

Data on readership, citations, and downloads for two publications in the field of information systems

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Abstract

Articles published in the "Journal of Strategic Information Systems" and the "Information and Management" were analyzed for their downloads, citations, and readership data from ScienceDirect, Scopus, and Mendeley, two social reference management systems, for the years 2002–2011. The association between downloads and readership data (Spearman $r=0.73/0.66$) and between downloads and citations (Spearman $r=0.77/0.76$) is medium to strong, according to our research. However, with a Spearman $r=0.51/0.59$, the association between citations and readership data was just medium-sized. These findings point to the fact that the two use metrics and the citation effect of the information systems articles that were analyzed varied to a different degree. Distinct obsolescence traits are associated with downloads and citations, as one would predict. Many years pass before the maximum number of citations is achieved, even though the most downloads often occur in the year of publication and the years immediately after. Additionally, downloads increased again in subsequent years, which may suggest that citations also influence downloads to a certain extent..

Keywords : Information systems journals, downloads, citations, readership, and Mendeley

Introduction

For decades, the Garfield Impact Factor has been the accepted measure of journal impact, and citations have been the only metric used to evaluate the quality of academic writing. According to Bollen et al. (2005), citation frequency and the impact factor continue to be significant metrics for evaluating research across several fields. Nonetheless, in the recent past, there were major shifts in the distribution of, especially journal articles. Almost all journal material is now accessible digitally, in contrast to the mid-1990s when paper copies were the norm (Kurtz and Bollen, 2010, p. 3). With this, it's simple to provide analytics based on readers for use. When compared to citation data, consumption data does really provide a number of benefits. They don't have to wait for publication, they cover more ground than just scholarly journals, and they take use trends into account (Kurtz and Bollen, 2010, p. 4). Data collecting is also simple and inexpensive. Usage metrics, on the other hand, do not replace citation metrics; rather, they supplement them. In contrast to the former, which are indirect measures of usage, citations are an indirect measure of use (Kurtz et al., 2005, p. 114). An additional source for measuring research, and especially for evaluating journals, might be alternative metrics (altmetrics) with the rise of the social web and its acceptance in academia (Bar-Ilan et al., 2012). Data from social bookmarking sites is especially vulnerable due to the absence of reliable worldwide download statistics (Haustein and Siebenlist, 2011, p. 446). When compared to the other services, Mendeley offers the greatest features and is, hence, is the one that seems to be most appropriate (Zahedi, Costa and Wouters, 2013). One study indicated that 82% of bibliometricians' published works were in Mendeley user libraries (Haustein et al., 2013). Another study by Li, Thewall and Giustini (2012) found that in 2010, Mendeley covered 94% of research publications published in Nature and 93% of research articles published in Science in 2007.

Literature study

Download and citation statistics have been compared in previous research. Local studies and global studies are the two main categories under which this research fall (Bollen and Van de Sompel, 2008). Comparatively, global studies are conducted on a global scale, while the former are limited to a single user demographic (like a university). See, for example, Duy & Vaughan, 2006; Huntington & Tenopir, 2006; Takei, Yoshikane & Itsumura, 2013; Tsay 1998a and 1998b for examples of local use assessments. Global investigations are less common in published works. Brody, Harnad, and Carr (2006), Chu and Krichel (2007), and Kurtz et al. (2005b) are examples of publications that typically make use of download data supplied by publishers of open-access journals or topic

repositories/preprint archives. (Commercial) e-journal package providers' consumption data was used for several studies (e.g., Moed, 2005; Nicholas et al., 2005; O'Leary, 2008).

