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Measuring Research Impact of Library and Information Science Journals: Citation verses Altmetrics

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Abstract:

Since the development of web 2.0, there has been a paradigm shift in methods of knowledge sharing. This has equally impacted on techniques of research evaluation. Many scholars have argued that the social utilization of research is hardly reflected in the traditional methods of research evaluation. This study is an attempt to contribute to this discussion with focus on the field of library and information science. The study extracted citation data from Web of Science, Scopus and Google Scholar, and altmetric attentions from 85 LIS journals indexed by Web of Science. Further, eighteen journals with high altmetric attention were identified, while nine of the journals maintained consistent presence in the three databases used. Of the three databases, citation data from Google scholar had a high correlation with altmetric attention of the 85 LIS journals while the other two databases maintained moderate correlations with altmetric attention of the journals. The study also found a positive correlation between citation scores and altmetric attention of the nine journals that maintained consistent presence in the three databases.

Keywords: Bibliometrics, Citation analysis, Research evaluation, Altmetrics, Scholarly communication, Social media

Introduction

For years now, the research impact of journals has often been determined using citation counts developed by ISI Web of Science, Scopus and other internationally recognized indexing bodies, h-index and impact factors. Even though citations are globally accepted as one of the metrics for research evaluation (Hirsch 2005; Ezema & Onyancha 2016), studies

have however questioned the authenticity of these bibliometric indicators given the time lag for accumulation of citations (Priem & Memminger 2010; Adie & Roe 2013; Thelwall, Haustein, Lariviere & Sugimoto 2013). Consequently, many have advocated for another evaluation metrics to determine the research and societal impacts of journal articles (Priem & Memminger 2010; Konkiel 2013) so that a form of "balance point" would be achieved (Galligan & Dyas-Correia 2013). The recent San Francisco Declaration on Research Assessment provides another criticism of traditional research assessment calling for the abandonment of journal impact factor. Consequently, the use of altmetrics order wise known as alternative metrics has been employed in journal evaluation and ranking. Altmetrics is defined as "the study and use of scholarly impact measures based on activity in online tools and environments" (Priem, 2014, p. 266). But the definition of Galligan (2012) provides more details as it is described as "new measurement for the impact of scholarly content, based on how far and wide it travels through the social Web (like Twitter), social bookmarking (e.g. CiteUlike) and collaboration such as Mendeley)…" Many scholars have questioned how social impact of research literature can be evaluated using citation counts (Tenopir & King 2000; Haustein 2012) as they contend that many readers of research publications may have applied them for other purposes like policy formulation treatment of ailments and other non-scholarly uses that requires no citations. Consequently, Galligan & Dyas-Correia (2013) have argued that altmetrics has greater potential in shaping research and scholarly communication giving its ability to provide indicators of the use of research reports in the social circles. The major aim of altmetrics is the measurement of interaction existing among scholars as they share research publications on the web using social media tools such as blog post, bookmarking, Twitter, Facebook post (Howard 2012).

Twitter, Facebook posts, Mendeley and other social media tools are identified as interesting and widely used tools for sharing of research reports among scientists. Despite the argument that altmetrics can be manipulated with ease, many studies have been conducted to determine the impact of these social media tools in research evaluation (Eysenbach 2011; Thelwall, Haustein, Lariviere & Sugimoto 2013) as publications are easily captured through altmetric tools as soon after publication (Tenopir & King 2000). Since the evaluation of research impact of library and information science journals has often been done through bibliometric studies, the present study intends to utilize journal citations and altmetrics measured by altmetric score for the purpose of determining relationships and differences between bibliometric indicators and altmetric scores of LIS journals. The specific objectives of this study are:

1. To prepare a rank list of LIS journals based on their altmetric attention
2. To compare the average performance of LIS journal based on citations and altmetrics
3. To identify journals with consistent appearance in all the databases and altmetric.com.
4. To determine the relationship between the citations and altmetric scores of LIS journals.

