

# A Citation Analysis of Sub-Saharan African Library and Information Science Journals using Google Scholar

**Omwoyo Bosire Onyancha**

*Department of Information Science  
University of South Africa  
PO Box 392, UNISA 0003, South Africa  
onyanob@unisa.ac.za  
b\_onyancha@yahoo.com*

## **Abstract**

*In bibliometrics, the numbers of research articles and citations constitute the main measurement indicators of research output and impact respectively. This study evaluates the library and information science/studies (LIS) journals published in sub-Saharan African countries in order to assess their performance. Drawing its data from Google Scholar, the paper compares the performance of 13 LIS journals using the following indicators: number of publications; average number of records; number of citations; citations per year; citations per article; citedness and uncitedness of the records published in each journal; h-index and g-index; and citation impact factor. The paper also identifies journals with the most cited works and ranks the journals according to the above measurement indicators. Results indicate that publication of LIS journals in Sub-Saharan Africa is a relatively recent practice; a number of journals have not published any issues for close to 5 years; some journals have ceased publication; there is irregular publication of journals; there are about five core LIS journals in the region; AJLAIS was the most highly cited journal, but the most influential journals in terms of the IF include SAJLIS, Innovation and Mousaion. The*

*challenges faced by journal publishers and researchers in sub-Saharan Africa, as well as recommendations on improving the visibility and impact of journals in the region and internationally, are outlined.*

## **Keywords**

Informetrics, citation analysis, library and information science journals, journal productivity, impact analysis

## **Introduction**

Journals play a vital role in the measurement of research output and/or impact because they are the most commonly used avenue for disseminating research findings. Significantly, journals provide information that is crucial for conducting research evaluation, namely: names of authors; authors' institutional affiliation; country affiliation of authors; year of publication and country of publication. Therefore, not only do journals provide a platform on which the research output and impact of individual authors, institutions or countries are measured (Ocholla and Ocholla, 2007), but they are also subjects of evaluation in and of themselves.

Citing several authors, Onyancha (2008) observes that there are as "many reasons for evaluating journals as there are different groups of people interested in information production, storage, dissemination and use." Interested parties include researchers, librarians, documentalists, electronic database publishers, funding agencies, and journal editors and publishers. Others are commercial publishers, information brokers, and university research councils. These varied interests have resulted in many papers being published about the performance of journals. Depending on the purpose

of individual studies, descriptive and/or evaluative informetric analyses have been conducted to evaluate journals using one or more of the following measurement indicators: number of articles, average number of articles, impact factor, average number of citations, citation age (age-weighted citation rate), cited journal half-life, co-citedness, consumption factor, importance index, influence weight, popularity factor; and lately, the *h*--index has also been proposed as a measurement of journals' performance (see Alloro, Casilli, Taningher and Ugolini, 1998; Altmann and Gorman, 1998; Black, 1999; Adusumilli, Chan, Ben-Porat, Stiles and Fong, 2003; Miguel-Dasit, Aleixandre, Valderrama, Martí-Bonmatí and Sanfeliu, 2005; Coats, 2005; Togia and Tsigilis, 2006; Tsay, 2006; Jones, 2007; Braun and Al in Costas and Bordons, 2008; Jamal, Smith and Watson, 2008; Onyanacha, 2008).

To a large extent, the citation databases of Thomson Scientific (published formerly by ISI – Institute for Scientific Information), namely: the Science Citation Index (SCI), Social Sciences Citation Index (SSCI) and/or the Arts and Humanities Citation Index (A&HCI), have acted as the sole sources of data for the aforementioned and other related studies, especially the studies that made use of citations to evaluate scholarly journals. The Journal Citation Reports (JCR) database, also published by Thomson Scientific, provides citation and article counts which are used to determine how journals are used by different researchers. The database supports journal comparisons through its provision of each journal's impact factor, total number of recent articles (articles published in the last two years), total number of recent cites, immediacy index, and cited half-life.

Citation analyses of scholarly journals published in Africa as a whole, and sub-Saharan Africa in particular, have eluded research evaluators and decision makers for a long time, mainly because of the following reasons:

a) Citation analyses are commonly conducted using ISI's citation indexes, but most journals published in Africa are not indexed in these indexes. According to Onyanacha (2008), ISI only indexed 28 African journals in 2006. Until 2007, ISI never covered any of the LIS journals published in sub-Saharan Africa. The African Journal of Library,

Archives and Information Science (AJLAIS) is the only African LIS-specific journal indexed in ISI, having only been included in 2007.

