



The altmetrics for measuring readers' intentions towards scholarly contents in the field of information security

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Abstract

Aim: This research aimed to examine the relationship between citations (Bibliometrics) and readers' intentions (Altmetrics) for each type of scholarly document by applying altmetrics tools to measure their attitudes toward highly cited content in the field of information security.

Method: Scopus was used to identify the most prolific types of documents published in the field of information security in the years 2014 and 2015, as this was thought to be an appropriate time frame for the scholarly production to be freely accessible in full text and, consequently, for the right to use and cite to be taken, as well as for the production to be used and interacted with across various social media channels. Among scholarly writing, conference papers, articles, and book chapters fared best. We picked the 20 most-cited articles from each document type to gauge reader intent and analysed them.

Findings: This research found that articles received the most citations among all document types studied, followed by conference papers and book chapters. Articles that received the most citations also attracted the most reader intent. Given the interconnected nature of citations and goals, this finding makes sense. The correlation was impacted by the variety of documents used. Based on the data, it is clear that the articles are the ones to which the correlation between citations and attention is strong. The most interesting citations were for the articles about intentions.

Implications/Novel contribution: This research significantly contributes to the body of literature because it provides detailed information about citations and article publications.

Keywords: Altmetrics, Information Security, Readers' intentions, Citations

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INTRODUCTION

As a result of global progress in ICT, information has proliferated across all spheres of society, including academic, political, economic, and social. As a result, information has become a crucial factor in all endeavours, and a vital backer of national development (Al-Oqaily, 2017). The security of this information is jeopardised by the growth in its volume and the ease with which it can be transferred from one location to another via local or global networks. If their security isn't guaranteed, they could be compromised and destroyed at any time (Fouad & Naeema, 2011). Because of the equally rapid development of computing technology, the field of information security has grown enormously since the 1990s. As a result, academics from many fields have begun investigating the topic of information security. It has rapidly risen to prominence as a central focus of academic discourse.

Information security has generated millions of records or participations, as shown by a search engine query volume browse. You get 171,000,000 in Google, 84,000,000 in Yahoo, and 0 in Bing (306,000,000). In Scopus, 137,587 academic articles were found.

In general, research initiatives mandate the adoption of best practices for securing information systems, with the ultimate goal of protecting sensitive data. Since more people are using the open-access method to read scholarly articles, scholarly journals are being met with new resistance. The advent of digital communication through social media has also facilitated the dissemination of content. As a result, information security has risen to the forefront as an absolute necessity on every front (AL-Hanooti, 2014; Nugraha, 2017).

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There has been an uptick in the publication of scholarly works in the field of information security, so it's important to investigate why. Many valuable metrics exist to assess the impact of scholarly content, but these matrices are impacted by the delay between when content becomes available and when its citations are formally published. Academic, social media platforms like ReserachGate, Mendeley, and Academia have revolutionised the way information is shared and disseminated in the academic community by making it possible to read articles in their entirety regardless of whether or not they have been formally published in a journal that is indexed by Scopus. In this light, new matrices based on a direct measurement that tally the goals and impact of scholarly content have been developed (Altmetrics). This metric tracks the number of people's intentions on social media and investigates the correlation between scientific endeavours and readers' goals (Sankar & Kavitha, 2016). The importance of Altmetrics indicators was highlighted, and the matrices' acceptance and use as a supplementary measurement to more conventional methods were recommended (bibliometrics, h-index etc.) Torres-Salinas, Cabezas-Clavijo, and Jiménez-Contreras (2013).

This research endeavours to use Altmetrics tools to assess the level of interest in highly cited scholarly contents in the field of Information Security across a range of document types, with the ultimate goal of determining whether or not there is a statistically significant relationship between citations and intentions.

Purposes of the Study

This study aims to:

1. Identify the level of scholarly production in the field of information security and the major types of scholarly documents published in the field.
2. Measure the readers' intentions towards the highly cited contents in the field of information security within the selected types of scholarly documents.
3. Investigate the correlation between the citations (Bibliometrics) and readers' intentions (Altmetrics) for each type of selected scholarly document.
4. Find the correlation between the Altmetrics tools (Twitter, Mendeley, and others).

