

Does it Matter Which Citation Tool is Used to Compare the H-Index of a Group of Highly Cited Researchers?

Hadi Farhadi, Hadi Salehi, Melor Md Yunus, Aghaei Chadegani Arezoo,

Maryam Farhadi, Masood Fooladi, Nader Ale Ebrahim

▶ To cite this version:

Hadi Farhadi, Hadi Salehi, Melor Md Yunus, Aghaei Chadegani Arezoo, Maryam Farhadi, et al.. Does it Matter Which Citation Tool is Used to Compare the H-Index of a Group of Highly Cited Researchers?. Australian Journal of Basic and Applied Sciences, 2013, 7 (4), pp.198-202. hal-00830415

HAL Id: hal-00830415 https://hal.science/hal-00830415

Submitted on 5 Jun2013

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers. L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Does it matter which citation tool is used to compare the h-index of a group of highly cited researchers?

Hadi Farhadi^{1*}, Hadi Salehi², Melor Md Yunus³, Arezoo Aghaei Chadegani⁴, Maryam Farhadi⁴, Masood Fooladi⁴, and Nader Ale Ebrahim⁵

¹School of Psychology and Human Development, Faculty of Social Sciences and Humanities, Universiti Kebangsaan Malaysia (UKM), Malaysia

²Faculty of Literature and Humanities, Najafabad Branch, Islamic Azad University, Najafabad, Isfahan, Iran

³Faculty of Education, Universiti Kebangsaan Malaysia (UKM), Malaysia

⁴Department of Accounting, Mobarakeh Branch, Islamic Azad University, Mobarakeh, Isfahan, Iran

⁵Department of Engineering Design and Manufacture, Faculty of Engineering, University of Malaya, Kuala Lumpur, Malaysia

^{*}Corresponding author: Hadi Farhadi (School of Psychology and Human Development, Faculty of Social Sciences and Humanities, Universiti Kebangsaan Malaysia (UKM), Malaysia; farhadihadi@yahoo.com)

Abstract: *h-index* retrieved by citation indexes (Scopus, Google scholar, and Web of Science) is used to measure the scientific performance and the research impact studies based on the number of publications and citations of a scientist. It also is easily available and may be used for performance measures of scientists, and for recruitment decisions. The aim of this study is to investigate the difference between the outputs and results from these three citation databases namely Scopus, Google Scholar, and Web of Science based upon the h-index of a group of highly cited researchers (Nobel Prize winner scientist). The purposive sampling method was adopted to collect the required data. The results showed that there is a significant difference in the h-index was more than the h-index in two other databases. It was also concluded that there is a significant positive relationship between h-indices based on Google scholar and

Scopus. The citation indexes of Scopus, Google scholar, and Web of Science may be useful for evaluating h-index of scientists but they have some limitations as well.

Key words: h-index, Scopus, Google Scholar, Web of Science, Nobel Prize, Physics, Chemistry, Economic Sciences

1. Introduction

Nowadays, when citation information is needed there are a few sources to rely on. The most comprehensive web version of citation indexes sources are Scopus (http://www.scopus.com/), Google Scholar (<u>http://scholar.google.com/</u>), and the Web of Science (<u>http://portal.isiknowledge.com/</u>). Scopus, Google scholar, and Web of Science are regarded as the most useful and trustful source for searching. They are valuable tools for searching which provide the citation searching and ranking by times cited (Mikki, 2009). These three sources of citation indexes are multidisciplinary and international coverage and used to assess the scientific output worldwide (Bar-Ilan, 2008).

2. Background

To quantify the research output of a single scientist, Hirsch (2005) introduced the h-index. *h*index is calculated by the number of publications and the number of citations received. As defined by Hirsch (2005), a scientist has index h if h of his or her N_p papers have at least h citations each and the other (N_p-h) papers have \leq h citations each. It is a single number which supports a good representation of the scientific lifetime achievement (Egghe & Rousseau, 2006; van Raan, 2006). For example, if a scientist has published 15 papers that each had at least 15 citations, h-index of him/her will be 15. Although this single number is simple to compute and it takes into account both the quantity and impact of the papers, it is essential to consider which database is reporting this single number (h-index).

h-index is computed based upon the data from the aforementioned citation indexes to measure the scientific output of a researcher. The data from these citation indexes are important for scientists and universities in all over the world. For instance, h-index is one of the impressive

and effective factors used by promotion committees to evaluate research productivity and impact at universities. Although, citing and cited documents from these citation tools are associated to each other, h-index can be obtained separately from different citation databases of Scopus, Google Scholar, and Web of Science. That is because each of these citation indexes has a different collection policy which influences both the publications covered and the number of citations (Bar-Ilan, 2008). Hence, the outputs and the results from these sources of citation indexes should not be approximately similar.

