General Article

PATEL HYPOTHESIS OF RESEARCH EVALUATION

*U. S. Patel
Department of Biological Sciences, Rani Durgavati University Jabalpur, Madhya Pradesh, India
*Author for Correspondence

ABSTRACT
Six formulas are designed to evaluate research journals, research fields, research papers, researchers, research institutes and nations for up to date research outputs while three formulae are formulated to measure research efficiency, institute efficiency and national efficiency of researchers, institutes and countries respectively for their periodic performances. These formulas are easy and better than citation based Impact Factor and H-indices. Proposed formulas are useful in decision making for appointments, carrier advancement, financial support, awards and rewards. Eight suggestions also made for betterment of journals and researchers.

Key Words*: Grade, Humanity, Immediacy, Index, Internet, Referees, Uniform*

INTRODUCTION
The idea of impact factor was devised by Garfield (1955). It is used to measure relative importance of a journal within its field. The journals with high impact factor are deemed to be more important than those with lower ones. Impact factor is calculated yearly for those journals that are indexed in Thomson Reuters' Journal Citation Report. The creation of the Science Citation Index in 1961 made it possible to calculate Impact Factor (Garfield, 2006). Despite of widely use of Impact Factor several criticisms have been made regarding its validity (Erjen, 2009) and editorial policies that increase Impact Factor of a journal (Fassoulaki *et al.,* 2002; Agrawal, 2005; Douglas and Kristine, 2011). Impact Factor may be incorrectly applied to evaluate the significance of an individual publication or to evaluate an individual researcher (Seglen, 1997). Riikonen and Vihinen (2008) suggested that analysis of the scientific contribution of persons, disciplines or nations should be based on actual publication and citation counts rather than on derived information like Impact Factors.

The H-index was suggested by Hirsch (2005) to quantify an individual's scientific research output but now it can also be applied to journals (Braun *et al.,* 2006), institutes (Vaan-Raan, 2006) and countries (Jasco, 2009). Like Impact Factor, H-index also has some advantages and disadvantages (Costa and Bordons, 2007) especially its manipulation through self citation (Christoph & Servaas, 2011). There are a number of situations in which H-index may provide misleading information about a scientist's output (Wendil, 2007). Various indices like m-index (Hirsch, 2005), g-index (Egghe, 2006), a-index (Jin *et al.,* 2007), v-index (Riikonen and Vihinen, 2008), p-index (Pratap, 2010), n-index (Namazi and Fallazaheb, 2010) etc. have been applied as modification or complement to the h-index. Now, there are more than twenty variants of h-index giving preference to high citation count (Schreifer, 2010) but there are evidences also that the work that is rarely cited or uncited is used extensively (McRoberts and McRoberts, 2010).

Most articles in most fields are not well cited, whereas some articles in small fields may have unusual impact especially where they have cross disciplinary impact. It is well known that there is skewed distribution of citations in most fields. The well known 80/20 rule applies in that 20% of articles may account for 80% of citation (Garfield, 2005). Therefore, I suggest formulas that are free from citation count, distribution and dispute.

General Article

FORMULAS

(1) Research Journal Value (RJV): is an indicative number for evaluation of importance of journals. The formula of Research Journal Value is designed to measure importance of a research journal. It comprises five parameters and a Humanity Factor logically put in numerator and denominator. In my view, a journal is more important if it publishes more articles, its frequency is more, it is easily available , it has better referred system, and takes less time for articles publication. Humanity Factor in denominator is to keep journal value in limited digits for convenience of calculations.

$$RJV = \frac{\text{Number of articles published in a year} \times \text{Number of pages published in a year} \times \text{Number of referees per article evaluation}}{\text{Number of Subjects included} \times \text{Period in days for articles publication} \times \text{Humanity Factor score}}$$

Supposed:

(a)

$$\text{RJV of journal 'A' for the year 'y'} = \frac{200 \times 1000 \times 2}{1 \times 90 \times 300} = 14.81$$

Research Journal Value of the journal 'A' for the year 'Y' is 14.81

(b)

$$\text{RJV of journal 'B' for the year 'y'} = \frac{200 \times 1000 \times 2}{1 \times 60 \times 300} = 22.22$$

Research Journal Value of the journal 'B' for the year 'Y' is 22.22

(c)

$$\text{RJV of journal 'C' for the year 'y'} = \frac{200 \times 1000 \times 2}{3 \times 60 \times 300} = 7.40$$

Research Journal Value of the journal 'C' for the year 'Y' is 7.40

(d)

$$\text{RJV of journal 'D' for the year 'y'} = \frac{200 \times 1000 \times 2}{3 \times 90 \times 300} = 4.93$$

Research Journal Value of the journal 'D' for the year 'Y' is 4.93.