Literature Review

The social impact of research publication has generated many discussions among scholars. The flaws associated with the traditional research evaluation such as citations, impact factors and h-index, which often emphasize research impact ignoring the social use particularly on the web have been observed (Smith 2001; Shema, Bar-Ilan & Thelwall 2013) Altmetrics, which has the potentials of tracking readership, diffusion, reuse of scholarly publication on the social media on the Web seems to provide alternative measure (Piwowar 2013). Proponents of altmetrics have underscored it potentials in providing greater insight

into the social impact, which the traditional tools could not cover in scholarly communication on the social media (Gilligan & Sharon-Dyas 2013) and the use Web 2.0 tools such as Twitter and blogs (Eysenbach 2011).Similarly, Thelwall (2009) reported the use of web citation analysis to determine scholarly articles mentions on the web and Vaughan (2003) has adopted it to ascertain the relationship between link metrics. Another study applied this to find out the article mentions on the web (Vaughan & Shaw 2005). Indications show that Web 2.0 tools have mechanisms of generating data from other sources which provide structured data through application programming interface (APIs) otherwise called altmetric (Priem, Hermminger, 2010; Li, Thelwall & Giustini 2011).

Studies have attempted to determine the relationship between altmetrics and other traditional methods of research evaluation. Some of them looked at journal citation reports and Google scholar citations (Kousha & Thelwall 2007; Meho & Yank 2007; Delgaldo-Lopez-Cozar & Cabezas-Clavijo 2012) and article downloads (Pinkowitz 2002; Brody, Harnad & Carr 2005; Moed 2005). Studies that measured the relationship between citations and altmetric scores have provided statistical significant associations in Twitter, Facebook wall posts, blogs among other social media platforms (Thelwall, Haustein, Lariviere & Sugimoto 2013). Another study Eysenbach (2011) measured impact and attention to scholarly articles in the social media and found 4208 tweets against 286 articles published in *Journal of Medical Internet Research* over the first thirty days of publication with a moderate and statistical significant relationship between citations and tweets which relates to Zipf and Bradford law of distribution. The study of Kortelainen & Katvala (2012) looked at the attentions received by the journal websites using the social media tools and found that 78 of them use the tools and RSS was the most dominant. The study of Shema, Bar-Ilan & Thelwall (2013) focused on blog citations hypothesizing that articles receiving blog citations close to their publication time are likely to receive more journal citations in future. The study found statistically significant evidence in favour of the hypothesis.

A related study (Ortega 2015) used the profile of 10,000 Spanish authors extracted from scholarly social sites (ResearchGate, Academia.edu and Mendeley) and search engines (Microsoft Academic search and Google scholar citations) found little overlapping between sites. Correlation between bibliometric indicators and altmetrics shows a scant relationship at the author level. Another study (Zhao & Wolfram 2015) examined the popularity of LIS journals on Twitter and found that journals with the highest Twitter attention were Journal of the American Society for Information Science and Technology (2668), College and Research Libraries (1730) and Scientometrics (625). It also observed a significant and moderate positive correlation between the Twitter mentions and Eigenfactor scores of the journals. Much as this study used LIS journals like the present study, it has a narrow coverage of altmetric attention since Twitter was the major focus.

Methodology

This study adopted descriptive informatics to analyze 85 library and information science journals found in Web of Science (WoS) of Thomson Reuters. WoS was chosen because majority of the journals it indexed appear in other major indexing databases such as Scopus – thus ensuring consistency of the journals selected for the study. Citation reports of the journals were extracted from WoS and Scopus and later the journal titles were entered into Harzel's Publish or Perish software to extract their Google scholar (GS) citation for a five-year period (2011 to 2016). For purpose of comparison, Altmetric explorer (http://www.altmetric.com) was used to extract article scores of the journals from news stories, blog posts, tweets, Facebook posts. The data was exported into Microsoft Excel for analysis and results were presented using frequency counts and percentages. To determine the journals with the most frequent altmetric article scores, all the journals that met the average

article score of 1019.9 were selected. Pearson Product Moment Correlations was used to determine the correlations between citations of WoS, Scopus and GS and altmetric article scores of the journals.

Results

Result of this study shows that LIS journals are receiving attention in the social media as can be seen in table 1. Many of the journals used for the study received altmetric attention apart from a few, but 18 of the journals met the average altmetric article score of 1019.9. Journal of American Medical Informatics ranks first, followed by Journal of Computer-Mediated Communication and Scientometrics. A close study of the table indicates that journals with high altmetric attention did not show higher citations in WoS, Scopus and Google scholar. For instance, Journal of Documentation that ranked 18th recorded very high citations in WoS, but Journal of the Association for Information Science and Technology has a low WoS citation and ranked fifth in the altmetric attention.