This study aims to distinguish the major differences on h-index of scientists between three citation databases of Scopus, Google Scholar, and Web of Science. Therefore, based upon the literature, this study attempts to answer the following research questions:

- 1) How much the results from these sources of citation indexes are different?
- 2) Can universes and promotion committees use the h-index of a scientist as a tool for synthesizing and depicting the scientific production in a more exhaustive way?

To answer the above research questions, the current study investigated the differences between the outputs and the results from these three citation databases (Scopus, Google Scholar, and Web of Science) based upon the h-index of a group of highly cited researchers (Nobel Prize winner scientists).

3. Methodology

There exist three commonly web versions of citation indexes sources to measure the h-index of a scientist. Hence, this study computed the h-index for 12 Nobel Prize winners based upon data from Scopus, Google Scholar, and Web of Science for three different fields of study namely physics, chemistry and economic sciences. Then, we compared the h-index data of these 12 Nobel Prize winners to find out the correlation between the h-index of three mentioned citation indexes sources. Purposive sampling method was used to collect the required data. To do so, we used the official web site of the Nobel Prize (<u>http://www.nobelprize.org/</u>) as our starting point, which lists the all Nobel Prize winners.

Every year, the Nobel Foundation in Stockholm, Sweden, presents an international award called "Nobel Prize" to those who have made outstanding contributions to their disciplines. The Nobel Prize includes a medal, a diploma, and cash award given annually to those who during the preceding year have given the greatest benefit to human beings. Every year, the respective Nobel Committees invite thousands of university professors, members of academies and scientists from different countries, previous Nobel laureates, and members of parliamentary assemblies to submit candidates for the Nobel Prizes for the coming year. These nominators are chosen in such a way that as many countries and universities as possible are represented over time.

For this study, we selected 12 scientists from the official website of the Nobel Prize who have won the Nobel Prize in three different fields of physics, chemistry, and economic sciences. Then the name of each scientist was searched in three citation indexes sources of Scopus, Google Scholar, and Web of Science (see Figures 1, 2 and 3). We brought Serge Haroche (the physics Nobel prize 2012 winner) as an example in following figures. As can be seen in the following figures, the h-index of Serge Haroche is 34, 35 and 21 based upon Scopus, Google Scholar, and Web of Science, respectively.

SciVerse	Hub ScienceDirect Scopus Applications	,	Register Login 🕀 Go to SciVal Suit		
	Scopus		Brought to you by UKM Library		
Search So	urces Analytics Alerts My list Settings	Live Chat Help Tutorials	NO A MARKED IN		
Quick Search	Search				
📕 Print l 💟 E	-mail 📔 🐮 Request author detail corrections	Documents			
Haroche	e, Serge		This author has published 166 documents in Scopus : (Showing the 2 most recent)		
Personal	 Find potential author matches 	J.M., Haroche, S.	o, I., Gleyzes, S., Brune, M., Raimond,		
Name	Haroche, Serge		olved photon number distribution		
Other formats	Haroche, S.	reconstruction o	f a cavity field by maximum		
Author ID	7004396547	(2012)New Journal	of Physics		
Affiliation	Ecole Normale Superieure, Paris France	Haroche, S.	ny prizewinning research		
Research		12012/value			
Documents	166 🔮 View Author Evaluator I 💠 Add to my list I 🔖 Set alert I 🔝 Set feed	View details of all	166 documents by this author		
References	946		an a		
Citations	11462 total citations by 6800 documents 📶 View citation overview I 🔖 Set alert	Scopus:	is author publishes new documents in		
h Index	34 View h-Graph The h Index considers Scopus articles published after 1995.	Set alert	Set feed		
Co-authors	150 (maximum 150 co-authors can be displayed)	V Setalet a	Construction of the second sec		
Web search	3781				
Subject area	Physics and Astronomy Engineering Materials Science	Cited by since	e 1996		
m mine and an	More	This author has be (Showing the 2 mo	en cited by 6800 documents in Scopus: st recent)		

Figure1. Serge Haroche's h-index by Scopus is 34.