- b) ISI citation indexes are inaccessible because of their high subscription fees. Most institutions in Africa cannot afford to purchase the citation indexes in CD-ROM format or by subscribing to the Web of Science, ISI's portal to the citation indexes.
- c) The manual examination of references using hard copy (or print) journals in order to conduct a citation analysis can be very tedious and sometimes inaccurate.
- d) Informetricians are few in sub-Saharan Africa. Unlike developed countries, where there are many informetric/bibliometric research centres or units (e.g. Bibliometrics [Research unit] at Universiteit Hasselt; Bibliometric and Informetric Research Group [School of information Systems, Technology and Management – University of New South Wales]; and the Bibliometrics Research Group [City University]), only one university in sub-Saharan Africa – the University of Ibadan, Nigeria – offers formal training in informetrics and has an established centre for studies/research on the subject, namely: Africa Regional Centre for Information Science (ARCIS).
- e) Africa, and more particularly sub-Saharan Africa, lacks science and technology databases that can be used to conduct informetric studies (Nwagwu, 2005, 2007). This situation has resulted in scholars using the ISI databases to conduct studies on Africa's research outputs thereby underestimating the continent's actual research output. Consequently, some scholars (e.g. Nwagwu, 2005, 2007) have proposed the development of an African citation index as a tool for research evaluation in the continent.
- f) Informetrics, both as a research method and as a sub-field of library and information science, is not considered as viable as other sub-fields/courses in LIS schools in sub-Saharan Africa. It is therefore not treated as a priority area in which university administrators as well as governments should invest. Social policies in most Sub-Saharan African countries are not research-based.

Politicians decide on priorities based on intuition through committees and other instruments. Apart from South Africa, where university research is still supported by the government in terms of subsidy for each published research, the significance of university research is actually yet to be given prominence in the region; its evaluation might not be considered of any positive input to policy makers.

As a result, studies that employ citation analysis techniques in order to study citation patterns and the influence of individual researchers, journals, and institutions in various disciplines, including LIS, are rare in Africa. One of the rare attempts was made in 2005 by the STIMULATE 4 Group (2005) [Prof Ronald Rousseau and others] to calculate the impact factor percentile of all ISI-covered journals published in Africa or containing the words Africa or African in their title. The study found that there was no “statistically significant difference between the average ISI impact factor, the first quartile impact factor, and the median impact factor”, and concluded that “for journals with relatively low impact factors, there is little difference between the various ways in which synchronous impact factors are calculated”. Similarly, Mouton, Boshoff and Tijssen (2006) conducted a “Comprehensive analysis of South African research journals”, and among their findings, the authors concluded that nearly half of South Africa’s journals do not have any international visibility because the articles in those journals are not cited outside South Africa. A further analysis of the citation impact factor (by way of calculating the composite extended journal impact factor – CE-JIF) of the 107 journals that received at least 1 citation between 1994 and 2002 produced a cluster of only 6 journals that ‘surpassed’ a modified IF of 0.50. Unlike in the case of the STIMULATE 4 Group’s study where none of the journals analyzed was LIS-specific, Mouton, Boshoff and Tijssen’s (2006) study covered only one LIS journal, i.e. *South African Journal of Libraries and Information Science* (SAJLIS). The journal was categorized among the journals that produced a CE-JIF of less than 0.1.

With regard to LIS research, few citation-related studies have been conducted in Africa. Aina (2002) conducted a study to investigate the frequency with which the *African Journal of Library, Archives*

*and Information Science* (AJLAIS) is consulted by examining the references of articles published therein and in three other LIS journals. Olalude (2007) followed a similar research approach in a study to “(i) ascertain the extent to which the librarians and other information professionals in sub-Saharan African countries are sourcing information from the Internet for their academic and professional publications from 2000 to 2005. Both studies used ‘physical counting’ (or analysis) of references to obtain their data on numbers of articles, references, citations, etc).

Onyancha’s (2007) is among the few studies in the region that have utilised citation databases to conduct an analysis of citations in LIS literature. The study extracted data from ISI’s Science and Social Sciences citation indexes to examine LIS records produced by researchers in Africa between 1981 and 2006 in order to identify, among other factors: the total number of citations received by LIS records; the average number of citations per LIS record in each country; and the most cited LIS records. Whilst other studies (e.g. Ocholla and Ocholla, 2007) have generally aimed to assess the productivity of LIS research in Africa as a whole or in specific countries, they nevertheless identify the sources (or journals) in which the authors publish their research, thereby identifying the most commonly used journals as ranked by the number of records published in each journal.

