

Benchmarking science: a critique of the ISI (Thomson-Reuters) index

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1. Introduction

The Organization of Islamic Conference decided¹ in Dec 2005 to urge Member States to strive for “quality education that promotes creativity, innovation and research and development.” The Vision 1441 on Science and Technology adopted by the 10th session of the Islamic summit in Putrajaya,² Malaysia, in 2003, had already declared that “OIC member states are committed to become a community that values knowledge and is competent in utilising and advancing S&T to enhance...socio-economic well-being”. This is indeed a laudable objective.

However, noting the lack of objective methodologies, to evaluate performance of universities, the OIC decided to evolve one. A meeting of technical experts in Tehran in 2007 drafted a document containing the proposed criteria for ranking of universities in the OIC region. This decided to adopt a “key performance indicator” which gives 50% weightage to research quality and output. The emphasis on research quality is again a worthwhile and laudable move.³

The difficulty begins with the *criteria* used to measure research quality. The Technical Document asserts (p. 11) that “it is internationally admitted that the quality of a given published article can be measured by the number of citations it receives”. It also states (p. 10) that “according to the international standards, only the journals classified by the Institute of Scientific Information (ISI)...should be used both for counting publications and citations”.

Thus the way to judge research output recommended by OIC is (a) publication (in ISI journals, others not counted), (b) citation index, (c) impact parameter (exclusiveness of journal). This has now been widely implemented in various universities across the Islamic world. Research funding and promotions in universities are decided on the basis of this assessment.

1 OIC Summit, Ten Year Strategic Plan, public statement, *Third Extraordinary Session of the Islamic Summit Conference, Makkah al Mukarramah, Kingdom of Saudi Arabia, 5-6 dhul qa'dah 1426 h 7-8 December 2005*, sec V.1..

2 Organisation of Islamic Conference, Conference on Science and Technology, Vision 1441: Kuala Lumpur Declaration on Science and Technology for the Socio-Economic Well-Being of the Ummah, 7-10 October 2003.

3 OIC Report. (2007). Report on adopted criteria, procedures and mechanisms for ranking of universities. Tehran, April 2007. <http://www.oic-oci.org/oicnew/poa/ranking.pdf>.

2. Objectives vs methodology

However, as argued in this paper, the proposed methodology *conflicts* with the stated objectives. In this situation, it is the methodology which will be followed by people at the ground level, not the stated objectives. Thus, the criteria of measurement, not the stated objectives, will determine the actual outcome, which will be *contrary* to the stated objectives.

Accordingly, the criteria for measurement of research quality and its exact relation to the stated objectives needs to be carefully re-examined to ensure that the stated objectives are met.

According to the stated objectives, research is being encouraged to support socio-economic well being of the community. This means that research quality must be measured by the socio-economic well being it brings about.

Does citation index correlate with socio-economic well-being?

But nobody ever demonstrated that the citation index (counted using ISI journals) correlates with socio-economic well being, especially in non-Western societies. There is not a single study or publication on this. So, this cannot be accepted, even if it is “internationally admitted”. Counter examples are easy to find. For example, there are thousands of papers published on string theory. Many among these are also highly cited. However, there is no impact of this research on the socio-economic well being of anyone (other than the researchers themselves!) for the past thirty years.

Is citation index a measure of truth?

There is no scientific evidence that the citation index is even a reliable measure of truth.

Thus, thousands of well-cited papers have been published on dark matter in the galaxy and its composition, though it now seems likely that this dark matter is an artificial hypothesis, and it is unlikely to exist in the galaxy (in significant amounts). There are many other cases where highly-cited “fashionable” works simply went out of fashion.

Science is full of surprises: for eighty years scientists uniformly believed the expansion of the cosmos was decelerating, and routinely spoke of the deceleration parameter, but they now believe that its expansion is accelerating due to something unknown called “dark energy”. This is part of the present-day “standard model” of cosmology. They may again be wrong. Thus, the citation index only measures popular opinion among certain scientists, which popular opinion can be fickle, whereas socio-economic well-being is something more solid and not so easily upset. So, it is unlikely that a firm relation will *ever* be established between citation index and socio-economic well being.