Citations	ublication Citation Cour			Search projects		
Project Home Downloads	Wiki Issues Source	2				
Summary People						
Project Information +-70 Recommend this on Google Starred by 182 users Project feeds Code license GRU GEPL v/2 Labels Gadget. Scholar, Citations, Publications, h-index 	total number of cited put IMPORTANT: Please nu the gadget performs ca in the gadget need to b published an <u>article</u> in th of our gadget with a beil A Google Scholar gadg	blications and Jorge E. the that this tool is as a loculations on by clicking e refined until the return he Library Journal that	Hirsch's <u>H-Index</u> . courate/inaccurate as g on the "view publication ned page shows as ac describes many issues any of the possible pitt citations and other	Google Scholar itself. Thu ons" link. If the returned p curate information as the	ons of author(s). It provides s it is important to check and age shows inaccurate result user deems it for hismer pur on Google Scholar. This art red when using our tool.	d refine the data that s then the search terms rpose. Peter Jacso
Links	Statistics.					
Groups Discussion	Citations for 'Serge F Cited Publications: 6 H-Index: 35		view publications			
	Serge Haroche Submit					

Figure 2. Serge Haroche's h-index by Google Scholar is 35.

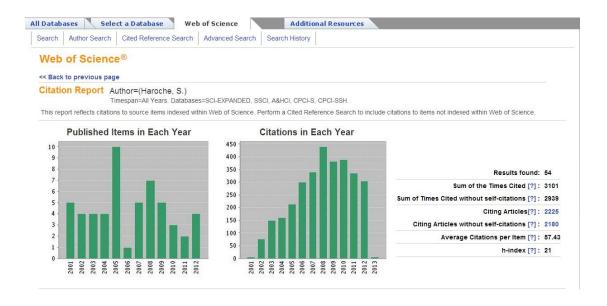


Figure 3. Serge Haroche's h-index by Web of Science is 21.

4. **Results and Discussion**

Table 1 shows the h-index of 12 Nobel Prize winner scientists in three different citation indexes of Scopus, Google Scholar and Web of Science.

Noble Prize Winner's	Year	Research field	Web of	Scopus	Google
Name			Science		Scholar
Serge Haroche	2012	Physics	21	34	35
David J. Wineland	2012	Physics	20	47	23
Saul Perlmutter	2011	Physics	35	38	32
Brian P. Schmidt	2011	Physics	21	46	62
Robert J. Lefkowitz	2012	Chemistry	31	106	167
Brian K. Kobilka	2012	Chemistry	24	63	70
Dan Shechtman	2011	Chemistry	11	5	13
Akira Suzuki	2010	Chemistry	85	56	79
Alvin E. Roth	2012	Economic	4	28	68
		Sciences			
Thomas J. Sargent	2011	Economic	11	21	77
		Sciences			
Christopher A. Sims	2011	Economic	13	13	64
		Sciences			
Peter A. Diamond	2010	Economic	6	14	61
		Sciences			

Table 1. h-index of 12 Nobel Prize winner scientists in three different citation indexes

Our first step in understanding the differences between Scopus, Google Scholar, and Web of Science based upon the scientists' h-index was to examine the means of each citation tool resource. Figure 4 shows the mean of h-index for Nobel Prize winner scientists based upon data from Google Scholar (mean=62.58), Scopus (39.25), and Web of Science (23.5). As can be seen in Figure 4, the mean of Google scholar h-index (mean = 62.58) for scientist in this research is more than the mean of Scopus h-index (mean = 39.25) and mean of Web of Science h-index (mean = 23.5). The results can be reasonable because Google Scholar covers more articles indexed than other two citation tools and it contains books and conference proceedings which may alter considerable citation metrics (Vanclay, 2007; Bar-Ilan, 2008; Mikki, 2009).

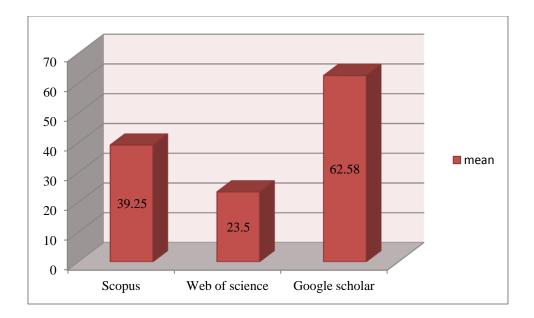


Figure 4. Comparing the h-index of 12 Nobel Prize winners based upon data from Scopus, Google Scholar and Web of Science

Table 2 also shows the multiple regression between the h-index of 12 Nobel Prize winners based upon data from Scopus, Google Scholar and Web of Science. The multiple regression results show that there is a positive significant relationship between Scopus and Google Scholar h-index (β =.799, p<.05). This indicates that more h-index in Scopus citation tool corresponds with more Google Scholar h-index. In other words, we can conclude that the h-index of Scopus can predict the Google scholar h-index. However, this study could not find a significant relationship between the h-index in Web of Science and Google Scholar h-index.