With the introduction of Scopus and Google Scholar as tools of research evaluation, informetric studies are likely to become more feasible in developing countries which, to a large extent, have limited access to ISI’s databases. There is a high likelihood that scholars in developing countries may shift their focus from ISI’s citation indexes (and even Scopus) to Google Scholar. Onyancha and Ocholla (2008) reveal that although ISI’s citation indexes are still widely used to evaluate research both regionally and internationally, there is an increased usage of Google Scholar and, to a limited extent, Scopus (e.g. Yang and Meho, 2006; Bar-Ilan, 2006; Noruzi, 2005; Pauly & Stergiou, 2005; Bar-Ilan Levene and Lin, 2007; Charbonneau, 2006; and Harzing, 2007). While taking cognisance of the limitations associated with Google Scholar (e.g. its inclusion of non-scholarly citations; limited coverage of scholarly journals; and

the longer period it takes to update the service when compared to ISI's databases), Onyancha and Ocholla (2008) nevertheless advise the use of the service to assess researchers' performance in developing countries as it is "affordable and easily accessible when compared to the costly Thomson Scientific service and Elsevier's very expensive search engine, Scopus".

### **Purpose of the Study**

The purpose of this paper is two-fold: (1) to assess the citedness of LIS journals in sub-Saharan Africa; and (2) to demonstrate the use of Google Scholar as a tool in analysing citations of non-ISI indexed journals. In view of this broad purpose, the study analyses citations in the LIS journals under review in order to:

- Determine the number of cited and uncited documents in the LIS journals published in Sub-Saharan Africa.
- Measure each journal's influence using citation impact factors.
- Rank the journals according to various indicators, including number of papers; number of citations; number of years of publication; papers per year; cites per year; cites per paper; h-index; and g-index. (see explanations concerning the h-index and g-index in the Appendix).
- Identify the journals with the most cited works.
- Compare sub-Saharan African LIS journals' impact factors with those of some LIS journals published outside Africa.

### **Methods and Materials**

The geographical region of coverage in this study is sub-Saharan Africa. Sub-Saharan Africa consists of countries in the region of Africa to the south of the Sahara desert. sub-Saharan Africa comprises 48 independent nations (World Bank, 2008). The list of LIS journals published in sub-Saharan Africa was obtained from the Web-based version of Ulrich's Periodicals Directory [hereafter referred to as the Directory] (see <http://www.ulrichsweb.com/>). The Directory provides authoritative information on the publishers and bibliographic details of more than 300,000 periodicals, including academic and scholarly journals, open access publications, peer-reviewed titles, popular magazines, newspapers, newsletters,

and consumer and trade or business-to-business periodicals. An advanced search was conducted to identify journals with any of the following keywords as subject terms: library, information science, archives, and knowledge management.

A combination of the above search terms and the names of each of the sub-Saharan African countries yielded a total of 16 academic/scholarly journals published in sub-Saharan Africa. The search was limited to journals that were designated as 'active', meaning that these journals are still in circulation and/or production, although, as we confirmed later on, some of the 'active' journals are actually no longer being published.

Ulrich classifies periodicals into different categories including peer-reviewed, online, open access, etc. Only those that were designated as peer-reviewed were included in this study. Of the total of 16 LIS scholarly/academic and peer-reviewed journals identified from the Directory, only 14 were selected for analysis based on the language of publication. The other two LIS journals were published in Afrikaans. Only English-published journals were included in the analysis because a search for Afrikaans journals in Google Scholar did not yield any records. Whether the non-indexing of Afrikaans journals was due to the language of publication was not ascertained. It was observed that Nigeria publishes majority of LIS journals (i.e. 7) closely followed by South Africa which yielded 6 journal titles. The 14th journal is published in Tanzania.

After their selection, the journals' titles were then used to extract relevant data from Google Scholar using Publish or Perish® (PoP) software. The software extracts scholarly citations and calculates the number of citations and impact of journals. According to Harzing (2007), the author of the program, PoP uses Google Scholar queries to obtain citation information, which is then analysed and converted to obtain, among other statistics, the following: total number of papers; total number of citations; average number of citations per paper; average number of citations per year; Hirsch's h-index and Egghe's g-index (shown as h-index and g-index respectively in the output). (See the Appendix for further explanations on the h-index and g-index)

The search in Google Scholar was limited to articles published between 1991 and 2007. Extreme care was taken to include the previous titles by which

some of the journals were known. For instance, the *South African Journal of Libraries and Information Science*'s search included a search on the *South African Journal of Library and Information Science*, a name by which the journal was known until 2002. Whenever a sub-Saharan African journal shared a name with a foreign journal, for example *Innovation*, we used the publisher's name to select articles that were published in the journal that this study was interested in.

The total number of citations that each journal received per year and between 1991 and 2007 was obtained by summing up the total number of citations obtained by all the articles published in a given journal per year for the entire period of study, i.e. 1991-2007.