After looking at the use logs of Blackwell Synergy and Emerald Insight, Nicholas and colleagues produced one of the most thorough studies of its sort. The authors found, among other things, that there is a significant difference in the age distribution of downloaded articles among journals and throughout large topic categories. The age distribution of the materials downloaded also differs between the various subscriber kinds (e.g., professors, postgraduates, undergraduates, etc.). Our study is further informed by the work of Moed (2005), who investigated the correlation between citations and downloads of Elsevier's Tetrahedron Letters online journal. When studying the patterns of download and citation obsolescence, Moed employed a synchronous and diachronous technique. The second finding made the impact of citations on download counts very evident. In addition, prior research by Schloegl and Gorraiz (2010) and (2011) examined the correlation between downloads and citations in cancer and pharmacology publications. Our earlier work with journals from other fields was able to be continued using the data supplied by the Elsevier Bibliometric Research Program (<http://ebrp.elsevier.com/>). Additionally, this time around, we also incorporate Mendeley readership statistics in the comparison.

Due to a lack of satisfactory validation data, social media has not yet been used in the evaluation of scientific accomplishments (Thelwall et al., 2013). A moderate association was discovered between Mendeley reading numbers and citation rates in the few experiments that employed distinct data sets each. For example, according to Haustein et al. (2013) and Bar-Ilan and associates (2012), there was a 0.45 connection between the publications of 57 speakers at the 2010 Leiden STI conference. Finding a correlation of 0.54 (Science) and 0.56 (Nature) between Scopus citations and Mendeley readership data obtained in 2010, Li, Thelwall, and Giustini (2012) examined articles published in Nature and Science in 2007. Both PLoS (0.5) and the Journal of the American Society for Information Science and Technology (0.46) have somewhat lower correlations, according to Priem, Piwowar, and Hemminger (2012) and Bar-Ilan (2012), respectively. The relationships between readership and citation counts differ throughout fields, according to a recent paper by Mohammadi and Thelwall (2013). The examined humanities fields had an average correlation of 0.43, in contrast to the 0.52 seen in the social sciences.

Among the most promising altmetrics sources, our research is among the first to compare citation data with download data. These three sources reflect different roles in scholarly communication and go through different stages. One stage involves accessing research literature and organizing it using reference management systems. The other stage is publishing an article that was composed using the consulted literature. For example, citing authors vs. users of articles is one stage. So, we'd want to see what similarities and contrasts our three data sets, which reflect various stages of academic communication, have in common. The following concerns will be given special attention:

Do the most downloaded papers also happen to be the most cited? Also, have these been the most popular additions to Mendeley user libraries, a platform for collaborative reference management?

When it comes to publishing level obsolescence, are citations and downloads different?

Do citation, download, and readership statistics vary in any other ways?

Approach and information resources

Journal of Strategic Information Systems (JoSIS) and Information and Management (I&M) are two journals in the field of information systems that underwent the following assessments. We consulted publications in the field of information systems as two of our writers are highly qualified in this area. This contribution compares the findings of JoSIS with those of a comparable journal (I&M), even though the analyses of JoSIS were already published in the proceedings of ISSI 2013 (Schlögl, Gorraiz, Gumpenberger, Jack & Kraker, 2013). At the document level, Elsevier supplied both citations and downloads. Between 2002 and 2011, all documents were made accessible for download by ScienceDirect, and all citations were made available by Scopus until mid-2012. And from 2002–2011, we tallied up all the times these two publications' articles appeared in user libraries (= readership frequencies) on Mendeley. All of the Mendeley data came straight from their database.

Given the widespread recognition of ScienceDirect and Scopus, we will focus on Mendeley in this description. Software tools that aid in research are made available to users via Mendeley (Henning & Reichelt 2008). One of the most popular is Mendeley Desktop, a reference management and cross-platform PDF program that is freely available for download. Users may organize their own research libraries with ease by placing items in appropriate folders and tagging them for easy retrieval. The papers are collected by users from all around the globe and made available in the Mendeley research catalogue (for further information, see Hammerton et al. (2012)). With the help of over 2.5 million users, this collection now has over 110 million unique pieces (Jack, 2014).

Users may also add and update information about themselves, such as their field of study, research interests, biography, contact info, and publications, to their Mendeley accounts. To help users keep tabs on how well-received their particular articles are within the Mendeley community, these profiles now provide readership figures. The number of people who have added an author's piece to their own research library on Mendeley is shown by these readership numbers.