Table 2. Multiple regression between the h-index of 12 Nobel Prize winners based upon datafrom Scopus, Google Scholar and Web of Science

	В	Beta	t
Constant	24.761		1.561
Web of Science	300	164	639
Scopus	1.143	.799	3.122^{*}
R ² = 0.54, F= 5.32, p<0.05			

Based upon the samples' field of studies, the results showed that the h-index mean of chemistry (mean = 59.17) is more than the h-index mean of physics (mean = 37.5) and economy (mean = 31.67). It means that the citation and publication in chemistry area are more than those of physics and economy (see Figure 5).

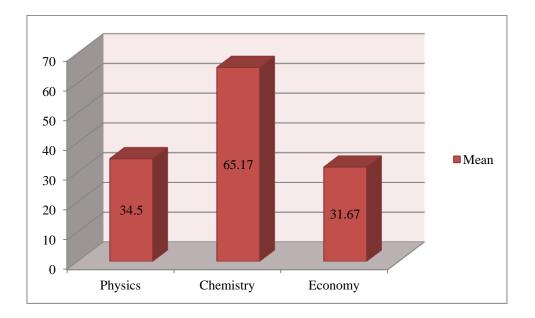


Figure 5. Comparing the h-index of 12 Nobel Prize winners based upon their research area

5. Conclusions

h-index retrieved by citation indexes of Scopus, Google Scholar, and Web of Science is used to measure the scientific performance and the research impact studies based upon the number of publications and citations of a scientist. It also is easily available and may be used for performance measures of scientists and for recruitment decisions. As the results showed for the samples of this study, the difference in the h-index between three citation indexes of Scopus, Google Scholar and Web of Science is obvious and noticeable. The Google Scholar h-index is more in comparison with the h-index in two other databases. Moreover, the findings showed that there is a significant relationship between h-indices based upon Google Scholar and Scopus.

We can conclude that it matters which citation tools are used to compute the h-index of scientists. Therefore, the universities and promotion committees need to consider which citation

tool is used to compute the h-index of a researcher or a lecturer. In general, when we intend to report the h-index of a scientist, we need to consider and mention the sources of citation indexes. We cannot compare the h-index of two scientists without mentioning the sources of citation indexes. The citation indexes of Scopus, Google Scholar and Web of Science might be useful for evaluating the h-index of scientists but they have their own limitations as well.

References

Bar-Ilan, J. (2008). Informetrics at the beginning of the 21st century: A review. *Journal of Informetrics*, 2(1), 1-52.

Bar-Ilan, J. (2008). Which h-index? A comparison of WoS, Scopus and Google Scholar. *Scientometrics*, 74(2), 257-271.

Egghe, L., & Rousseau, R. (2006). An informetric model for the Hirsch-index, *Scientometrics*, 69 (1), pp. 121-129.

Google Scholar. (No Date). About Google Scholar. Retrieved 27 January 2013, from http://scholar.google.com/.

Hirsch, J. E. (2005). An index to quantify an individual's scientific research output. *Proceedings* of the National Academy of Sciences, 102(46), 16569-16572.

ISI WoS. Thomson Scientific. (No Date). Web of Science. Retrieved 27 January 2013, from http:// http://portal.isiknowledge.com/.

Mikki, S. (2009). Google Scholar Compared to Web of Science: A Literature Review. *Nordic Journal of Information Literacy in Higher Education*, 1 (1), 41-51.

Nobel Prize. (No Date). About Nobel Prize. Retrieved 27 January 2013, from http://www.nobelprize.org/.

Scopus. (No Date). About Scopus. Retrieved 27 January 2013, from http://www.scopus.com/.

Van Raan, A. F. J. (2006), Comparison of the Hirsch-index with standard bibliometric indicators and with peer judgment for 147 chemistry research groups. *Scientometrics*, 67 (3), 491–502.

Vanclay, J. K. (2007). On the robustness of the h-index. *Journal of the American Society for Information Science and Technology*, 58(10), 1547-1550.