The same approach used to calculate the impact factor (IF) for ISI-indexed journals was adopted in order to obtain the IF of the 14 journals evaluated in this study. The ISI (Thomson Reuters, 2009) uses the following formula in calculating a given journal's IF:

$$\frac{\text{Cites to recent articles}}{\text{Number of recent articles}}$$

Rousseau (2002:422) expresses this mathematically as follows:

$$\frac{\text{CIT (2002, 2001)} + \text{CIT (2002, 2000)}}{\text{PUB (2001)} + \text{PUB (2000)}}$$

Where:

CIT(2002, 2001) stands for citations received in 2002 by the papers published in 2001; CIT(2002,

2000) refers to citations received in 2002 by papers published in 2000; PUB(2001) constitutes the number of papers published in 2001; and PUB(2000) comprises papers published in 2000.

This study considered the number of citations earned by each journal in 2007 from papers (or any other document type) published in the respective journals in 2005 or 2006 for purposes of calculating the journal Impact Factor (IF). The choice of the time frame within which the IF was determined was necessitated by the need to compare ISI-indexed LIS journals' IFs as covered in the Journal Citation Reports of 2007 and sub-Saharan African LIS journals. In order to obtain the number of times each journal was cited in 2007, a link to each of the articles published in either 2005 or 2006 was followed to establish whether or not the citing document was published in 2007. Having obtained citations received in 2007 and the number of publications in a given journal in 2005 or 2006, the above formula was used to calculate each journal's IF, as shown in Table 8.

An aspect that deserves mention is that the accuracy of the results provided in Table 4 depends on the results returned by Google Scholar. For instance, although the results in Table 2 indicate that SAJLIS did not publish any records in 2001, it was confirmed through a search in the University of South Africa' (UNISA) library's print collection that SAJLIS published at least five records in that year. The results of the analyses, based on data from Google Scholar only, may therefore not cover all the records/papers that the respective journals actually published, but may nevertheless be used to reflect each journal's productivity and influence.

**Table 1: LIS journals in sub-Saharan Africa (Source: Ulrich's Periodical Directory, Accessed 15 March 2008)**

<i>Journal Title</i>	<i>Publisher/Proprietor</i>	<i>Language</i>	<i>Start Year</i>	<i>Frequency</i>	<i>Circulation</i>
<b>NIGERIA</b>					
AJAL	Standing Conference of African University Libraries (SCAUL)	English/ French	1983	Semi-Annually	200 unspecified
AJLAIS	Archlib & Information Services Ltd.	English	1991	Semi-Annually	400 paid
JLISA	University of Ibadan/IFLA Africa	English	2001	Semi-Annually	
LJLIS	Nigerian Library Association-Lagos State	English	Not known	Semi-Annually	
LLIB	Nigerian Library Association-Lagos State	English	1966	Irregular	400 unspecified
NLISR	Nigerian Library Association-Oyo State	English	1983	Semi-Annually	1000 unspecified
NL	Nigerian Library Association	English	1963	Quarterly	500 unspecified
<b>SOUTH AFRICA</b>					
Argiefjaarboek vir Suid-Afrikaanse Geskiedennis	National Archives of South Africa	Afrikaans/ English	1948 (vol III)	Annually	
ESARBICA	International Council on Archives	English	1973	Annually	200 unspecified
INDILINGA	Indilinga	English	2002	Semi-Annually	
INNOVATION	University of KwaZulu-Natal, Pietermaritzburg	English	Not known	Irregular	
MOUSAION	University of South Africa NISA Press	Afrikaans/ English	1955	Semi-Annually	1150 unspecified
SAJIM	Centre for Information and Knowledge Management, University of Johannesburg	English	1999	Quarterly	
SAJLIS	Library and Information Science Association of South Africa	English	1933	Quarterly	1600 unspecified
SAAJ	South African Society of Archivists	English/ Afrikaans	1959	Annually	300 unspecified
<b>TANZANIA</b>					
University of Dar es Salaam Library Journal	University of Dar es Salaam, Library	English	1989	Semi-annually	

**Key:**

AJAL – African Journal of Academic Librarianship

AJLAIS – African Journal of Library, Archives and Information Science

JLISA – Journal of Libraries and Information Science Africa

LJLIS – Lagos Journal of Library and Information Science

LLIB – Lagos Librarian  
 NLISR – Nigerian Library and Information Science Review  
 NL – Nigerian Libraries  
 ESARBICA – ESARBICA Journal  
 INDILINGA – Indilinga Journal  
 INNOVATION – Innovation  
 MOUSAION – Mousaion  
 SAJIM – South African Journal of Information Management  
 SAJLIS – South African Journal of Libraries and Information Science  
 SAAJ – South African Archives Journal

## Results

### Publication Trends of Documents in sub-Saharan African LIS Journals

The distribution pattern of the journals according to the country of publication, as shown in Table 1, was as follows: South Africa - 6, Nigeria - 7 and Tanzania - 1. Thus, Nigeria and South Africa can be said to produce the highest number of LIS journals in the region.

