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Altmetrics indicators for measuring the readers' intentions towards the highly cited articles in knowledge sharing

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ABSTRACTS

The limited applications of the citation analysis inspire academics and editors to think of other alternative non-citation measure that catch the academic and public readers' online intentions as well. Altmetrics is considered as alternative impact matric for measuring the intentions (find, download, cite, use, shared, recommend, or discuss) towards scholarly contents in peer reviewed journals, databases, open access sources, etc. The study intends to explore the readers' intentions (publicity) towards the highly cited articles in knowledge sharing within the major subject areas interested in the topic and their characteristics. It also aims at inspecting the interdisciplinarity among the highest cited articles within the major subject areas. The results concluded that there were high correlations between citations and intentions in social sciences, business, and medicine. The results also resolved that social media paths such as Mendeley, Twitter, Blogs and many others unquestionably will facilitate academic as well as public communication worldwide.

Keyword: Social media communication, Altmetrics indicator, Scholarly contents, Readers' intentions, Interdisciplinarity

INTRODUCTION

In 1955, Eugene Garfield proposed his impact factor measure to detect the average number of citations a journal receives for its articles. Since then, many authors have utilized citation analysis as a tool for measuring the impact factor of scholarly journals. It has been applied to either a subject field of study (Roy, Hughes, Jones & Fenton, 2002; Abrizah, Zainab, Kiran, & Raj 2013; Elangovan & Allareddy, 2015) or to collection of journals published within a geographic area (Lee, C. S., 2009) or even to the journal itself for measuring the self-citation (Yang, 2009). The nature and the methodological approach applied by these studies governed by calculating the average number of citations to articles. To do so, Cross (2017) highlighted that "Calculating an impact factor requires a denominator (the total number of articles published) and a numerator (the total number of citations to those articles" in published articles too. This

requirement is accompanied by the limited use of the measurement only with journals indexed in the Web of Science. The case of utilizing citations in measuring the impact factor has been questioned and reconsidered in the light of the increased digital scholarly communication and the impact of public readers. Consequently, the impact factor encountered with a variety of criticisms and challenges. One of these is the time lag between publishing the article and the time when other articles start to cite and contribute to the impact factor of the cited article. Williams and Padula (N.D.) stressed that the limited scope of the measure to reveal the association between the articles and only limited list of journals, encounter its failure to illustrate the accurate impact of a single scholarly work and the impact of alternative research outputs. This criticism was underlined by Garfield himself when emphasized that there are articles which are not regularly cited but still are considered significant. He argued that because of their support to bridge the gaps in knowledge within rapidly developing fields. (Garfield, 1973) This expression reflects the significance of public interests, which is not limited to citations. Williams and Padula (N.D.) added that merely waiting for citation impact by itself could be a problem particularly for the early-career researchers who are seeking to build themselves in their field.

Consequently, the limited applications of the citation analysis inspire academics and editors to think of other alternative non-citation measure that catches the academic and public readers' online intentions as well. A measurement that gathers the intentions (find, download, cite, use, shared, recommend, or discuss) towards scholarly contents in peer reviewed journals, databases, open access sources, etc. and analyzes the source of the intentions in the social media. Principally, this measurement, called Altmetrics, is considered as alternative impact matric to show that "every day, thousands of scholarly papers are discovered, discussed and shared" (http://www.Altmetrics.com) Moreover, "Altmetrics can be applied to nontraditional scholarly outputs because Altmetrics consist of data from much more than journal article citations alone." (Williams and Padula, N.D., p. 12)

It is the aim of this study to explore the readers' intentions (publicity) towards the highly cited articles in knowledge sharing within the major subject areas interested in the topic.

Purposes of the Study

The current study proposes to investigate the following:

1- Explore the major subject areas interested in the field of knowledge sharing shown in relevant scholarly articles
2- Inspect the interdisciplinarity among the highest cited articles within the major subject areas
3- Investigate the characteristics of readers' intentions in social media towards the selected articles
4- Examine the correlation between the impact factor and the readers' intentions towards the selected articles.

Research questions and hypotheses:

To fulfil the above purposes, three research questions and one hypothesis were designed:

1- What are the major subject areas mostly interested in knowledge sharing field of research?
2- Is there an interdisciplinarity approach among the highest cited articles within the major subject areas?
3- What are the characteristics of the readers' intentions (publicity) of the highly cited articles within each major areas?

4- Are there significant correlations between citations and readers' intentions (publicity) of the highly cited articles, generally and within each major subject areas?