We compared the article titles given by Elsevier with those in the Mendeley database in order to locate relevant papers in the Mendeley catalog. During the matching procedure, we used a Levenshtein ratio of 1/15.83 since there are slight discrepancies between the article titles in the two databases. Applying this ratio to a larger pool of titles yielded respectable matching results, with an accuracy of around 99.9 percent. Still, in order to lessen the possibility of false positive matches, we checked borderline situations by hand. For article titles a and b, the Levenshtein ratio LR is calculated in the following way:

$$LR = \frac{\text{Levenshtein distance}_{a,b}}{\max(\text{length}_a, \text{length}_b)}$$

Results

Save information

You may download articles from ScienceDirect in two different formats: HTML and PDF. Out of all the papers published between 2002 and 2011, the two information systems journals had the highest share of downloads for pdf documents, at over 61% apiece.

You can see the breakdown of the two journals' document kinds and the number of downloads to them in Table 1. Different editing procedures may explain the striking discrepancy in the document types published in the two publications. The document type with the most downloads is full-length articles. Even though they only account for 56.4% of downloads for this journal, full-length articles account for 94.1% of JoSIS downloads. Downloads of full-length articles account for virtually all of I&M's traffic. The second journal had an average of one full-length article every issue, but surprisingly, one editorial and one brief communication—which may be exceptional—had more downloads.

Table 1 shows the distribution of document types for the "Journal of Strategic Information Systems" (n=321 docs) and "Information and Management" (n=647 docs) in terms of downloads from 2002 to 2011 (download year: <=2011).

Document types (DT)	<i>J. of Strategic Information Systems</i>				<i>Information and Management</i>			
	n	% docs	% DL	DL per DT ¹	n	% docs	% DL	DL per DT ¹
Abstract only					1	0.2%	0.1%	14.8*y
Advertisement					4	0.6%	0.0%	1.0*y
Announcement	5	1.6%	0.4%	5.9*x				
Book Review	4	1.2%	0.3%	5.5*x				
Content list	29	9.0%	0.4%	1.0*x				
Editorial Board	29	9.0%	0.4%	1.5*x	22	3.4%	0.2%	1.3*y
Editorial	49	15.3%	3.3%	4.6*x	1	0.2%	0.2%	34.6*y
Erratum	1	0.3%	0.1%	5.7*x	5	0.8%	0.2%	6.0*y
Full length article	181	56.4%	94.1%	35.4*x	581	89.8%	98.9%	29.0*y
Index	12	3.7%	0.2%	1.3*x	12	1.9%	0.1%	1.5*y
Miscellaneous	9	2.8%	0.2%	1.8*x	20	3.1%	0.2%	1.5*y
Short communication					1	0.2%	0.2%	35.7*y

Publishers note	2	0.6%	0.2%	7.0*x				
All	321	100%	100%	21.2*x	647	100%	100%	26.3*y

¹ Since the download (DL) numbers are very sensitive, we cannot provide the absolute figures but only the relations among them.

There is often some time lag between the print publication date and the time a document was made available online due to the fact that the examined journals are available both digitally and in print (see Table 2). There are noticeable disparities between the two journals when comparing the print publishing delay for full-length papers. These articles mostly correlate to the document categories article, review, and conference paper in Scopus. I&M has a publishing wait of almost four months, which is over 2.6 times greater than JoSIS's 50-day delay for full-length articles.

Section 2. For the "Journal of Strategic Information Systems" (n=321) and "Information and Management" (n=647 documents), the average discrepancy between the print and online publishing dates is from 2002 to 2011.

Document types	<i>J. of Strategic Information Systems</i>		<i>Information and Management</i>	
	n	Online date - print publication date (mean days)	n	Online date - print publication date (mean days)
Abstract only			1	-260.0
Advertisement			4	-17.5
Announcement	5	-13.2		
Book Review	4	-40.5		
Content list	29	12.9		
Editorial Board	29	12.9	22	7.9
Editorial	49	9.0	1	-41.0
Erratum	1	-145.0	5	-31.2
Full length article	181	-49.8	581	-131.5
Index	12	-4.9	12	-4.3
Miscellaneous	9	32.9	20	-18.0
Short communication			1	-145.0
Publishers note	2	-13.0		
All	321	-24.9	647	-119.5