General Article

(2) Research Field Value (RFV) is an indicative number for evaluation of importance of the research fields. The formula of Research Field Value is designed to measure importance of a research field of any subject. It comprises three parameters: articles published in the subject and sub-subject put in numerator and multiplied to get sufficient digits while articles published in specialized field put in denominator. The research field which has less publications is more important from research point of view for holistic and balanced development of society. The specific research field lesser explored has greater potential of new findings. Humanity Factor in denominator is to keep research field value in limited digits for convenience of writing and calculations.

$$RJV = \frac{\text{Total number of papers published in the subject in all journals} \quad \text{x} \quad \text{Total number of papers published in sub-subject in all journals}}{\text{Total number of papers published in the specialized field in all Journals} \quad \text{x} \quad \text{Humanity Factor score}}$$

Supposed:

$$\text{RFV of fungal taxonomy for the year 'Y'} = \frac{\text{Plant Science} \quad X \quad \text{Mycology}}{\text{Fungal taxonomy} \quad X \quad \text{HFS}} = \frac{1,0000 \quad X \quad 200}{50 \quad X \quad 300} = 133.33.$$

Research Field Value of fungal taxonomy for the year 'Y' is 133.33.

(3) Research Paper Value (RPV): is an indicative number for evaluation of importance of research papers. This formula of Research Paper Value is designed to measure quality of the research articles. It comprises four parameters: Research Journal Value and Research Field Value put in numerator and multiplied to get sufficient digits for further calculations while number of authors and grade of articles put in denominator to rectify quality of the articles. The grade third is mandatory for articles published in journals without referees. Humanity Factor in denominator is to keep Research Paper Value in limits for convenience of writing and calculations.

$$RPV = \frac{\text{Research Journal Value for the previous year} \quad \text{x} \quad \text{Research Field Value for the previous year}}{\text{Number of authors in the paper (article)} \quad \text{x} \quad \text{Grade of paper given by referee as 1 or 2 or 3} \quad \text{x} \quad \text{Humanity Factor score}}$$

Supposed:

(a)

$$\text{RPV for the paper 'A'} = \frac{14.81 \quad x \quad 133.33}{1 \times 1 \quad x \quad 300} = \frac{1974.61}{300} = 6.58$$

General Article

The Research Paper Value of the paper 'A' is 6.58.

(b)

$$\text{RPV for the paper 'B'} \quad = \quad \frac{14.81 \quad \text{x} \quad 133.33}{1 \text{ x } 3 \quad \text{x} \quad 300} \quad = \quad \frac{1974.61}{900} \quad = \quad 2.19$$

The Research Paper Value of the paper 'B' is 2.19.

(c)

$$\text{RPV for the paper 'C'} \quad = \quad \frac{14.81 \quad \text{x} \quad 133.33}{5 \text{ x } 1 \quad \text{x} \quad 300} \quad = \quad \frac{1974.61}{1500} \quad = \quad 1.31$$

The Research Paper Value of the paper 'C' is 1.31.

(d)

$$\text{RPV for the paper 'D'} \quad = \quad \frac{14.81 \quad \text{x} \quad 133.33}{10 \text{ x } 1 \quad \text{x} \quad 300} \quad = \quad \frac{1974.61}{3000} \quad = \quad 0.65$$

The Research Paper Value of the paper 'D' is 0.65.

(4) Scientist Value (SV): is an indicative number for evaluation of importance of research scientist. The formula of Scientist Value is designed to measure research output of the scientist. It comprises one parameter the total of Research Paper Values of a scientist, in numerator. Humanity Factor in denominator is to keep Scientist Value in limited digits for convenience of writing and calculations.

$$\text{SV} \quad = \quad \frac{\text{Total number of Research Paper Values of a scientist}}{\text{Humanity Factor score}}$$

Supposed:

$$\text{SV} \quad = \quad \frac{27,000}{300} \quad = \quad 90$$

Scientist Value of a particular scientist is 90.

(5) Scientist Efficiency (SE): is an indicative number for evaluation of periodic research output of a scientist. The formula of Scientist Efficiency is designed to measure research output of a scientist for a definite period of time. Formula is simple in which sum of Scientist Values acquired is divided by the period of work in years.