METHODOLOGY

Scopus was consulted to reveal the highly cited papers in the field of knowledge sharing during the period 2014-2016. To identify the major subject areas, the results were analyzed by subjects. Within each subject area, a sample of twenty highly cited articles were selected and analyzed in accordance to their characteristics. Their impact factors were recorded and the readers' intentions for each article were calculated with the use of the Altmetrics measurement. Finally, SPSS was utilized to find the level of association between the impact factors and the intentions of these articles generally and within each major subject.

Limitation of the selected articles

The list of the articles will be selected from Scopus with the following limitations:

- Topic: knowledge sharing
- Period: 2014-2016
- Type of Documents: Articles only

Population and Sampling

The search in Scopus within the up limitations resulted with 4443 articles distributed by date as following (Table1)

Table (1): the population of articles in knowledge sharing by date

Year	#	%
2016	1518	34%
2015	1566	35%
2014	1359	31%
Total	4443	100%

After analyzing the search result (4443) by subject areas, twenty "cited the highest" articles were selected from each major subject (will be identified in the analysis part) as a sample.

LITERATURE REVIEW

The target intention of this part is to draw an image about other participation within the purposes of the current study. Two themes were anticipated to fulfil the clarity of that image, including:

Interisciplinarity and knowledge sharing

In its seminar organized by Jarke, O'Leary and Studer, (2000), the Dagstuhl Center for Informatics brought together a team of specialists from universities and industries with a variety of subject areas, including Information Systems, Management Sciences and Computer Sciences. The seminar intended to address issues, among them the role of knowledge management approach in supporting and improving the knowledge-intensive business processes. The discussion aimed at analyzing the flow of information between different subtasks of a process and the kind of knowledge to share for performing these subtasks. The seminar then reached to a conclusion that interdisciplinarity between scientists and practical people will lead to improve exchanging ideas and experiences relevant to knowledge management.

Jasemi, and Piri, M. (2012) emphasized that the main mission of knowledge management (creating, capturing, sharing, distributing, leveraging and archiving) is to transform individuals' experiences into explicit knowledge within the organization. This means that the new received information will be processed in light of individual's previous experience. The purpose of such transformation is to promote and produce new knowledge that can be shared by others in different tasks and approaches. Consequently, "Interdisciplinarity can become a new parameter of competition… Through [with the] increased interdisciplinarity, we can get more out of the investments in knowledge and education that we are currently pursuing." (DEA and FBE, 2008)

Impact factors and publicity of scholarly papers

For years, evaluative bibliometrics have been utilized as techniques for judging the "impact of published scholarly work as cited in the context of other published scholarly works." (Rosas SR; Kagan JM; Schouten JT;Slack PA, and Trochim, WMK, 2011). Werner (2015) assumed that scientists by citing the best-quality academic papers are contributing to the continuous development of knowledge. He justified his assumption by the actual reasons of citations, including;

- to give credit to partial results towards the same goal;
- to back up some terminology;
- to provide background reading for less familiar ideas; and
- Sometimes to criticize.

Even with such reasons, Werner commented that scientist seek to reach the higher impact factor paper with a thorough technical discussion, but not a paper written for public readers which might be scientifically more valuable. This comment confirmed by Wiley Online Library. From the Library point of view, researchers, funders and institutions are essentially concerned about the public impact of their work. The Library, then, accused the traditional approach of counting the impact based on only the citations beyond the public intentions in social media (Twitter, Facebook, Google+, Pinterest, blogs).

Despite the popularity of the traditional techniques in measuring scholarly works' impact, Brody, Harnad, & Carr,. (2006) criticizing them as being slow. They emphasized that, for a citation be counted, it should be passed through a series of long procedures. Peer reviewed article should be:

a. Accepted for publication
b. Published,
c. Read by other authors,
d. Cited by other authors in their own articles, and
e. Those citing articles are themselves peer-reviewed, revised, and published",

The procedures might take a range from 3 months to 2 years or even longer.

Ignorance to social use of scholarly papers on the web is another indication for reconsidering the impact factor only as a metric of quality of scholarly papers. In health sciences, Smith claimed that the "main aim of health research is to improve the health of people. Yet the performance of researchers tends to be measured by the scientific quality of their research rather than by its impact on health." They mentioned that the committee of the Royal Netherlands Academy of Arts and Sciences advised to find another approach capable of measuring the "social impact of the health research." (Smith, 2001). Shema, Bar-Ilan, & Thelwall (2013).claimed that "the impact of journal articles is not limited to other scholarly material, but extends beyond formal scholarly discourse. They emphasized the role of social

media, blogs in specific, as alternative indicators that discuss the impact of the scholarly articles as well.