Table 2 shows the publication trends of documents in the 14 LIS journals published in sub-Saharan Africa as covered in Google Scholar.

Table 2: Publication trends of sub-Saharan African LIS journals, 1991-2007

**Table 2: Publication trends of sub-Saharan African LIS journals, 1991-2007**

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
SAJLIS	0	8	15	16	12	16	13	11	0	4	0	18	23	23	54	68	31	312
AJLAIS	7	8	7	4	3	11	14	11	12	17	15	20	16	16	18	16	15	210
MOUSAION	1	4	2	1	6	19	14	22	17	12	20	19	25	15	9	14	8	208
SAJIM	0	0	0	0	0	0	0	0	6	16	11	19	16	24	22	19	13	146
INDILINGA	0	0	0	0	0	0	0	0	0	0	0	14	24	31	46	10	16	141
INNOVATION	0	0	2	2	0	0	1	3	0	0	13	11	10	9	15	15	12	93
UDSLJ	0	0	0	0	0	0	0	0	0	0	0	8	17	17	18	8	16	84
ESARBICA	0	0	1	2	0	0	0	0	5	0	15	9	9	12	10	10	7	80
LJLIS	0	0	0	0	0	0	0	0	0	0	0	1	30	15	10	0	0	56
NL	0	1	0	2	2	0	3	0	3	1	1	3	1	31	0	0	1	49
SAAJ	0	0	0	0	1	8	6	1	0	2	0	0	1	0	0	0	0	19
JLISA	0	0	0	0	0	0	0	0	0	0	7	2	0	0	0	0	0	9
NLISR	3	1	0	0	0	1	0	0	0	1	2	1	0	0	0	0	0	9
LLIB	0	0	0	2	0	0	1	0	0	1	0	3	0	0	0	0	0	7
<b>TOTAL</b>	<b>11</b>	<b>22</b>	<b>27</b>	<b>29</b>	<b>24</b>	<b>55</b>	<b>52</b>	<b>48</b>	<b>43</b>	<b>54</b>	<b>84</b>	<b>128</b>	<b>172</b>	<b>193</b>	<b>202</b>	<b>160</b>	<b>119</b>	<b>1423</b>

Of the 14 journals, *SAJLIS* was the most productive, having published a total of 312 articles between 1991 and 2007, followed by *AJLAIS* (210), *Mousaion* (208), *SAJIM* (146) and *Indilinga* (141). The rest of the journals produced a total of less than 100 documents each. In terms of publication trends, it was noted that some of the currently active journals (e.g. *SAJIM* and *Indilinga* – both produced in South Africa) are relatively young. *SAJIM* began its

publication in 1998, while *Indilinga* was only started in 2002. Although most journals have regularly produced LIS documents, there have been occasional instances where no publication was done, e.g. *SAJLIS* in 1991, 1999, and 2001, and *Innovation* in 1995 and 1996. Other journals (i.e. *SAAJ*, *JLISA* and *LLIB*) have since ceased publication, whilst *LJLIS* and *NLISR* are still being published, although they appear irregularly.

### Citation Trends of sub-Saharan African LIS journals

Table 3 presents the data on the citations of journals from 1991 to 2007. The data reveals that citations to the journals have experienced a zigzag trend for the entire period of review. *AJLAIS* maintained a leading position between 1991 and 2001, before being replaced by *SAJLIS* from 2002 to 2007. Other South African journals, such as *Mousaion* and *SAJIM*, and of late *Indilinga*, have shown remarkable performance in some years. For instance, *Mousaion* performed better than any other journal in 1995 when it scored its second highest number of citations (21) compared to *AJLAIS*' 9 citations. *Mousaion*'s highest number of citations (i.e. 23) was recorded in 1999. *SAJIM*, which began its publication in 1999, obtained 9 citations in the same year and went on to perform exceedingly well in 2000 when it received its highest number of citations (35). Another journal that performed well, given its short history, is *Indilinga*. The journal was first published in 2002 and since then has received a total of 54 citations, of which 24 were received in 2003 alone. In fact, in that year, the journal was ranked second behind *SAJLIS*, which obtained 35 citations.