Study Questions

To achieve the purposes of the study, the following research questions were tested:

1. a) What is the level of scholarly production in the field of information security?
b) What are the major types of scholarly documents published in the field of information security, according to Scopus' results in the period (2014-2015)?
2. What are the readers' intentions about the highly cited contents within the selected types of documents in the field of Information Security?
3. Is there a significant correlation between citations (Bibliometrics) and readers' intentions (Altmetrics) towards scholarly contents in the field of information security within the selected types of scholarly documents?
4. Is there a significant correlation between the Altmetrics tools (Twitter, Mendeley, others)?

METHODOLOGY

Scopus, Altmetrics, Excel and SPSS used to achieve the study objectives.

Population and Sampling

For illustrating the use of altmetrics as a tool for measuring the intentions of readers towards the highly cited scholarly contents within the selected document types in the field of Information security, the follows procedures were followed for selecting the study population and sampling:

- The topic "Information Security" was entered in Scopus.
- Years were limited from 2014-2015, since this period considered as a valid period for the scholarly production to be available in the full text and therefore to take the right to use and cite, as well as to be used and interacted through different social media channels.
- The results which Scopus retrieved were sorted to the option 'cited by highest'.

- Three major document types were selected -being the most productive types in the field- which are: Conference Paper, Article, and Book Chapter.
- The first 20 scholarly contents from each document types were chosen to be analyzed for measuring the readers' intention.

Table 1 shows the distribution of the population and the sample of selected types of documents among the period from (2014-2015) as follows:

Table 1: Population and sample from scopus

Type of Documents	Number of Documents	Sampling	% of Sample
0.2%	20	10853	Conferences
0.2%	20	8769	Articles
3% 20	614	Books	Chapter

Limitation of the Study

Publication years: (2014-2015): The sample was selected in this period, since it is considered as a valid period for the scholarly production to be available in the full text and therefore to take the right to use and cite, as well as to be used and interacted through different social media channels.

Documents types: The researchers selected the first three documents types, since they are the most productive types in the field of information security in the period 2014-2015, based on the results that retrieved in 25 October 2017.

RESULTS AND DISCUSSION

This part will provide and discuss the study findings according to the study objectives and questions as follows:

Objective 1: Identify the level of scholarly production in the field of information security and the major types of scholarly documents published in the field.

Actually, the field of information security has expanded dramatically since the 1990s as related to computer technology rapid progression. Accordingly, the subject of information security has attracted the attention of researchers interested in various sciences. It becomes one of the most vital topics in scholarly contents. In browsing the volume of hits, concerning the term "information security" reflects millions of records or participations. In Google, the result is (171,000,000), in Yahoo (84,000,000), in Bing (306,000,000). In Scopus (137.587) academic contents were retrieved.

According to Scopus, the major documents types published in the field of information security in period (2014-2015) are Conference Paper with (10853) results, followed by Article with (8769) results, and Book Chapter with (614) results. The high level of production of the subject of information security in the conference proceedings can be justified by the importance of the role that Conferences play in scholarly communication, whether in giving scientists the possibility to present and discuss initial outcomes of their research, supporting them to improve their social communications, or even allowing them to keep up with the current research developments in their discipline and research about the contemporary tendencies in their specialty (González-Albo & Bordons, 2011). In addition, the Conferences give the Scientifics the opportunity to present any existing part of their research regardless of the whole study. That is why the number of scholarly contents is high in Conferences.

Articles were the second productive type of documents publishing in the field. Ernst (2006) mentioned the reasons of preferring publishing in journals, which are: the journals may have longer page limits; this is useful for researchers to include their full research. In addition, Journals have higher acceptance rates. Moreover, journal reviews may be more detailed, giving the researchers the opportunity to improve their work. Moreover, some universities are evaluating their faculty based totally on their journal publications due to that articles which are publishing in journals are being more affect and citations.

Regarding publishing Book Chapter, Woodrow (2014), mentioned the advantages of writing a book chapter, which are: the process of publishing book chapter are easy; rejections are rare and there is no need for major revisions. Also, often there is no competition for book chapters - that is why Individuals frequently approached to

make a contribution chapters. Moreover, a book chapter may enhance the author profile and give opportunities for future.