From a scientific standpoint, full-length articles are the most intriguing document type, thus we limited the obsolescence study to these two magazines. Using both a synchronous and diachronous method, obsolescence may be explored (Moed, 2005, p. 1090). In the first, the publishing data of the articles is used to determine the number of downloads (citations), with the download/citation date being a constant variable. In the latter, the situation is reversed (the publishing date is set in stone). Tables 3–4 (and Tables 7-8) provide for a diachronous analysis in their rows, whereas Tables 3–4's columns allow for a synchronous one. Data privacy concerns prevent us from providing any more information on the downloads in these tables beyond relational numbers.

Table 3. Downloads per year for the "Journal of Strategic Information Systems" (n=181), broken down by print publishing year (2002-2011), document type (full length article - FLA), and download year (<= 2011) (refer to Schlögl et al, 2013).

Pub. year	n	Download year										Downloads per FLA –	
		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011		All
2002	13	1.0	2.3	1.7	1.3	1.2	1.4	2.4	2.8	2.8	2.7	19.6	7.4*x
2003	21	0.0	1.3	2.2	1.0	1.0	0.9	1.5	1.3	1.5	1.1	11.9	2.8*x
2004	17			1.7	2.6	2.1	2.2	2.4	2.7	2.9	2.3	18.9	5.5*x
2005	18				1.7	2.3	1.8	2.0	2.4	2.6	2.2	15.0	4.1*x
2006	14				0.2	2.4	2.1	1.8	2.1	2.0	2.0	12.5	4.4*x
2007	18					0.0	2.7	3.6	3.4	3.5	2.9	16.1	4.4*x
2008	16						0.0	2.9	3.5	3.0	2.4	11.8	3.6*x
2009	14								3.1	4.0	3.1	10.2	3.6*x
2010	21									3.9	4.4	8.3	2.0*x
2011	29									0.3	5.6	5.9	1.0*x

All	181	1.0	3.7	5.6	6.8	8.9	11.1	16.6	21.4	26.4	29.0	130.4
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² Since the download numbers are very sensitive, we cannot provide the absolute figures but only the relations among them.

Table 4. Year wise relation³ of downloads per print publication year (2002-2011), (doc type: full length article - FLA, download year: <=2011) for “Information and Management” (n=581)

Pub year	n	Download year											Downloads per FLA –
		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	All	
2002	46	1.7	1.6	1.2	1.1	1.0	1.2	1.7	2.1	2.2	1.9	15.8	7.6*y
2003	73	0.5	3.1	2.2	1.5	1.3	1.4	1.9	2.2	2.2	1.9	18.3	5.6*y
2004	71		0.4	4.2	2.7	2.0	2.1	2.5	2.9	3.0	2.6	22.3	7.0*y
2005	61			0.6	3.6	2.1	1.7	2.0	2.5	2.4	2.1	17.1	6.2*y
2006	78				0.4	3.5	3.0	2.6	3.0	3.0	2.6	18.1	5.1*y
2007	48					0.0	2.6	2.2	2.0	2.1	1.7	10.7	4.9*y
2008	62						0.0	4.0	3.9	3.2	2.7	13.8	4.9*y
2009	56							0.0	3.8	3.1	2.4	9.3	3.7*y
2010	42								0.2	2.9	2.1	5.2	2.8*y
2011	44									0.0	2.0	2.0	1.0*y
All	581	2.2	5.1	8.3	9.2	9.9	12.0	16.9	22.7	24.1	22.0	132.5	

³ Since the download numbers are very sensitive, we cannot provide the absolute figures but only the relations among them.

The synchronous obsolescence analysis of both journals reveals that from the downloads of a certain year, most (formatted in bold) accumulate for articles either published in the download year or one year earlier. In several cases, articles are downloaded in the year before print publication, since they were already available online. Tables 3 and 4 furthermore show that older articles are also downloaded relatively often. To some degree the higher downloads of older articles might be due to a higher number of published articles in those years (see column n). However, this does not explain why, for instance, the 13 articles from JoSIS published in 2002 were downloaded so many times in 2011 and in previous years.