The relative decline in the citations received by *AJLAIS* when compared to *SAJLIS* and other South African journals requires further research to determine the reasons behind that trend. Nevertheless,

research and publications; (ii) Mouton, Boshoff and Tijssen (2006) had concluded that nearly half of South Africa's journals do not have any international visibility because the articles in those journals are not cited outside South Africa; (iii) *SAJLIS* is a national journal that rarely publishes papers from other countries except when their content relates to South Africa, whereas *AJLAIS* has a continental focus. Hence, it is possible that *AJLAIS*' cites might have been declining due to dwindling citations from across Africa, whereas those of *SAJLIS* might be due to increasing cites from other South African journals and other publications besides its own self-citations.

Table 3 also ranks the journals according to the total number of citations. It shows that unlike in the analysis of the number of documents where *SAJLIS* was leading, *AJLAIS* was leading in terms of the total number of citations. *AJLAIS* received a total of 328 citations, followed by *SAJLIS* (172), *Mousaion* (158), *SAJIM* (112), *Innovation* (73), *Indilinga* (54), *NL* (49), *ESARBICA* (35) and the *NLISR* (20). It should also be noted that although some journals have ceased publication, they still receive citations (e.g. *SAAJ*).

### Citedness of sub-Saharan African LIS Journals

An examination of the number of records cited per journal against the total number of uncited records revealed that most of the records published in all but

**Table 3: Number of citations received by sub-Saharan African journals, 1991-2007**

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
<i>AJLAIS</i>	21	37	31	14	9	14	39	18	23	45	23	18	20	8	6	2	0	328
<i>SAJLIS</i>	0	4	1	2	0	4	12	1	0	3	0	37	35	27	31	11	4	172
<i>MOUSAION</i>	2	10	11	1	21	8	5	19	22	4	18	3	17	6	6	2	3	158
<i>SAJIM</i>	0	0	0	0	0	0	0	0	9	35	13	9	16	12	13	3	2	112
<i>INNOVATION</i>	0	0	7	1	0	0	5	16	0	0	3	20	0	8	1	10	2	73
<i>INDILINGA</i>	0	0	0	0	0	0	0	0	0	0	0	4	24	4	19	3	0	54
<i>NL</i>	0	1	0	1	5	0	5	0	7	0	0	6	1	22	0	0	1	49
<i>ESARBICA</i>	0	0	1	1	0	0	0	0	8	0	9	3	7	3	2	1	0	35
<i>NLISR</i>	6	2	0	0	0	6	0	0	0	1	4	1	0	0	0	0	0	20
<i>UDSLJ</i>	0	0	0	0	0	0	0	0	0	0	0	0	6	2	2	0	0	10
<i>JLISA</i>	0	0	0	0	0	0	0	0	0	0	4	5	0	0	0	0	0	9
<i>LLIB</i>	0	0	0	3	0	0	1	0	0	0	0	5	0	0	0	0	0	9
<i>LJLIS</i>	0	0	0	0	0	0	0	0	0	0	0	1	2	4	1	0	0	8
<i>SAAJ</i>	0	0	0	0	2	2	0	1	0	3	0	0	0	0	0	0	0	8
<b>TOTAL</b>	<b>29</b>	<b>54</b>	<b>51</b>	<b>23</b>	<b>37</b>	<b>34</b>	<b>67</b>	<b>55</b>	<b>69</b>	<b>91</b>	<b>74</b>	<b>112</b>	<b>128</b>	<b>96</b>	<b>81</b>	<b>32</b>	<b>12</b>	<b>1045</b>

the following facts may be useful in understanding the above patterns: (i) South Africa is the only country in sub-Saharan Africa where university research is supported by the government in terms of subsidy for each published research, a policy that is likely to boost

two of the journals remain uncited (see Table 4). The two exceptions are *AJLAIS* and *LLIB*, the latter of which ceased publication in 2003. The journal that recorded the highest percentage of uncited records was *UDSLJ* (91.67%) followed by *LJLIS* (87.50%),



*SAJLIS* (78.85%), *Indilinga* (75.89%), *Innovation* (72.04%), *ESARBICA* (71.25%) and *SAJIM* (70.55%). The highest citation rate was recorded by *NLISR*, i.e. 100%, which implies that all of its published records have been cited. The journal with the second highest citation rate was *LLIB* (85.71%). This journal is no longer being published. The only active journal that surpassed the 50% citation rate was *AJLAIS*, which recorded a citation rate of 50.95%, implying an almost equal number of cited and uncited records of those published by the journal between 1991 and 2007. In total, of the 1423 records published in the 14 journals, only 435 (30.57%) are cited, while the remaining 988 (69.43%) are, as of yet, uncited.

