

Čimbenik utjecaja i procjena znanstvenih radova ili timova

Impact factor and evaluation of scientific papers or teams

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Godine 2005. čimbenik utjecaja (engl. *impact factor*, IF) proslavio je svoju 50. obljetnicu. Eugene Garfield je objavio svoj rad „*Citation index to science a new dimension in documentation through association of ideas*“ u časopisu *Science*. Danas je pojam čimbenika utjecaja postao proturječan, poglavito u svezi s procjenom znanstvenog stupnja pojedinaca ili ustanova.

Čimbenik utjecaja je rezultat statističkih operacija koje utvrđuju očekivanja citiranosti neke publikacije na osnovi dvogodišnje procjene. To je vrijednost časopisa, a ne dotične publikacije ili autora. Međutim, nema sumnje da prestižni časopisi s visokim čimbenikom utjecaja objavljuju radove visoke znanstvene razine. To je usko povezano s visokim čimbenikom utjecaja tog časopisa.

Stopa citiranosti može se povezati s kvalitetom rada, no dublja procjena ovoga pitanja otkriva kako mnogi radovi (oko 20%) iz prestižnih časopisa nisu citirani. Stoga se možemo zapitati: da li su to doista vrhunski radovi?

Čimbenik utjecaja predstavlja jednostavne kvantificirane podatke za znanstvenu proizvodnju, no moramo ga povezati s područjem istraživanja. Tu postoje velike razlike, npr. vrhunski časopis u laboratorijskoj medicini je *Clinical Chemistry* (IF = 5,454), u nefrologiji je to *Journal of American Society of Nephrology* (IF = 7,371), u onkologiji je vrhunski časopis *CA A Cancer Journal for Clinicians* (IF = 63,342), a ukupno sedam časopisa ima IF iznad 10. *Cell* (IF = 29) i *Nature Review Molecular Cell Biology* (IF = 31) su vrhunski časopisi u bazičnoj staničnoj znanosti, dok još 16 drugih časopisa ima IF viši od 10. Procjenu IF treba raditi na osnovi „opterećenog čimbenika utjecaja“ prema području istraživanja.

Čimbenici utjecaja časopisa čine i jedan od parametara za financiranje istraživanja. Urednici imaju veliku moć da odaberu visoko kvalificirane recenzente za odabir radova. Oni neizravno utječu na financiranje budućih istraživanja različitih znanstvenika i ustanova.

Science Citation Index (SCI) je usko povezan s čimbenikom utjecaja. Danas se on zasniva na Web of Science, što ga organizira i izrađuje E. Garfield. Prvi svezak *Science Ci-*

In 2005, the impact factor celebrated its 50th anniversary. Eugene Garfield published the paper “*Citation index to science a new dimension in documentation through association of ideas*” in *Science*. The phenomenon of impact factor is contradictory in these days, mostly in connection with the evaluation of the scientific degree of individuals or institutions.

The impact factor is a result of statistical operations determining the expectation of a publication to be cited based on two-year evaluation. It is the value of the journal and not of the publication or author. However, without doubts, prestigious journals with high impact factors publish papers of a high scientific level. This is tightly connected with the high impact factor of the journal.

The rate of citations can be related to the quality of paper, but in deep evaluation of this problem, we can find that many papers (around 20%) from prestigious journals are not cited. We can ask the following question: Are they really the top papers?

The impact factor represents simple quantification data for scientific production, but we cannot forget to relate the impact factor to the research area. There are very great differences, e.g., a top ranking journal in laboratory medicine is *Clinical Chemistry* (IF = 5.454), in nephrology *Journal of American Society of Nephrology* (IF = 7.371), in oncology the highest ranking journal is *CA A Cancer Journal for Clinicians* (IF = 63.342), and seven journals in total have an IF higher than 10. *Cell* (IF = 29) and *Nature Review Molecular Cell Biology* (IF = 31) are on top of the journals from basic cell science and another 16 journals have an IF higher than 10. The evaluation of IF must be done based on “weighted impact factor” to the research area.