The diachronous analysis exhibits that, in particular, a few older volumes from JoSIS reach their download maximum several years after publication. In contrast, most downloads for I&M occur in the publication year (with the exception of 2002). This confirms the observation by Nicholoas and colleagues (2005) that the age pattern of downloads may vary more or less strongly even between journals from the same discipline. Both journals have in common (for the publication years 2002-2006) a re-increase in the downloads in the years 2008/2009. This stands in contrast to our former studies in the fields of oncology (Schloegl & Gorraiz, 2010) and pharmacy (Schloegl & Gorraiz, 2011), where half of the downloads were made within the first two years after publication followed by a continuous decline afterwards.

Citation data

Tables 5 and 6 show that, as expected, reviews receive more citations per document than articles (20.2 vs. 14.8 for JoSIS, 42.6 vs. 26.3 for I&M). One interesting fact is that more than one quarter (27%) of all documents of JoSIS and one tenth of all documents of I&M were not cited in the citation window (2002-2011). This is mainly true for documents other than articles and reviews (editorials, errata and conference papers). In contrast, a certain download volume for these document types is also accumulated in ScienceDirect. In addition, the publication date has a great influence on the citation rate. Usually only a minority of the articles are cited in the year of publication. For instance, 21 articles in JoSIS and 35 articles and 3 reviews in I&M published in 2011 did not receive any citation in the publication year.

Table 5. Distribution of Scopus document types and citations per document type for “Journal of Strategic Information Systems” (2002-2011) (see Schlögl et al., 2013)

Doc. type	No. docs	No. uncited	% uncited	Citations	%	Citations per doc. type
Article	151	22	15%	2563	86.4%	14.8
Conference paper	13	9	69%	8	0.3%	0.4
Editorial	33	26	79%	13	0.4%	0.2
Review	18	1	6%	383	12.9%	20.2
All	215	58	27%	2967	100%	10.9

Table 6. Distribution of Scopus document types and citations per document type for “Information and Management” (2002-2011)

Doc. type	No. docs	No. uncited	% uncited	Citations	%	Citations per doc. type
Article	549	52	9%	14431	89.4%	26.3
Editorial	1		0%	43	0.3%	43.0
Erratum	5	4	80%	1	0.0%	0.2
Review	39	3	8%	1661	10.3%	42.6
All	594	59	10%	16136	100%	27.2

Citations to articles, reviews, and conference papers from 2002–2011 are organized by age in Tables 7 and 8. The synchronous analysis reveals that throughout all citation years, publications published in 2002 obtain the highest number of citations for JoSIS. This is not the case for I&M to the same extent. Even if it happens sooner, the citation maximum for older works in this journal does occur. According to the results of the diachronous study, very few documents were referenced in the publishing year. A year after publication, there is a sharp spike, but citations stay pretty constant over the next several years, reaching a peak in 2010 and 2011 for the vast majority of instances. Table 7. Citations for the "Journal of Strategic Information Systems" (n=150, only referenced documents) organized by year of publication (2002–2011) for the following document types: articles, reviews, and conference papers. (Refer to the study of Schlögl et al., 2013)

Pub. year	n	Citation year										all	Cites per cited doc
		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011		
2002	13	2	19	38	69	88	105	158	165	194	199	1037	79.8
2003	14		1	6	21	27	39	35	41	40	39	249	17.8
2004	17			0	15	40	56	74	78	88	107	458	26.9
2005	19				0	16	46	78	76	93	99	408	21.5
2006	14				1	2	14	31	31	53	49	181	12.9
2007	18						1	31	74	92	85	283	15.7
2008	15							3	30	69	83	185	12.3
2009	14								3	34	57	94	6.7
2010	18									5	40	45	2.5
2011	8										14	14	1.8
All	150	2	20	44	106	173	261	410	498	668	772	2954	

Table 8. Year-wise citations (2002-2011) per publication year for “Information and Management” (document types: article, review, conference paper), (n=533, only cited documents)