article was written by P. Clarke and published in *SAJIM* in 2000. The article, entitled “*Internet as a medium for qualitative research*”, received a total of 18 citations, followed by A. Kantumoya’s article – “*Public libraries and community information services in Africa*” – which received the same number of citations (i.e. 13) as K.J. Muchombu’s paper entitled “*Information needs for rural development: the case study of Malawi*”. Both articles were published in *AJLAIS* in 1992. Ranked third in Table 5 is “*The marginalized workforce: Africa’s library and information profession*”, which was authored by J.R. Neil and published in *AJLAIS* in 1991. Other journals that produced some of the most cited records include *Innovation*, *SAJLIS*

**Table 4: Cited and uncited records in sub-Saharan African LIS journals**

	<i>Cited records</i>	<i>Percentage</i>	<i>Uncited records</i>	<i>Percentage</i>	<i>TOTAL</i>
SAJLIS	66	21.15	246	78.85	312
AJLAIS	107	50.95	103	49.05	210
MOUSAION	70	33.65	138	66.35	208
SAJIM	43	29.45	103	70.55	146
INDILINGA	34	24.11	107	75.89	141
INNOVATION	26	27.96	67	72.04	93
UDSLJ	7	8.33	77	91.67	84
ESARBICA	23	28.75	57	71.25	80
LJLIS	7	12.50	49	87.50	56
NL	27	55.10	22	44.90	49
SAAJ	6	31.58	13	68.42	19
JLISA	4	44.44	5	55.56	9
NLISR	9	100.00	0	0.00	9
LLIB	6	85.71	1	14.29	7
<b>TOTAL</b>	<b>435</b>	<b>30.57</b>	<b>988</b>	<b>69.43</b>	<b>1423</b>

#### **Journals with the most cited LIS Works**

Table 5 shows the documents that had obtained seven or more citations during the period under review and which journals published them. The most cited

and *Mousaion*. While there was one article that received 11 citations, most (i.e. 5) obtained 10 citations, followed by articles that received 9 citations (4), 7 citations (4) and 8 citations (2).

**Table 5: Journals with the most cited works, 1991-2007**

Rank	Author/s	Title	Source	Date	Cites
1	P Clarke	Internet as a medium for qualitative research	SAJIM	2000	18
2	A Kantumoya	Public libraries and community information services in Africa	AJLAIS	1992	13
2	KJ Mchombu	Information needs for rural development: the case study of Malawi	AJLAIS	1992	13
3	JR Neill	The Marginalized Workforce: Africa's Library and Information Profession	AJLAIS	1991	12
4	M Snyman, R Snyman	Getting information to disadvantaged rural communities: the centre approach	SAJLIS	2003	11
5	A Kagan	The transformation of South African librarianship: survey results and analysis of current opinions	Innovation	2002	10
5	AO Idowu, I Mabawonku	Information technology facilities and applications in some Nigerian research and university ...	AJLAIS	1999	10
5	D Rosenberg	Resource Sharing—Is It the Answer for Africa?	AJLAIS	1993	10
5	FA Ehikhamenor	Information technology and scientific and technological information in Nigeria: revolution or ...	AJLAIS	1993	10
5	S Weber	The future of the university: the cutting edge	Mousaion	1999	10
5	Y Sayed, K De Jager	Towards an investigation of information literacy in South African students	SAJLIS	1997	10
6	D Yumba	Internet in the library: potentials	AJLAIS	1997	9
6	E Camble	The information environment of rural development workers in Borno State, Nigeria	AJLAIS	1994	9
6	J Chisenga	Indigenous knowledge: Africa's opportunity to contribute to global information content	SAJLIS	2002	9
6	ME Ojo-Igbinoba	The potentials of Internet for library services in Nigeria	AJLAIS	1997	9
7	PJ Lor	Legal deposit: some issues in the international scene	Mousaion	1999	8
7	RJ Page-Shipp, MMP Hammes, H Pienaar, F Reagon, G ...	e-Research support services: responding to a challenge facing the South African research and ...	SAJIM	2005	8
8	AM Kaniki, MEK Mphahlele	Indigenous knowledge for the benefit of all: can knowledge management principles be used effectively ...	SAJLIS	2002	7
8	F Fairer-Wessels, MP Machel	The development of alternative information services for the black community in South Africa	Mousaion	1993	7
8	K De Jager, M Nassimbeni	An exploration of the current status of information literacy tuition in South African tertiary ...	SAJLIS	2003	7
8	P Sturges, G Chimseu	Information repackaging in Malawi	AJLAIS	1996	7

### Performance of each Journal according to different measurement indicators

This section focuses on the number of years of production, papers per year, cites per year, h-index and g-index (columns 4 to 6 in Table 6). The years of productivity for each journal (see column 4) were computed using PoP software, beginning from the year in which the journal published at least one article within the period under review, i.e. between and including 1991 and 2007. For instance, although

*SAJLIS* is 74 years old, the software returns a 'years' value of 17, meaning that since (but excluding) 1991, the journal has been in production for 17 years. The software starts counting the number of years from 1992 because that was the year in which the journal published (at least one article) for the first time in the 1991-2007 year period. This explains why *NLISR* recorded a value of 18 despite not publishing any articles between 2003 and 2007.