Objective 2: Measure the readers' intentions towards the highly cited contents in the field of information security within the selected types of scholarly documents.

To achieve this objective, frequency distributions and average of use for each document type were calculated to measure the readers' intentions towards the highly cited contents, as it is illustrated in follows Table 2:

Table 2: Distributions of citations and readers' attentions frequencies for each type of selected document

Document Type	Citations	Sources for Readers' Attentions				Average of Citations	Average of Intentions
		M	T	Other	Total Intentions		
Conferences Papers	1385	1324	52	18	1394	69.25	69.7
Articles	4688	4633	502	90	5225	234.4	261.25
Books chapteres	170	75	11	0	86	8.5	4.3

T = Twitter, M = Mendeley, Other= CiteULike, Google+, FaceBook, Blogs

Data in Table 2 shows that: - Articles were the most types of documents that gained the highest number of citations, followed by Conferences papers and book chapters, this is due to that Conferences papers tend to be short, concise and include only the most exciting part of the whole research, while journals papers tend to be longer and may include more detailed information which leads to the full understanding of the results (Montesi & Owen, 2008).

- As articles gained the highest number of citations, they gained also the highest number of readers' intentions. This is an expected result because citations and intentions are affected by each other.

- The average of intentions for article and Conference Paper is higher than the average of citations, this is relevant to the several access to online source that catch the reader's attention. - Among the attentions sources, Mendeley approves to be the most accessible desktop and online web application among all types of selected documents followed by twitter.

As it is shown, citations and intentions are affected by each other. There is certainly a correlation between impact factor and readers' intention because the impact factor depends on a set of practices that reflect the readers' intention such as citation, reading, browsing, commentary, sharing of source, etc. This result was consistent with the result of Finch, O'Hanlon, and Dudley (2017) which found that suggest altmetrics might provide an initial and immediate indicator of a research article's future scholarly impact and particularly for articles published in more specialist journals. Also, the results support the findings of previous studies which have demonstrated links between online attention and citations in broader disciplines. Also, the results of Finch et al. (2017) showed that the positive relationship between AAS and citations was strong for articles and low impact factor for journals. This suggest that articles in higher impact journals which are usually interest a wider general audience may accumulate citations whether if they not received online promotion.

The study of Priem, Piwowar, and Hemminger (2011) found that the differences in citation correlation between scholarly and general services suggest altmetrics which can gather impact on varied audiences, while the low correlation with citation suggests that altmetrics captures a sort of impact. The comparison of citations with Mendeley reader (intentions) counts and tweets these three measures are indicators for different types of impact on different social groups. More specifically, the quantitative study has shown that the number of Mendeley readers and tweets are two distinct social media metrics and they differ from citations, differences in breadth of distribution, intensity and correlation with citation patterns differ between specialties for both metrics. The results imply that one social media metric is not like the other and by no means are they an alternative to citation impact measures, and social media counts of papers from different fields of research are not directly comparable, a fact long known in traditional bibliometrics (Haustein, Larivière, Thelwall, Amyot, & Peters, 2014).

Objective 3: Investigate the correlation between the citations (Bibiliometrics) and readers' intentions (Altmetrics) for each type of selected scholarly document.

To achieve this objective, the researchers used Pearson correlation to examine if there is a significant correlation between citations and readers' intentions for each type of selected scholarly document, which are

Conferences Paper, Articles, and Book chapter. The follows are the analyzing the Pearson correlation of each document type.

Conference Paper

By using the Bibblimetrics (citations) indicators from Scopus, and Altmetrics (readers' intention) from different web 2.0 channels (Mendely, Research Gate, Twitter, Facebook etc.), Pearson's correlations test results reveals that there is no statistically significant correlation between conferences papers' citations and intentions; hence the value of correlation is non-moderate (negative) as illustrated in Table 3.