Citation index correlates *negatively* with well-being in the non-West

Even if it is granted, for the sake of argument, that there may be some sort of general relation between citation index and the socio-economic well-being of Western societies, the same is not necessarily true

for non-Western societies. On the contrary, it is easy to see many situations where the citation index correlates *negatively* with the socio-economic well-being of non-Western societies. Thus, at a training-seminar in Malaysia on how to maximize citations, the trainer reportedly pointed out that people should not work on diseases of local significance to Malaysia, but should work on diseases of international significance. The same complaint has been heard in India, that researchers do not work on diseases like malaria, and tuberculosis, relevant to Indians, but instead research issues like heart-disease, which are of greater interest in the West.

A specific example is that of “Indian childhood cirrhosis”. Whole families used to suffer from the issue of juvenile cirrhosis of the liver, leading to numerous early deaths. But nobody bothered to study it, because this was a specifically Indian problem. The issue was clarified when steel prices went down, and people switched to stainless steel vessels for cooking. The phenomenon disappeared, so the reason became clear. The earlier technology was that of using a metal called “pital” (brass). Though there was a specific traditional technique of tinning the surface (called “kalai”), carelessness in this led to those deaths. However, no researcher bothered to point this out, just because this was not of “international significance”.

Other deficiencies of the citation index and impact parameter

Many other arguments can be brought to bear against the citation index. It was the product of a one-man start-up company (Institute of Scientific Information), which product was successfully marketed to large sections of the scientific community. It has now been taken up by one of the largest publishing conglomerates: Thomson-Reuters, because this criterion clearly helps to increase the sales of scientific journals, in general, and their science journals in particular.

Naturally, this for-profit company is primarily concerned about its profits, not scientific truth. If there is a conflict of interests it is not difficult to imagine which way the company will choose. To entrust scientific truth in the hands of a single for-profit company is dangerous. To allow it to take decisions secretly is worse: the data on which the impact parameter is based is not public, and not shared by Thomson Reuters with researchers.⁴ Doubts have been expressed that the company may manipulate matters for purposes of propaganda or on payment.⁵

Apart from ethical issues, there are basic statistical issues. Thus, one journal, in an editorial, cited all the papers published in that journal. This caused its impact parameter to jump. The distribution is skewed, and may well be long-tailed, so it is not clear what is the quality of the estimators used.

The key-performance index, proposed by the OIC has unfortunately neglected all this criticism, just by saying that it is “internationally admitted” that citation is the measure of quality.

However, a much more serious matter, which makes the citation index procedurally bad, and *damaging* to the interests of non-Western countries, is the following.

4 M. Rossner, H. Van Epps, and E. Hill, “Show me the data”. *J. Cell Biology* **179** (6), pp. 1091-92.

5 The PLoS Medicine Editors. 2006. The impact factor game. It is time to find a better way to assess the scientific literature. *PLoS Med.* 3:e291 doi:10.1371/journal.pmed.0030291

3. The criterion of reputability

Long ago Popper, in his *Logic of Scientific Discovery* proposed the criterion of falsifiability, which he later⁶ renamed to the refutability, saying he did not know English well enough when he gave the first name in 1935. This criterion of refutability does have certain merits, for it demands that scientific knowledge must be continuously and rigorously put to test.

In contrast, parameters such as the citation index and impact parameter only measure *reputability*; this does not even guarantee good science which must be refutable, not reputable. For example, people have complained that many results of string theory are reputable, but not refutable. That is they are “not even wrong”,⁷ so one can learn nothing from the rejection of these theories. The case of the steady state theory is similar.

Reputability as a means of social control: preserves any belief

On the other hand, it is well known that for centuries the church used this criterion of reputability as a means of social control. It simply declared all its critics as disreputable “heretics” etc., to prevent its beliefs from being challenged. Thus, we have a long baseline of empirical evidence to show that this criterion of reputability is bad for the truth, for it enabled the church to preserve the most absurd conclusions.

A well-known example is the laughable date of creation of the world (23 October 4004 B.C., at nine o'clock in the morning) as determined with exquisite precision by that most reputable of worthies the then Vice Chancellor of the University of Cambridge, Sir John Lightfoot,⁸ who published it in 1644, before Bishop Ussher. This was broadly believed in the West for some 15 centuries, and Western scholars in the 19th c. called Indians “superstitious”, hence disreputable, for believing the cosmos was much older. Thus, the criterion of reputability, measured by the citation index, encourages social control, not truth or good science. It can lead to and preserve the most absurd conclusion. This much has been empirically demonstrated over a long period of time.