The impact factors of journals are also one of the parameters relevant for research funding. There is a strong power of editors to choose the highly qualified reviewers for selection of papers. They have indirect influence on funding future research of different scientists and institutions. Science citation index (SCI) is in tight connection with the impact factor. It is now based on the Web of Science organized and developed by E. Garfield. The first volume of the Science Citation Index was published in 1961. This

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tation Index je objavljen 1961. godine. Ovaj parametar pokazuje broj citata nekog rada prema odabranoj bazi podataka iz časopisa. Ova baza podataka sadrži oko 8.000 časopisa. Monopol ove baze podataka okončan je 2004. godine i danas joj je stvarna alternativa Scopus koji obuhvaća oko 14.000 časopisa. Bazu podataka Scopus organizira Elsevier i više je usredotočena na europsku regiju.

Nijedna od ovih dviju baza podataka ne uzima u obzir monografije, koje su osnovni izvor informacija, kao ni udžbenike ili studentska skripta.

Objavljivanje radova u web časopisima ili na web stranicama te e-tečajevi i udžbenici, kao i njihova procjena još uvijek predstavljaju otvoreno područje, te za ove platforme valja očekivati nove scientometrijske tehnike.

Nacionalni časopisi su važni za nacionalnu znanstvenu zajednicu. Oni bi prvenstveno trebali služiti za izobrazbu, uz kraće informacije za znanstvenu zajednicu; naravno, trebaju objavljivati i izvorne radove. Izdavač i znanstveno društvo trebali bi težiti njegovu uključivanju u međunarodne baze podataka, poglavito Scopus ili Web of Science.

Postoje i nove scientometrijske tehnike za procjenu časopisa i znanstvenika – gustoća citata, poluživot citata, Erdosov broj (najviše ga rabe matematičari) ili *h* indeks. Svi ovi novi instrumenti rabe sofisticirane statističke i matematičke procese. Hirschov indeks (*h* indeks) se definira kao omjer broja radova i broja citata koji je jednak ili viši od broja radova. Ovaj indeks treba rabiti za procjenu osoba koje se pridružuju sveučilišnom osoblju ili prestižnim društvima. Vrijednost *h* indeksa od 10–12 je za prestižna sveučilišta znak za stalno zaposlenje bez reizbora. Za članstvo u American Physical Society potreban je *h* indeks od 15–20, a za članstvo u US National Academy of Science iznad 45.

Ekspertna provjera je jedan od novih postupaka za procjenu instituta. Eksperti u obzir uzimaju ne samo brojčani IF, nego i druge kriterije znanstvenoga rada kao što su patenti, izobrazba novih znanstvenika, međunarodna suradnja i projekti itd.

Znanstveni rad i njegova procjena nisu puki čimbenik utjecaja, koji je također važan, nego i drugi pokazatelji kao što su uspješna izobrazba poslijediplomskih studenata, priprava udžbenika i monografija, te patenti.

Ovaj proces je daleko zahtjevniji od čistog jezika brojeva i zasigurno puno objektivniji.

parameter shows the number of citations of a paper from a selected database of journals. This database contains around 8,000 journals. The monopoly of this database was finished in 2004 and nowadays the Scopus is a real alternative that includes around 14,000 journals. The Scopus database is organized by Elsevier and focuses more on the European region.

These two databases take neither monographs, which are basic resources of information, nor educational textbooks or student manuals in consideration.

Publishing of papers in web journals or on web pages, and e-learning courses and textbooks and their evaluation are still open and we should expect new scientometric techniques for these platforms.

National journals are important for national scientific community. They should have more educational character with brief information for scientific community; of course, they should also publish some original articles. The aim of the publisher and scientific society should be to fill in the journal to international databases, mainly to Scopus or Web of Science.

There are also new scientometric techniques for evaluation of journals and scientists – citation density, citation half-life, Erdos number (most used by mathematicians), or *h* index. All these new instruments use sophisticated statistical and mathematical processes.

The *h*-index (Hirsch index) is defined as the ratio of the number of papers and the number of citations, which is the same or higher than the number of papers. The *h*-index should be used for evaluation of persons entering university staff or prestigious societies. The value of *h*-index 10-12 is for prestigious universities a mark for tenure. A fellow of the American Physical Society needs an *h*-index of 15-20 and a member of the US National Academy of Science higher than 45.

Checking by experts is one of the new trends for institute evaluation. The experts should take into consideration not only the number of IF, but also other criteria of the scientific work such as patents, education of new scientists, international co-operations and projects, etc. Scientific work and its evaluation are not only impact factor, which is also important, but other indicators as well, e.g., successful education of postgraduate students, preparation of textbooks and monographs, and patents.

This process is more challenging than brief language of numbers, and for sure, more objective.

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