Pub. year	n	Citation year										all	Cites per cited doc
		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011		
2002	46	3	32	35	38	40	40	37	40	40	38	2617	56.9
2003	72		12	43	59	58	63	67	61	62	66	2826	39.3
2004	72			6	54	64	70	70	65	71	69	3603	50.0
2005	62				14	47	51	55	58	60	56	2278	36.7
2006	77					14	52	61	69	75	69	1985	25.8
2007	54						11	45	49	53	54	1227	22.7
2008	61							20	49	55	60	988	16.2
2009	50								14	44	46	435	8.7
2010	33									12	32	125	3.8
2011	6										6	8	1.3
All	533	3	44	84	165	223	287	355	405	472	496	16092	

Number of readers

See how many times (full-length) publications listed in Mendeley user libraries were published in JoSIS and I&M between 2002 and 2011 in Table 9. Given that Mendeley began operations in 2009, it would not have been feasible to do an obsolescence analysis on reading data by dividing it into two years, 2010 and 2011, as was done with citations and downloads. According to Gorraiz et al. (2013), on page 142, the number of users of Mendeley also increased dramatically over that period. The distribution of readership each publication year for the two information systems journals is reasonably even, in contrast to downloads and, in particular, citations. The delayed release of Mendeley might be one explanation for why older publications do not attract more readers in relation to citations and downloads.

Table 9. "Journal of Strategic Information Systems" (n=181) and "Information and Management" (n=581) readership numbers by publishing year (2002-2011). data collected from Mendeley: October 2012, document type: full-length article

Publication year	n	Journal of Strategic Information System			Information and Management			
		Occurrences in libraries	user	Occurrences per doc	n	Occurrences in libraries	user	Occurrences per doc
2002	13	566		43.5	46	992		21.6
2003	21	344		16.4	73	1168		16.0
2004	17	471		27.7	71	1701		24.0
2005	18	371		20.6	61	1071		17.6
2006	14	382		27.3	78	1669		21.4
2007	18	580		32.2	48	909		18.9
2008	16	451		28.2	62	1317		21.2
2009	14	416		29.7	56	911		16.3
2010	21	499		23.8	42	727		17.3
2011	29	537		18.5	44	484		11.0
All	181	4617		25.5	581	10949		18.8

Analyzing the relationship among downloads, citations, and audience size Patterns of obsolescence Previous research has shown that citations and downloads exhibit distinct obsolescence characteristics. Citations for papers that get few in the year of publication spike the next year and remain rather constant thereafter. This is in contrast to the download trend, wherein publications tend to have a surge in activity either in the year of publication or just following. It is evident that citations have a significant impact on downloads based on the following facts: (1) the most cited JoSIS articles from 2002 had a high proportion in the downloads of later download years (synchronous analysis); and (2) in 2008/2009, there was a re-increase in downloads for articles published between 2002 and 2006, which was accompanied by higher citations (diachronous analysis). In his 2005 article for Tetrahedron Letters, Moed estimated a 25% impact. Nevertheless, we refrain from attempting to measure this impact for the reasons stated in Schloegl and Gorraiz (2011).

Correlations

Figures 1 and 2 show the relationship between downloads, citations and readership which is similar for the two journals. We computed the highest correlation (Spearman) between downloads and citations ($r=0.77$ for JoSIS and $r=0.76$ for I&M) which was slightly lower between downloads and readership ($r=0.73$ for JoSIS and $r=0.66$ for I&M) and clearly lower between citations and readership ($r=0.51$ for JoSIS and $r=0.59$ for I&M). The correlations between Mendeley readership numbers and citations are in line with those of previous studies as was outlined in the literature review (see Bar-Ilan, 2012; Bar-Ilan et al., 2012; Li, Thelwall & Giustini, 2012; Mohammadi & Thelwall, 2013; Priem, Piwowar & Hemminger, 2012). Only the analysis by Li and Thelwall (2012) found a higher correlation (Spearman $r=0.68$) between Mendeley and Scopus for 1397 genomics and genetics articles published in 2008 (data collection: January 2012).