Table 3: Pearson's correlations between Conferences Papers' Citations and intentions

		Conference Paper Citations	Conference Paper Intentions
Conference Paper Citations	Pearson Correlation	1	-.075
	Sig. (2-tailed)		.752
	<i>N</i>	20	20
Conference Paper Intentions	Pearson Correlation	-.075	1
	Sig. (2-tailed)		.752
	<i>N</i>	20	20

Article

By using the Bibblimetrics (citations) indicators from Scopus, and Altmetrics (readers' intention) from different web 2.0 channels (Mendely, Research Gate, Twitter, Facebook,etc.), Pearson's correlations test results reveals that there is a significant linear correlation between citations and attentions of Article, hence the value of correlation is moderate (positive) as illustrated in Table 4.

Table 4: Pearson's correlations between article's citations and intentions

		Article Citations	Article Intentions
Article Citations	Pearson Correlation	1	.551*
	Sig. (2-tailed)		0.012
	<i>N</i>	20	20
Article Intentions	Pearson Correlation	.551*	1
	Sig. (2-tailed)		0.012
	<i>N</i>	20	20

Book Chapter

Regarding Book Chapter, by using the Bibblimetrics (citations) indicators from Scopus, and Altmetrics (readers' intention) from different web 2.0 channels (Mendely, Research Gate, Twitter, Facebook,etc.), Pearson's correlations test results reveals that there is no statistically significant correlation between Book Chapter's citations and intentions; hence the value of correlation is non-moderate (negative) as illustrated in Table 5 .

Table 5: Pearson's correlations between book chapter's citations and intentions

		Book Chapter Citations	Book Chapter Intentions
Book Chapter Citations	Pearson Correlation	1	-.125
	Sig. (2-tailed)		.599
	<i>N</i>	20	20
Book Chapter Intentions	Pearson Correlation	-.125	1
	Sig. (2-tailed)		.599
	<i>N</i>	20	20

According to Scopus results for the period (2014-2015), Conferences Papers were the most productive types of document in the field of Information Security. This is an expected result, due to that, the field of Information

Security is renewable and Conferences give opportunities for keeping up with the latest trends in the field. Therefore, Conferences Papers were expected to be the most cited types and the most intentioned by readers, but it was not. Articles were the most cited types and the most intentioned by the readers; that is why the Pearson correlation test result reveals that there is a significant correlation between citations and readers' intentions for the Articles.

This result of being Articles the most cited and intentioned types of document rather the Conferences Papers can be justified based on what (González-Albo & Bordons, 2011), referred that Conference proceedings and extended journal articles play different and integrated roles in scientific communication. Conferences are desirable venues for disseminating information permitting scientists to present initial research, discussing new results with colleagues, and enhancing future research, while journal papers are commonly extra complete, correspond to an extra mature report of the research and have some archival function. This is what used to be agreed and confirmed by Montesi & Mackenzie, that the difference between the two types is that Conferences papers tend to be short, concise and include only the most exciting part of the whole research, while journals papers have a tendency to be longer and may include more detailed information which leads to the full understanding of the results (2008).

Although the vital function that Conferences play in scholarly communication, whether in giving scientists the possibility to present and discuss initial outcomes of their research, supporting them to improve their social communications, or even allowing them to keep up with the current research developments in their discipline and research about the contemporary tendencies in their specialty; the greater weight is assigned to journal articles as compared to proceedings papers in research assessment procedures in many disciplines which consequently leads scientists to extended their conferences papers to be published in journals (González-Albo & Bordons, 2011).

Extending conference presentations into journal articles is a practice that exists to some extent. Possible motives for this practice is to improve the visibility and impact of the research, based on the reality that journal articles are more likely to be cited than conference papers and that proceedings become obsolete faster than other document types. That is why authors may tend to publish in journal articles to optimize their citation track (Montesi & Owen, 2008).

Objective 4: Find out the correlation between the Altemetrics tools (Twitter, Mendely, others). To achieve this objective, the researchers used Pearson correlation to examine if there is a significant correlation between altmetrics tools, which are: twitter, Mendely, and other which include (CiteULike, Google+, FaceBook, Blogs, ect.). Pearson correlation result reveals that there is a significant correlation among all the used Altmetrics tools which are twitter, Mendely, and others, hence the value of correlation is moderate (positive) as illustrated in Table 6.