Table 1: Rank list of Journals with Altmetric Attention and their citations scores

S/N	Journals	WoS	Scopus	GS	Altmetric scores
1	Journal of American medical informatics	6622	2412	27432	15691
2	Journal of Computer-Mediated Communication	3160	612	8355	8555
3	Scientometrics	6436	1967	24592	7537
4	Journal of Health Communication	2851	927	11290	5453
5	Journal of the Association for Information Science and Technology	453	1574	8962	4060
6	Learned Publishing	258	99	1635	3400
7	Journal of Informetrics	1458	683	8886	2893
8	Journal of the Medical Library Association	770	184	2359	2783
9	College & Research Libraries	715	265	5026	2758
10	Journal of Academic Librarianship	827	343	4660	2155
11	Information Systems Research	5175	738	26263	1693
12	Social Science Computer Review	969	279	5448	1598
13	Health Information and Library Journal	544	116	1577	1555
14	Journal of Information Science	1216	288	6599	1303
15	Telecommunications Policy	1077	376	7363	1177
16	Research Evaluation	740	164	2887	1114
17	Government Information Quarterly	1580	1125	13326	1101
18	Journal of Documentation	1354	217	3592	1054

Table 2 shows that GS citation has greater proportion (66.8%) when compared to WoS (15.5%), Scopus (3.8%) and Altmetric attention (14.7%). This is expected as GS has wider coverage of journals than WoS and Scopus, but it is important to highlight that the journals are receiving remarkable attention through the social media as tracked by Altmetric.com.

Table 2: Comparison of Bibliometric Citations with Altmetric Article Scores

S/N	No of Journals	Citations/article scores	%	Average
Web of Science	85	93740	15.5	1102.8
Scopus	79	22979	3.8	290.9
Google scholar	85	403355	66.8	4745.3
Altmetrics.com	85	83637	14.7	1019.9
Total		603711	100	

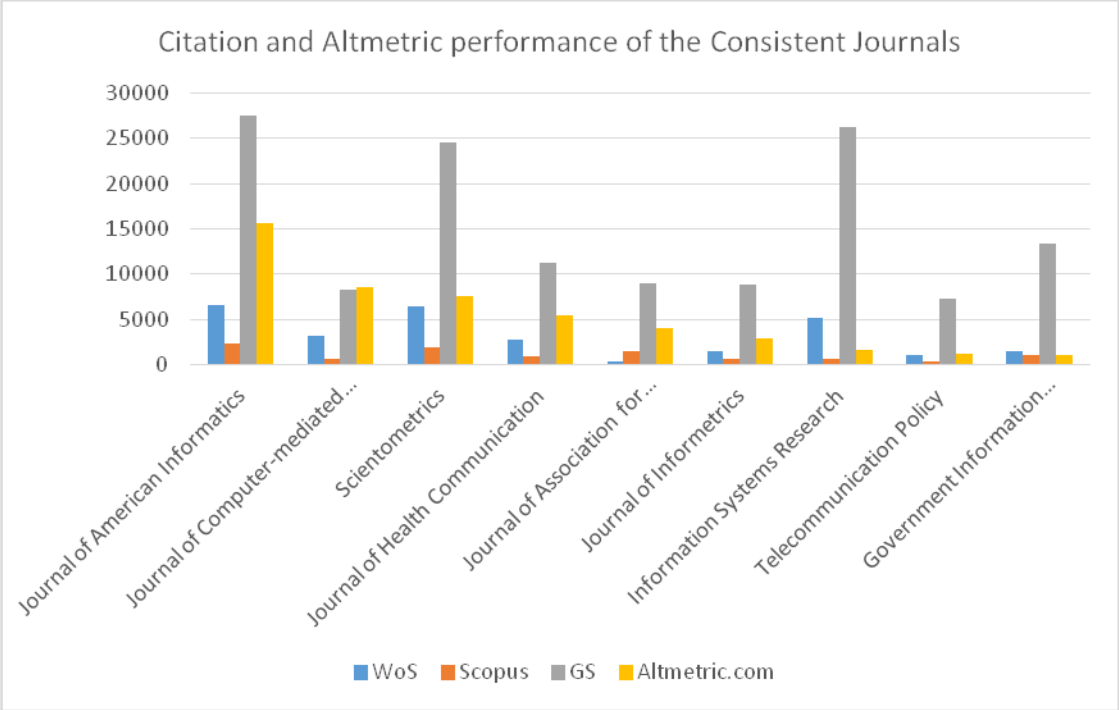

Fig 1

Table 3: Consistent Journals in Bibliometric and Altmetric Indicators

s/n	Journals	WoS	Scopus	GS*	MCC*	Alt. score
1	Journal of American Informatics	6622	2412	27432	12155	15691
2	Journal of Computer-mediated Communication	3160	612	8355	4042	8555
3	Scientometrics	6436	1967	24592	10998	7537
4	Journal of Health Communication	2851	927	11290	5023	5453