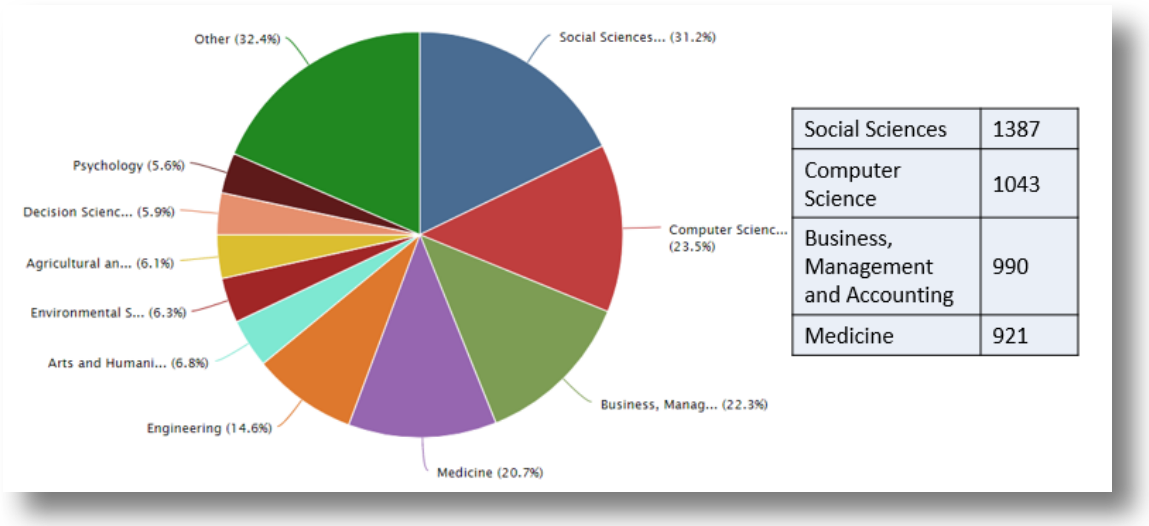
From the above comments and criticism, we conclude that, as a reason of the extensive acceptance of electronic publishing accompanied with growth of social media communication, the diffusion, and use of scientific works become more achievable to be assessed and discussed on a variety of social media platforms. Thus, another metrics to measure the readers' intention through theses platforms have been recommended side by side with the traditional citations metrics.

DATA ANALYSIS

Research question 1: What are the major subject areas mostly interested in knowledge sharing field of research?

To respond to this question, the researchers utilize Scopus to analyze the search results by subject areas so that will recognize the articles surrounding each major subject. Scopus subject analysis indicates that the 4443 articles are distributed among 25 subject areas. Hence, by calculating the number articles within each subject, the total becomes 7771 articles. The last number ensures the sharing of many articles by more than one subject areas.

Figure 1 identify that four major interrelated subject areas are supporting the topic of knowledge sharing, namely Social Sciences; Business, Management and Accounting; Computer Science and Medicine as reflected in Figure 1



Social Sciences	1387
Computer Science	1043
Business, Management and Accounting	990
Medicine	921

Figure (1): Articles in knowledge sharing by subject areas

Research question 2: Is there an interdisciplinarity approach among the highest cited articles within the major subject areas?

Table 2 reflects the interaction between the major subject areas in terms of the highly cited articles. The highest sharing percentage exists in the column of social sciences (as being the top major subject area) in association with other major subject areas. This describes the interdisciplinarity approach that social sciences and other interrelated major areas can share an article in knowledge sharing. The exceeding number of the articles (7771) confirmed duplications of citing or sharing an article by more than one subject areas. Table 2 shows a rate of 3% to 26% of associations.

Table 2: Interactions among major subject areas

Major Subject Areas	Social Sciences	Computer Science	Business, Management and Accounting	Medicine
Social Sciences	**1387 (100%)**	**270 20%**	**206 15%**	**134 10%**
Computer Science	**270 26%**	**1043**	**117 11%**	**30 3%**
Business, Management and Accounting	**134 14%**	**117 12%**	**990**	**10 1**
Medicine	**134 15%**	**30 3%**	**110% 12**	**921**
Percentages are calculated from the total articles within each raw				

The following step is then to select a sample of the highest cited articles within each subject areas. This step was done by clicking on the number of articles facing each subject area, Scopus will list the articles by" cited by highest", then 20 articles from each subject areas. The 80 articles from four interrelated major subject areas. Table 3 summarizes the selected articles by date of publication. The table shows that Medicine achieves the highest rate of citations (minimum 22-maximum 268) for the 20 articles. It also reveals that the number of cited published articles is associated negatively with date. The current articles cited less because of the earlier mentioned reasons by Brody, Harnad, & Carr,. (2006), otherwise citations will not be considered for calculating the impact factor unless the citing articles are themselves published in peer reviewed journals too..

