic definition of journal impact factors and information about Malaysian statistics in R&D under ISI Thomson database has been given. The ISI Thomson is the best tool for any researcher to explore the journal status and its IF. The IF is a very useful tool for journal evaluation, but must be used discreetly. Considerations include the amount of review or other types of material published in a journal, variations between disciplines, and item-by-item impact.

The journal status with regard to coverage in the ISI databases as well as the occurrence of a title change is also very important. IF has caused conflict and controversy, influenced perception of published scientific research and evaluation [8, 9]. The best way to overcome this conflict and controversy is to understand the statement by Hoeffel [10]:

*"Impact Factor is not a perfect tool to measure the quality of articles but there is nothing better and it has the advantage of already being in existence and is, therefore, a good technique for scientific evaluation. Experience has shown that in each specialty the best journals are those in which it is most difficult to have an article accepted, and these are the journals that have a high IF. Most of these journals existed long before the impact factor was devised. The use of impact factor as a measure of quality is widespread because it fits well with the opinion we have in each field of the best journals in our specialty."*

In order to achieve excellence in R&D, universities cannot escape from the quality of R&D evaluated via publications, which is usually referred to journal impact factor because it simply shows recognition internationally. The most important thing is the audience who cited the work. In Malaysia, one of the main criteria for an establishment of a Research University (RU) is publications with IF. Malaysia's vision to be a world-class k-economy must be coupled with high-quality R&D of international standard. Harvard, Oxford, MIT and Cambridge have shown their outstanding achievement in R&D generated over the course of hundreds of years.

Comparatively, Malaysian R&D can be considered young and fresh since most universities were developed during the past 50 years. During the time when journals were standardized with impact factors, Malaysia, or Malaya, was in a political turmoil in order to strive for independence from the British, followed by 30 years of nation development based on economics and education. As such, it is not off mark to consider that Malaysian R&D had only begun in the 80s.

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