This phenomenon is not restricted to theology. Einstein was the most reputed scientist in the last century, and his false claim to the theory of relativity held up the development of science, and the use of functional differential equations.⁹ Scientists are afraid of writing anything against scientific authority: just as the church named dissenters heretics, to arouse prejudice against them, dissenting scientists get labelled “cranks”. Just as the church never debated with those it declared heretics, scientists do not debate with “cranks”. For example, the well known repository ArXiv has a secretive system of such classification.

6 Karl Popper, *Realism and the Aim of Science*, PostScript to LScD, vol. 1, Hutchinson, London, 1982.

7 Peter Woit, *Not Even Wrong: The failure of string theory and the search for unity in physical law*, Basic Books, 2006.

8 A. D. White, *The War of Science and Religion*, Appleton and Co., 1897, p. 9.

9 This is too complicated an issue to go into here. For the basics of functional differential equations, see C. K. Raju, *Time: Towards a Consistent Theory*, Kluwer Academic, Dordrecht, 1994. For an account for a layperson, see C. K. Raju, *The Eleven Pictures of Time*, Sage, 2003. For a solution of functional differential equations in a significant physical context, see, C. K. Raju, “The electrodynamic 2-body problem and the origin of quantum mechanics”. *Found. Phys.* **34**, 2004, pp. 937–62. For more on Einstein's mistake, see my acceptance speech for the TGA award, <http://ckraju.net/News/ckr-TGA-acceptance-speech.pdf>.

Reputability: in whose hands is the social control?

The immediate point, however, is a different one. Since the criterion of reputability serves as a means of social control, the question is this: in whose hands is that social control?

Even a cursory examination of the Thomson-Reuters (formerly ISI) database shows that the list of journals in it is predominantly Western (i.e., based in US, Canada, UK, Europe and Australia, New Zealand). Equally, the editorial boards of these journals are predominantly Western. For example, there are 159 journals related to education, all based in the West. Of the thousands of editorial advisors in these journals only 2 (0.2%) are Indian, and this ethnicity counts for nothing since these 2 are based in the West! Hence, even if we grant that publication in ISI journals is somehow suited to assess research quality for Western researchers, this is not the case for non-Western researchers, for Westerners play the role of superiors, not peers.

Thus, any researcher who wants to change the education system in India must first gather “credibility” or reputability by going with a begging bowl to these Westerners (very conscious of their political and socio-economic dominance) to publish his or her ideas in those journals. This ensures status quo, for nothing can be changed unless it is reputable, and Westerners have been given the authority of censors to decide what is reputable, just as the church decided it in the West not long ago. Thus, the use of the citation index provides a stick and means of social control to the West over the non-West.

That is, the measurement of research quality through publications in these journals serves to put non-Western scientists under the control of Western scientists. Does that improve their socio-economic well-being?

(It was in this context that the USM recently organized a conference on “Decolonising our Universities” which sought to change the curriculum in our universities, across the board, including in mathematics and science. This had a significant impact on people, and may result in a variety of policy changes, with a much greater long-term impact. But this would count for nothing on the KPI, because it is done outside the control of the West.)

Creating a class dependent on the West

However, there is one sort of socio-economic well-being with which the demand for ISI publications *does* correlate: in fact there is an insidious *causal* relationship. As a measure of Western reputability this is an even more dangerous consequence. It creates a class of intellectuals and academics who are allied to the West, and dependent upon its goodwill for their material prosperity. A handful of British were able to rule India precisely by creating such a class with vested interests, by means of the educational "reforms" of Macaulay.¹⁰ The long-term consequence has been that India, an exporter of knowledge and technology to Britain until the 18th c., turned into a chronic importer of knowledge and technology for the next two centuries, and remains so to this day, in a state of dependence. Thus, use of the citation index helps to create a class of dependent intellectuals who help the socio-economic well-being of the West at the expense of the non-West.