General Article

$$SE \quad = \quad \frac{\text{Scientists' Values}}{\text{Period of work}}$$

Supposed:

$$\text{SV of period } 2006\text{-}2010 \quad = \quad \frac{\text{Total RPV of 2006-2010}}{\text{Humanity Factor score}} \quad = \quad \frac{900}{300} \quad = \quad 3$$

$$SE \quad = \quad \frac{3}{5} \quad = \quad 0.6s$$

Scientist Efficiency of the scientist is 0.6 for the period of five years from 2006 to 2010.

(6) Institute Value (IV) is an indicative number for evaluation of importance of an institute in the field of research. The formula of Institute Value is designed to measure research output collectively of all scientists of a group or institute. It comprises one parameter the sum of Scientists Values of all scientists of the group or institute, in numerator. Humanity Factor in denominator is to keep Institute Value in limited digits.

$$\text{Institute Value} \quad = \quad \frac{\text{Total number of scientist values of all scientists of an institute}}{\text{Humanity Factor score}} \quad = \quad \frac{9000}{300} \quad = \quad 30$$

Institute Value of an institute in the field of research is 30.

(7) Institute Efficiency (IE): is an indicative number for evaluation of periodic research output of an institute. The formula of Institute Efficiency is designed to measure research output of an institute for a definite period of time. The formula is simple in which the sum of Institute Values acquired is divided by the period of work in years.

$$IE \quad = \quad \frac{\text{Total Institute Values}}{\text{Period of work}}$$

Supposed:

$$IE \quad = \quad \frac{30}{10} \quad = \quad 3$$

Institute Efficiency of an institute is 3 for the period of 10 years from 2001 to 2010.

General Article

(8) National Value (NV) is an indicative number for evaluation of importance of a nation. The formula of National Value is designed to measure research outputs collectively of all institutes of the country. It comprises one parameter the sum of Institute Values of all institutes of the country, in numerator. Humanity Factor in denominator is to keep limit on digits of National Value for convenience of writing and memorizing.

$$NV = \frac{\text{Total number of Institute Values of all institutes of a nation}}{\text{Humanity Factor score}}$$

Supposed:

$$NV = \frac{1500}{300} = 5$$

National Value of a nation in the field of research is 5.

(9) National Efficiency (NE): is an indicative number for evaluation of periodic research output of a nation. The formula of National Efficiency is designed to measure research output of a nation for a definite period of time. The formula is simple in which the sum of National Values acquired is divided by the period of work in years.

$$NE = \frac{\text{Total National Values}}{\text{Period of work}}$$

Supposed:

$$NE = \frac{50}{10} = 5$$

National Efficiency of a country is 5 for the period of 10 years from 2001 to 2010.

DISCUSSION

The number of papers published implies substantive research work or review articles only not any editorials, news blogs etc. The humanity factor score is a value of product of 25 x 12, the birth date (i.e. 25 the December) of Angel Jesus Christ. Presently, formulas appear a bit difficult but after indexing of all journals and their net connectivity would be very easy to find out any value with help of computer based calculations. Since all journals are not accessible at present, so counting of papers published in the subject, sub-subject, specialized field and number of pages is impossible. Therefore, calculations in this article are imaginary. Due importance have been given to research field specialization, immediacy of publication and referral system for measurement of relative importance of journals. Every research field has its own value but less explored field having less publications has greater potentials of new findings. The lesser number of articles published in the research field the greater is importance of that research field. Equal value have been given to all author of the article regardless of their sequence and increasing number of authors correspondingly decreased quality of the article as credit of the work is shared. The parameter of Research Journal Value in numerator of the formula of Research Paper Value is to minimize any bias done by referees. And grades given to articles by referees are averaged to further minimize any

General Article

bias. The quantity of Research Paper Value is the actual quality of any research output. An outstanding research output will get an outstanding Research Paper Value. The quality of the scientists should be measured neither by number of articles publications nor by articles citations but by number of scientist values. Scientists having large number of publications of less value can be compared with scientists having less number of publications of more value on the basis of Scientist Value. Researchers having greater Scientist Value should be regarded greater regardless disciplines. Evaluation of any research institute and country can easily be done on the basis of Scientists Values and Institute Value respectively. These formulae can be used for any preceding year, decade, even century; for any subject, institute or nation across the world. Proposed formulas can also be used in decision making for appointments, carrier advancement, financial support, awards and regards. Following eight suggestions are proposed for betterment of journals and researchers:

(1) There should be a uniform pattern of journals regarding font size 11, spacing, margins, references etc. to avoid any bias during counting of pages of a paper / article.
(2) All journals should be internet connected and indexed.
(3) All journals should be referred. Papers published in journals without referees should be given grade three.
(4) These formulae should be followed as early as possible for the sake of next generation of scientists.
(5) A list of subjects, sub-subjects and specialized field should be prepared at international level as recommended by example in table -1.
(6) Research Journal Value, Research Field Value and Research Papers Value should be mentioned at the top of any paper published.
(7) Number of member libraries and nations of distribution should also be mentioned at the top of each journal every year.
(8) Papers published in the journals that are not indexed and internet connected should not be considered as academic part of the researcher.