5	Journal of Association for Information Science Technology	453	1574	8962	3663	4060
6	Journal of Informetrics	1458	683	8886	3676	2893
7	Information Systems Research	5175	738	26263	10725	1693
8	Telecommunication Policy	1077	376	7363	2939	1177
9	Government Information Quarterly	1580	1125	13326	5344	1101

*GS = Google Scholar, WoS = Web of Science, MCC = Mean Citation Counts

A list of journals that consistently appeared with high metric indicators (citations and altmetric attention) in all the databases and Altmetric.com; (the journals that met the average citations/altmetric scores) is developed in Table 3. Only nine of the 85journals met this requirement and are therefore considered to have social and scholarly impact while the other journals have skewed impacts. Fig. 1 provides a clearer picture of the performance of the journals in social and scholarly circle.

Table 4: Correlation Matrix

		WoS	Scopus	GS	Altmetrics
WoS	Pearson Correlation	1	.743**	.358**	.444**
	Sig. (2-tailed)		.000	.001	.000
	N	85	85	85	85
Scopus	Pearson Correlation	.743**	1	.531**	.733**
	Sig. (2-tailed)	.000		.000	.000
	N	85	85	85	85
GS	Pearson Correlation	.358**	.531**	1	.531**
	Sig. (2-tailed)	.001	.000		.000
	N	85	85	85	85
Altmetrics	Pearson Correlation	.444**	.733**	.531**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	85	85	85	85

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4 shows the correlation coefficients or the levels of relationship between citations and altmetric attention of LIS journals. It revealed that journal article citations of Scopus had a high significant positive correlation with altmetric attention ($r = 0.733$, $p < 0.05$), while WoS ($r = 0.444$, $p < 0.05$) and GS ($r = 0.531$, $p < 0.05$) had significant moderate correlations with altmetric article scores. Similarly, journal citations of the three databases have positive

significant correlation with altmetric article scores at 0.01 levels of significance. The correlations were significant between WoS and Scopus ($r = 0.743$, $p < 0.05$) and between Scopus and Google Scholar ($r = 0.531$, $p < 0.05$). Though a significant positive correlation was found between WoS and GS ($r = 0.358$, $p < 0.05$), it was low compared to a high correlation found between WoS and Scopus and a moderate correlation between Scopus and GS. Finally, the correlation of journal article citations between Scopus and GS ($r = 0.531$, $p < 0.05$) equalled the correlation between journal article citations of GS and altmetric attention ($r = 0.531$, $p < 0.05$).

Discussions

Research evaluation is an area of interest to institutions, journal publishers, researchers and research funders and findings of this study provides an insightful understanding of social impact of LIS journals in relation to their scholarly impact. The result revealed that eighteen journals out of 85 have high altmetric attention – indicating that articles in those journals are shared using the social media tools. The number of altmetric article scores received by these journals is an indication that social media plays significant roles in the scholarly communication as has been reported in earlier literature (see Thelwall 2009; Eysenbach 2011; Kortelainen & Katvala 2012). Of interest also is that the two journals (Journal of American medical informatics and Journal of Computer-Mediated Communication) with high altmetric attention have high citation in Web of Science and Google Scholar but somewhat low citations in Scopus. The reason for this is not clear as Scopus have a very wide coverage of scientific journals in LIS research whose citations need to be tracked. Many journals (Learned Publishing, Journal of Medical Library Association, Health Information and Library Journals, and Research Evaluation) with high altmetrics scores have low citations in the scholarly database, which implies a form of bias in evaluation of such journals using bibliometric indicators alone. For this, many scholars question the continuous use of bibliometric indicators in research evaluation (see Priem & Memminger 2010; Adie & Roe 2013; Thelwall, Haustein, Lariviere & Sugimoto 2013), since such evaluation is skewed in favour of scholarly value. The list of the journals with high altmetric article scores relates with findings of an earlier study conducted by Zhao & Wolfram (2015) which identified Journal of the American Society for Information Science and Technology, College and Research Libraries and Scientometrics as journals with the highest share using Twitter as social media tool in LIS research.