Indeed, since these “Western-reputable” persons are invariably selected as “experts” for various academic tasks such as deciding the curriculum, this means that various elements of indoctrination,

¹⁰ C. K. Raju, *Ending Academic Imperialism: a Beginning*, Multiversity and Citizens International, Penang, 2011.,

such as a false Western history of science can be easily smuggled into the syllabus, as has been done in Indian school texts.¹¹ This also means that whole generations grow up indoctrinated into awe of the West with all sort of falsehoods. Even more deviously, these Western-aligned experts have prescribed the teaching of formal mathematics (as opposed to scientific mathematics) which involves indoctrination into a biased form of metaphysics which is opposed to Muslim, Buddhist, and, indeed, all non-Western philosophy.¹² All this is a key source of soft power to ensure Western dominance.

It seems the OIC countries have incorrectly accepted a methodology which ensures Western dominance, exactly as India was conned into accepting the Western model of education through a false history of science. (The carrot then was the same: advancement in science and technology.) If the current “key performance indicators” are not immediately reviewed, they are likely to usher in a long and disastrous period of dependence on and domination by the West.

3. Why is journal publication important?

Even if all these considerations are set aside, it is astonishing that a large group of nations has decided to follow the claims of a small for-profit company (ISI) now sold to a large for-profit company (Thomson-Reuters), without due diligence. While there is no correlation of the citation index with the socio-economic well-being of the *people* in the OIC countries, there is a clear correlation of the citation index and impact parameter with the socio-economic well-being of these companies! Indeed, the entire business of ISI was built around this product. It is clear why the largest publishing company (Thomson) would want to encourage the idea that the quality of scientific research can be measured only by *publications*, that too in a list of journals, the majority of which are brought out by large publishing houses. These publishing houses make a huge profit by means of a various government subsidies. First, the costs of research are borne by the state, but the ownership of the outcome (publications) vests in these companies to whom copyright of the publications is transferred. The refereeing etc. is also done for free by the academic community, and these days even the typesetting and proof-correction is often done by the author himself. However, the journals make a huge profit by charging for the journal, and for reprints etc. Thus, governments pay twice: first to generate the knowledge, and then to buy it back from the publishers. The publishers invest nothing to make a profit.

It is not clear what exactly is the service these publishing houses perform, in return for which they get a profit, since today distribution of information is mostly done electronically, and few people actually read printed journals. It is one thing that the results of scientific research are better off publicly disseminated. But this could be done in a variety of ways: by simply talking to others, as in a conference, or by writing up the results and posting them on a preprint server, etc. Indeed, a Fields medal was recently awarded for a piece of research which was never published. Once upon a time the journal was important because it took one's results to a wider community. That is no longer the case, and journals no longer perform that role. On the contrary, publication in a journal *restricts* the readership to those who can afford to purchase the journal.

The journals will maintain that they provide the service of quality control. That is not really true. What the journals do is to send a submitted paper to referees. The task of quality control is performed by the referees. Now this is a secretive process. As such, there is no objective way to judge the quality. We

11 C. K. Raju, “Teaching racist history”, *Indian Journal of Secularism* 11(4) (2008) 25-28.

12 C. K. Raju, “Teaching mathematics with a different philosophy. 1: Formal mathematics as biased metaphysics” (to appear) *Science and Culture*, 77 (7-8), 2011, pp. 275-80. (Incidentally, this is an ISI journal!)

simply have to believe in the editor. For all one knows, the editor might introduce a variety of biases, and some editors may be downright dishonest. This was how the system of secretive censorship functioned with the church. Our belief in the quality control of provided by the journal or censorship thus rests on mere faith in the editor.

4. So what is the alternative?

Clearly, in today's electronic age, journals have become redundant for purposes of dissemination of scientific knowledge, which can be quickly and efficiently performed electronically. Secretive processes cannot ensure quality in science.

Accordingly, a simple solution to the matter is to have *post-publication public debate*. Instead of publishing a paper, an author simply posts in on a public preprint server. The editor, elected by the community (not publishing house) invites referees to review the article publicly. The author gets a chance to respond publicly. People can read both sets of comments and make up their own mind. The referees who now work for free for publication houses, will be doing the same work now for the whole community. This would make the results of scientific research available to all, not merely those who can pay for journals. As suggested in my book on *Ending Academic Imperialism*, one needs to start such a Free Science Forum, somewhat like the Free Software Foundation. However, since those running the forum don't aim to make a livelihood out of it, it would require very little investment, and the OIC countries (and individual universities) can easily set up preprint-servers to enable this. This would be a solid means to combat the pernicious influence of reliance on both the Western criterion of reputability and large publishing houses.