Table 6: Correlation between Almetrics tools (twitter, mendely & other)

		Twitter	Mendely	Other
Twitter	Pearson Correlation	1	.294*	.655**
	Sig. (2-tailed)		.022	.000
	<i>N</i>	60	60	60
Mendely	Pearson Correlation	.294*	1	.407**
	Sig. (2-tailed)	.022		.001
	<i>N</i>	60	60	60
Other	Pearson Correlation	.655**	.407**	1
	Sig. (2-tailed)	.000		.001
	<i>N</i>	60	60	60

In the current era, social media is one of the accepted metrics for evaluating readers' interest towards scholarly contents. Social media altmetrics are a huge supporter to citation prediction (Priem et al., 2011). Twitter connects individuals, organizations and other entities for the purpose of sharing information which include photos and videos. Furthermore, often it used more for academic purposes. Twitter present some symbols (URL, @, ...etc) to facilitate searching in it (Haustein et al., 2014; Kavitha & Ashok, 2017).

Also, the results of the study of Finch et al. (2017) showed that twitter is the most important social media network for science communication. While Facebook is less dynamic than twitter and it used less by scientists professionally. However, this medium still provides an important contribution to the Altmetric Attention Score

(AAS) of individual research articles and journals. There is a positive correlation between number of followers and the mean weighted number of twitter mentions among journals ($r = 0.61$, $df = 8$, $p = 0.06$).

The study of Krutka and Damico (2017) showed that among social media platforms, twitter received special attention from both teachers and researchers. There is some evidence that twitter offers diverse opportunities for educators to tap into discussions. Therefore, twitter sought to develop a social media assignment that built upon a medium that could help connect pre-service teachers to their innovative colleagues in their field, support university and future class activities.

It was shown that tweets often seem to represent discussions by members of the public and the level of engagement does not only differ between (saving a paper to a library vs. tweeting about it) but also within platforms (saving vs. reading and retweeting a link vs. discussing the content) (Haustein et al., 2014).

Mendeley is a free citation manager that allow researchers to save and organize citations and PDFs. It is one of the social media that enable to follow individuals, join groups, and browse articles by discipline. The number of Mendeley users who have saved an article to their citation library is tracked (Sankar & Kavitha, 2016). A survey found that the main reason to save documents to Mendeley was to cite them (Haustein et al., 2014).

A Mendeley readership count for a particular document (at this time) indicates that a Mendeley user has added the document to their Mendeley library either for citing or using them in a professional or educational context. Among the currently captured social media metrics related to scientific documents, Mendeley reader counts have the highest correlations with citations, ranging from medium to high values, which implies a certain similarity between the two metrics. This suggests that citation theories may be of value to understand what is happening in the Mendeley environment (Haustein et al., 2014).

Other indicators in the social media like Facebook used sometimes to share academic information like journal articles, video presentations, and blog posts. Also, Slide Share, users can upload a slide deck or series of slides like those from PowerPoint or other similar programs. Other users can follow a user receiving notifications when that person uploads new presentations and Metrics include total number of views, favorites, comments, and downloads. As with other sources, metrics can hint at overall interest in a presentation but cannot differentiate between academic interest and interest from the general public (Kavitha & Ashok, 2017).

CONCLUSION, RECOMMENDATIONS AND IMPLICATIONS

The study reveals that the field of Information Security is a vital topic that attracts both the researchers and reader's intentions. Concerning the term "information security" reflects millions of records or participations. While browsing the scholarly content of the field in Scopus, the major productive documents types are Conferences Papers, Articles, and Book Chapter in the period 2014-2015. These documents types were selected for analyzing. At the aiming of this study to use Altmetrics tools to measure readers' intentions towards the highly cited scholarly contents in the field of Information Security within selected types of documents and therefore, find out if there is any significant correlation between citations and intentions for each document type, the results reveal that there is a significant correlation between the highly cited contents within the selected types of documents. This correlation was affected by the type of document. The statistical results reveal that the significant correlation between citations and attentions was for the Articles. Articles gained the highest citations and readers' intentions.

All in all, all indicators work to facilitate readers' access to scholarly content and provide them with a high potential to benefit from these content, and contribute to expanding the scope of publication for researchers.

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