Though Google Scholar generated greater percentage of citations because it has wider coverage of scholarly journals where it tracks citations, the contribution of altmetrics in the overall metric indicators of the journals can be seen in its huge potentials in measuring the research and societal impact of scholarly publications which has been observed by Smith (2001) and Piwowar (2013).

While the performance of the journals in both citations and altmetric attention varies remarkably, nine of the journals investigated consistently appeared in all the research evaluation indicators used. Evidently therefore, these journals have both scholarly and social impact; thus providing unbiased decision in journals research evaluation which gives credence to the concern of scholars such as Galligan & Dyas-Correia (2013). Evidences of social utilization of these journals as shown by their altmetric attention may have put to rest the debate on how to evaluate social impact of research literature (see Tenopir & King 2000; Haustein 2012). For librarians who are interested in subscribing to journals with both scholarly and social impact the nine journals will serve as guides in building their collection development.

Many studies on altmetrics focus on determining the relationship between altmetrics and use of bibliometric indicators for research evaluation. In extending this to LIS research,

this study also found a significant positive correlation between altmetrics attention and citations of the journals in all the databases used for the study. This therefore corroborates earlier studies such as Kousha & Thelwall (2007) and Delgaldo-Lopez-Cozar & Cabezas-Clavijo (2012) who found a relationship between citation counts of Google Scholar and article downloads. The findings also lay credence to the study of Thelwall, Haustein, Lariviere & Sugimoto (2013) who established a statistical significant association between bibliometric indicators and Twitter, Facebook and blogs using medical journals as well as the study of Zhao & Wolfram (2015) who found a positive statistical correlation between Twitter mentions and Eigenfactor scores of LIS journals.

Evidently, therefore altmetric attention is critical in research evaluation. Much as many evaluators may not rely on it alone, it is important to integrate it with the traditional bibliometric indicators. This integration would alley the worries of Smith (2001) who observed the weakness of the traditional evaluation metrics.

Conclusion

As the concern on the influence of social media tools in research communication continues to grow, scholars are expected to contribute to the debate especially in the area of application of social media indicators in research evaluation instead of relying only on the traditional indicators. This study is an extension of the discussion to LIS research since many of the existing studies focused on other academic disciplines. Apart from identifying LIS journals with high altmetric attention, the study moved further to ascertain whether there is any relationship between journal bibliometric citations and altmetric attention with the intention of guiding researchers concerned with research evaluation through empirical evidences. Findings of the study are also critical to librarians as they take decisions on journal subscriptions for collection development because usually librarians are expected to identify journals that can impact significantly on the readers. The findings of this study will also provide policy directions to journal publishers as they see the social impact of their journals rather than looking only the research impact. Finally, authors seeking publication channels are likely to be guided by the outcome of this discussion.

References

Adie, E & Roe, W (2013). Altmetrics: enriching the scholarly content with article-level discussion and metrics. *Learned Publishing*, 26, 11 -17.

Brody, T, Harnad, S & Carr, L (2005). Earlier web usage statistics as predictors of later citation impact. *Journal of the American Society for Information Science and Technology*, 57, 1060 – 1072.

Delgaldo-Lopez-Cozar, E & Cabezas-Clavijo, A (2012). Google scholar metrics: An unreliable tool for assessing scientific journals. *El Professional De La Informacion*, 21, 419 – 427.

Eysenbach, G. (2011). Can tweets predict citations? Metrics of social impact based on Twitter and correlation with traditional metrics of scientific impact. *Journal of Medical Internet Research*, 13(4), 1 20.

Ezema, I. J & Onyancha, O.B. (2016). A Bibliometric Analysis of Health and Medical Journals: Issues in Medical Scholarly Communication in Africa. *Serials Review*, 42(2), 116 – 128.

Galligan, F (2012). Altmetrics for librarians and institutions: Part 1. [Blog post]. Swets blog. Available at http://www.swets.com/blog/altmetrics-for-librarians-and-institutions-part i#.UJAmnVmhkyI

Galligan, F & Dyas-Correia, S (2013). Altmetrics: Rethinking the way we measure. *Serials Review*, 39, 56 – 61.

Haustein, S (2012). Readership metrics. In Cronin B, Sugimoto, C (eds.). *Beyond bibliometrics: Harnessing multi-dimensional indicators of performance.* Cambridge, MA: MIT Press.