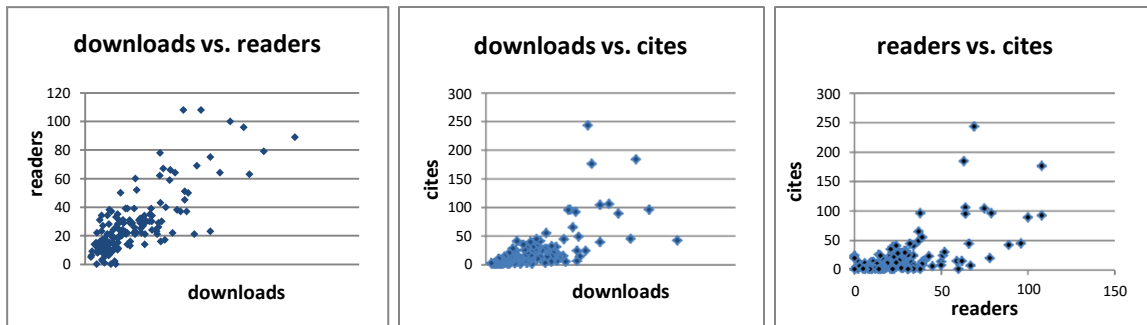


Figure 1. Downloads vs. readers vs. cites, scattergram for “Journal of Strategic Information Systems” (publication year: 2002-2011, doc type: full length article, only articles cited at least once) (n=150)

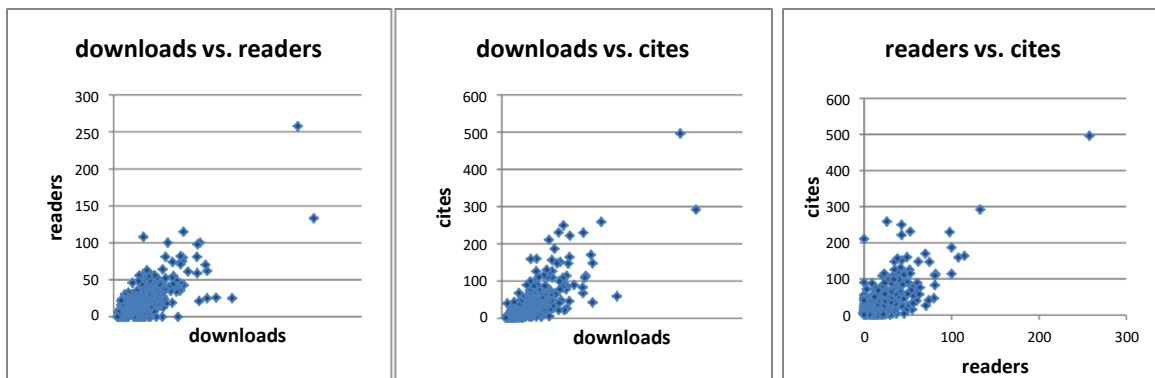


Figure 2. Downloads vs. readers vs. cites, scattergram for “Information and Management” (publication year: 2002-2011, doc type: full length article, only articles cited at least once) (n=528)

Since Mendeley didn't launch until late 2009, it's possible that this is one explanation for the weaker relationship between Mendeley users and citation rates. Hence, compared to ScienceDirect and, especially, Scopus, where they could be downloaded and cited before to 2009, older papers appear less often in Mendeley. This claim may be supported by the fact that, in contrast to the top ten rankings for citations and downloads, the top ten rankings for readership include many articles written after 2005.