TABLE 1: Sample of subject, sub-subject and specialization fields.

S. No.	Subjects	Sub-subjects	Specialized field / area / work
1	Plant Science	Mycology	Taxonomy Physiology Genetics Biological control Antibiotics, etc
		Angiosperms	Taxonomy Embryology Genetics Physiology, etc.
2	Animal Science	Entomology	Taxonomy Physiology Genetics Biological control, etc.

General Article

ACKNOWLEDGEMENTS

REFERENCES

Agrawal A (2005). Corruption of journal impact factors. *Trends in Ecology and Evolution* **20** (4) 157.

Banks MG (2006). An extension of the Hirsch-index: indexing scientific topics and compounds. *Scientometrics* **69** (1) 161-168.

Braun T, Glenjel W, Shubert A (2006). A hirsch-type index for journals. *Scientometrics* **69** (1) 169-173.

Costas R and Bordons M (2007). Advantages, limitations and its relation with other bibliometric indicators at the microlevel. *Journal of Informatics* **1** (3) 193-203.

Christoph B and Servaas K (2011). Detecting h-index manipulation through self citation analysis. *Scientometrics* **87** (1) 85-98.

Douglas NA and Kristine KF (2011). Nefarious numbers. *Notices of the American Mathematical Society* **58**(3) 434-437.

Egghe L (2006). Theory and practices of the g-index. *Scientometrics* **69** (1) 131-152.

Erjen VN (2009). Why do statistics journals have low impact factor? *Statistica Neerlandica* **63**(1) 52-62.

Fassoulaki A, Papilas K, Paraskeva A, and Patris K (2002). Impact factor bias and proposed adjustments for its derermination. *Acta Annaesthesiologica Scandinavia* **46** (7) 902-905.

Garfield E (1955). Citation indexes to science: a new dimension in documentation through association of ideas. *Science* **122** (3159) 108-111.

Garfield E (2005). The agony and the ecstasy: the history and meaning of the journal impact factor. *International Congress on Peer review and Biomedical Publication,* Chicago, September, page number 6.

Garfield E (2006). The history and meaning of the journal impact factor. *The Journal of American Medical Association* **295**(1) 90-93.

Hirsch E (2005). An index to quantify an individual's scientific research output. *Proceedings of the National Academy of Sciences* **192** (46) 16569-16572.

Jasco P (2009). The h-index for countries in web of science and scopus. *Online Information Review* **33** (4) 831-837.

Jin BH, Liang LM, Roussean R, Egghe L (2007). The R and AR-indices: complementing the h-index. *Chinese Science Bulletin* **52** (6) 8355-863.

McRoberts MH and McRoberts BR (2010). Problems of citation analysis: a study of uncited and seldom cited influences. *Journal of American Society for Information Science and Technology* **61** (1) 1-12.

Namazi MR, Fallahzadah MK (2010). N-index: a novel and easily calculable parameter for comparison of researcher working in different scientific fields. *Indian Journal of Dermatology Vereneology and Leprology* **76** (3) 229-230.

Pratap G (2010). The hundred most prolific economists using the p-index. *Scientometrics* **84** (1)167-172.

Riikonen P and Vihinen M (2008). National research contributions: a case study on Finnista biomedial research. *Scientometrics* **77** (2) 207-222.

Schreiber M (2010). Twenty Hirsch index variants and other indicators giving more or less preference to highly cited papers. *Annles der Physik* **19** (8) 536-554.

Seglen PO (1997). Why the impact factor of journals should not be used for evaluating research. *British Medical Journal* **314** (7079) 498-502.

Vaan-Raaan AFJ (2006). Comparison of the Hirsch-index with standard bibliometric indicators and with peer judgment for 147 chemistry research groups. *Scientometrics* **67** (3) 491-502.

General Article

Wendil M (2007). H-index: however ranked, citations need context. *Nature* **449** (7161) 403.