Table 3: distribution of the sample articles by year of publication

Major Subject Areas	Citation rates of articles	# of highest cited articles		
		2014	2015	2016
Social Sciences	19-70	13	5	2
Computer Science	23-83	14	5	1
Business, Management and Accounting	22-99	13	7	0
Medicine	22-268	10	9	1
Total		50	26	4

What are the characteristics of the readers' intentions (publicity) of the highly cited articles within each major areas?

To respond to this question, Altmetrics matric was consulted to calculate the readers' intentions toward each article within each major subject areas. The results will sightsee the basic characteristics of the intentions, according to,

Number of intentions by date of publishing compering to citations: The sample articles (20 from each subject area) were distributed according to their date of publishing, and then the total number of citations and intentions were specified to generate a comparative image between citations and intentions within each subject, Table 4. The data specifies that articles in medicine registered the highest intentions in 2015 followed by business in 2014, and in social sciences 2014 too, while computer sciences encounter the highest citation in 2014

Table 4: distribution of the citations and intentions by year of publication

Subject Areas	Year of Publication					
	2014		2015		2016	
	Citations	intentions	Citations	intentions	Citations	Intentions
Social Sciences	452	1284	147	715	42	31
Computer Science	757	482	223	368	35	266
Business, Management and Accounting	599	2051	207	815	0	0
Medicine	568	191	442	2356	26	173
Total	2376	4008	1019	4254	103	470

Types of intentions' tools: The total intentions were distributed according to the types of tools within each subject area. Mendeley constitutes the most utilized tool followed by Twitter within all of the four subjects. Social sciences, business and computer indicated other few tools such as CiteULike, blogs, Facebook and Google+. Medicine specified other tools, such as Wikipedia page, News Oulet, Policy Source, Radditor, Research highlight and Plateform. Computer Sciences communicated through citations more than utilizing social networks, Business indicated no intentions during the year 2016. Generally, intentions decreases by year because of the peer reviewed articles' publicity and availability. Table 5.

Table 5: distribution of intentions yearly by subject areas

Subject Areas	Year of Publication									Total
	2014			2015			2016			
	M	T	O	M	T	O	M	T	O	
Social Sciences	1213	49	22	688	22	5	20	9	2	2030
Computer Science	471	10	1	362	4	2	265	1	0	1116
Business, Management and Accounting	1921	125	5	799	15	1				2866
Medicine	785	230	191	1282	980	94	138	32	3	3735
Total	4390	414	219	3131	1021	102	423	42	5	9747
M: Mendeley, T: Twitter, O: Other										

Are there significant correlations between citations and readers' intentions (publicity) of the highly cited articles, generally and within each major subject areas?

To respond to this question, correlation test was applied to all citations and readers intentions of the eighty articles in general and to each twenty articles within each subject areas. The results indicated that there is a significant correlation between citations and intentions in

general. This correlation reflect a positive association between the two indicators (citations and intentions) in the topic knowledge sharing. Such association confirms a lifelike and realistic image of the publicity of the scholarly papers.

However, the individual correlation tests emphasize high associations between Social Sciences and the other two subjects, Business and Medicine. In the other side, this image disappears with Computer Sciences that shows non-significant correlation Table **6**

Table 6: correlation measurements between citations and intentions

Subject Areas	Pearson Correlation	Sig.	Note
Social Sciences	**0.513**	**0.021**	Correlation is significant at the 0.05 level (2-tailed).
Computer Science	**-.261**	**.266**	There is no significant correlation
Business, Management and Accounting	**0.823**	**0.000**	Correlation is significant at the 0.01 level (2-tailed)
Medicine	**0.585**	**0.007**	Correlation is significant at the 0.01 level (2-tailed)
General	**.503**	**0.000**	Correlation is significant at the 0.01 level (2-tailed)

CONCLUSION

One important point surrounding Altmetrics indicator for measuring the readers' intentions in the social media is that, high counts of readers' intentions are relevant to authors' activities in employing the current social media paths for publishing or publicizing their work. Social media paths such as Mendeley, twitter, blogs and many others will unquestionably facilitate academic as well as public communication worldwide. Accordingly, the increased use of social media communication will fetch more readers' intentions that empower the impact of, specifically, the currently published articles, help making sense of the large volume of academic data, increase interdisciplinarity and knowledge integration, and enable analysis by associating shared interests.

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