Hirsch, J.E (2005). An index to quantify an individual's scientific research output. *Proceeding of the National Academy of Science*, 102(46), 16569 – 16572.Doi: 10.1073/pnas.0507655102.

Howard, J (2012). Scholars seek better ways to track impact online. . *The Chronicle of Higher Education*, January 29. Available at https://eric.ed.gov/?id=EJ984789 (Accessed May 23, 2017).

Kortelainen, T & Katvala, M (2012). Everything is plentiful – except attention: The attention data of scientific journals on social web tools. *Journal of Informetrics*, 6, 661 – 668. http://dx.doi.org/10.1016/j.joi.2012.06.004

Kousha, K & Thelwall, M (2007). Google scholar citations and Google Web/URL citations: A multi-discipline exploratory analysis. *Journal of the American Society for Information Science and Technology*, 58, 1055 – 1065.

Li,X, Thelwall, M & Giustini, D (2011). Validating online reference manager for scholarly impact measurement (FP). Paper presented at ISSI Conference; Durban 4 -7 July 2011.

Meho, L.I & Yank K (2007). Impact of data sources on citation counts and ranking of LIS faculty: Web of Science vs Scopus and Google scholar. *Journal of the American Society for Information Science and Technology*, 58, 2105 – 2125

Moed, H.F (2005). Statistical relationship between downloads and downloads at the level of individual documents within a single journal. *Journal of the American Society for Information Science and Technology*, 56, 1088 – 1097.

Ortega, J.L (2015). Relation between altmetric and bibliometric indicators across academic social sites: The case of CSIC's members. *Journal of Informetrics*, 9, 39 – 49.

Pinkowitz, L (2002). Research dissemination and impact: Evidence from web site downloads. *Journal of Finance*, 57, 485 – 499.

Piwowar, H (2013). Altmetrics: what, why and where. *Bulletin of the Association for Information Science and Technology*, 39(1), 8 – 9.

Priem, J. (2014). Altmetrics. In B. Cronin & C. R. Sugimoto (Eds.), *Beyond bibliometrics: Harnessing multidimensional indicators of scholarly impact*. MIT Press.

Priem, J. Hermminger, B.M. (2010). Scientometrics 2.0: Towards new metrics of scholarly impact on the social web. *First Monday* 15. Available at http://firstmonday.org/article/view/2874/2570 (Accessed May 5, 2017).

The San Francisco Declaration on Research Assessment (DORA): Putting science into the assessment of research. Available at http://am.ascb.org.dora/ (Accessed May 23, 2017)

Shema, H, Bar-Ilan, J & Thelwall, M (2013). Do blog citations correlate with a higher number of future citations? Research blogs as a potential source for alternative metrics. Available at http://www.scit.wlv.ac.uk/~cm1993/papers/blogCitations.pdf (Accessed May 25, 2017)

Smith, R (2001). Measuring the social impact of research: Difficult but necessary. *BMJ*, 323(7312), 528. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1121118/ (Accessed May 23, 2017)

Thelwall, M (2009). *Introduction to webometrics: Quantitative web research for the Social Sciences*. Wolver Hampton: Statistical Cybermetrics Research Group. Available at https://seminarioec3.files.wordpress.com/2011/01/thelwall.pdf (Accessed May 23, 2017).

Thelwall,M, Haustein, S, Lariviere, V & Sugimoto, C.R (2013). Do altmetrics work? Twitter and ten other social web services. *Plos One*, 8(5), 1 – 7.

Tenopir, C & King, D.W (2000). *Towards electronic journals: Realities for scientists, librarians and publishers.* Washington DC: Special Libraries Association.

Vaughan, L (2005). Web link counts correlate with ISI impact factors: Evidence two disciplines. *Proceedings of the American Society for Information Science and Technology*, 39,436. Doi: 10.1002/meet.1450390148.

Vaughan, L & Shaw, D. (2003). Bibliographic and web citations: What is the difference. *Journal of the American Society for Information Science and Technology*, 54(14), 1313 – 1322. Doi: 10.1002/asi.10338.

Zhao, Y & Wolfram, D (2015). Assessing the popularity of the top-tier journals in the LIS field on Twitter. *Proceedings of the 78th ASIS&T Annual Meeting: Information Science with Impact: Research in and for the Community*, Article No. 92, St. Louis, Missouri — November 06 – 10, 2015. DOI: 10.1002/pra2.2015.145052010092