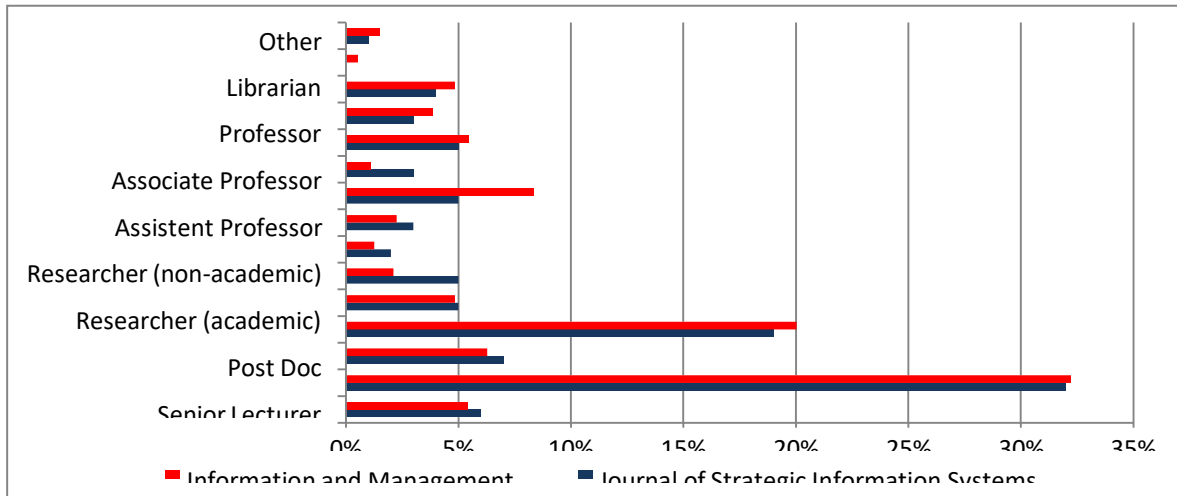


Figure 3: Readership structure of the articles in Mendeley for “Journal of Strategic Information Systems” and “Information and Management” (2002-2011) (data extraction: October 2012)

The younger demographic of Mendeley users may also account for the weaker relationship between the two metrics. Figure 3 demonstrates that students make up over two-thirds of the readers of the information systems publications that were analyzed. The majority of these readers are students pursuing master's or doctoral degrees. There is a glaring difference between this group and the people who cite and download papers from the two publications. Nicholas and colleagues (2005) reported that users with different levels of education have different patterns of use when it comes to the age of the viewed items compared to professors, researchers, and professionals/practitioners. This finding suggests that the user structure influences use. A third of the articles seen in Blackwell Synergy were not even from this category. Usage data are user type dependent, as was previously shown by Bollen and Van de Sompel (2008). The weaker association between citations and reading frequencies is understandable given the potentially much more pronounced user structure disparity between Scopus and Mendeley.

Findings and directions for further study

We found some similarities and some discrepancies in the citation, download, and readership statistics between the two journals of information systems. The features of obsolescence for citations and downloads are clearly distinct from one another. Although it takes time for papers to start getting more citations, the most popular period to download them is generally in the year of publication or just after. In any case, citations added later on do help boost downloads again. We calculated the strongest connection (Spearman $r=0.76/0.77$) between citations and downloads. Downloads and readership frequencies had a weaker link (Spearman $r=0.66/0.73$), while citations and readership had a much worse correlation (Spearman $r=0.51/0.59$). A comparison of Mendeley's user base with that of ScienceDirect and Scopus showed some interesting differences. While some research have shown a link between downloads and citations, the strength of this relationship is quite user-specific. A weaker relationship between citations and readership counts might be explained by the fact that the user structures of Scopus and Mendeley can be even more different than those of Scopus and ScienceDirect. Since they reflect distinct facets of journal usage, it is unrealistic to anticipate a perfect correlation between Scopus citations, ScienceDirect downloads, and Mendeley reading numbers. Lastly, it should be considered that e-journal consolidation took nearly four years (Gorraiz et al., 2013). As new results with global download data have shown, most previously published calculated correlations between downloads and citations could therefore provide a skewed view. The critical issue, therefore, is the time required for altmetrics to gain widespread acceptance among scientists. Therefore, it is important to use caution when interpreting the Mendeley connections.

Due to Mendeley's late start-up in 2009 and considerable user base growth since then, it did not make sense to conduct an obsolescence study of readership statistics. We want to do an

obsolescence study using readership data soon as the real data window is two years longer. In addition, we are interested in doing a replication research with other journals to further investigate any differences that may be particular to the field or the journal itself.

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