**Table 6: Performance of LIS journals by various indicators, ranked by the *h*-index**

	Papers	Cites	Years of Production	Papers/Year	Cites/Year	Cites/paper	<i>h</i> -index	<i>g</i> -index
AJLAIS	210	328	18	11.67	18.22	1.56	9	10
SAJLIS	312	172	17	18.35	10.12	0.55	6	7
INNOVATION	93	73	16	5.81	4.56	0.78	5	6
MOUSAION	208	158	18	11.56	8.78	0.76	4	6
SAJIM	150	110	10	15.00	11.00	0.73	4	6
INDILINGA	141	54	7	20.14	7.71	0.38	3	3
NL	49	49	18	2.72	2.72	1.00	3	3
ESARBICA	80	35	16	5.00	2.19	0.44	2	3
NLISR	9	20	18	0.50	1.11	2.22	2	3
JLISA	9	9	8	1.13	1.13	1.00	2	2
LLIB	7	9	15	0.47	0.60	1.29	2	2
SAAJ	19	8	14	1.36	0.57	0.42	2	2
UDSLJ	84	10	7	12.00	1.43	0.12	1	2
LJLIS	56	8	7	8.00	1.14	0.14	1	1

The Table reveals that the least number of years of production between 1991 and 2007 was 7, while the highest number was 18. The number of papers per year ranged from 0.47 to 20.14. *Indilinga* (20.14) recorded the highest number of papers per year, followed by *SAJLIS* (18.35), *SAJIM* (15), *AJLAIS* (11.67), *Mousaion* (11.56) and *UDSLJ* (12). The lowest number in terms of citations per year per journal was 0.57, recorded by *SAAJ*, while the highest number (i.e. 18.22) was recorded by *AJLAIS*. Other journals that yielded high values in relation to citations per year were as follows: *SAJLIS* (10.12), *Mousaion* (8.78), and *Indilinga* (7.71). In terms of the number

of citations per paper per journal, *NLISR* was leading with 2.22, followed by *AJLAIS* (1.56) and *LLIB* (1.29). The *h*-index ranged from 1 to 9, whilst the lowest and highest integer for the *g*-index was 1 and 10 respectively.

#### Rank Distribution of sub-Saharan African LIS Journals

Table 7 provides the information on how each journal was ranked according to various indicators. For example, *AJLAIS* was ranked 2nd in terms of the total number of papers (see column 1). Table is derived from Table 6.

**Table 7: Rank distribution of LIS journals**

Journal	Papers	Cites	Papers/Year	Cites/year	Cites/Paper	<i>h</i> -index	<i>g</i> -index	Overall Ranking
AJLAIS	2	1	5	1	2	1	1	1
SAJLIS	1	2	2	3	8	2	2	2
SAJIM	4	4	3	2	7	4	3	3
MOUSAION	3	3	6	4	6	4	3	4
INNOVATION	6	5	8	6	5	3	3	5
INDILINGA	5	6	1	5	11	5	4	6
NL	10	7	10	7	4	5	4	7
ESARBICA	8	8	9	8	9	6	4	8
UDSLJ	7	10	4	9	13	7	5	9
NLISR	12	9	13	12	1	6	4	10
JLISA	12	11	12	11	4	6	5	11
LJLIS	9	12	7	10	12	7	6	12
LLIB	13	11	14	13	3	6	5	13
SAAJ	11	12	11	14	10	6	5	14

It was found that, overall, *AJLAIS* was the best ranked journal, followed by *SAJLIS*, *SAJIM*, *Mousaion*, *Innovation*, *Indilinga*, *NL* and *ESARBICA*. *AJLAIS* was ranked 2nd in terms of the total number of papers and topped the list in terms of the total number of citations. The *SAJLIS* journal was ranked first in terms of papers and second in terms of the total number of citations, papers per year, h-index and g-index. Notably, no one journal was ranked the same across all the measurement indicators.

### Journal Impact Factors (IFs)

This section provides the IFs of journals that published documents in 2005 or 2006 since these years provided the denominator upon which the IFs were calculated. Only 9 of the 14 journals published at least one record in 2005 and/or 2006. Table 8 also

**Table 8: Journal IF of sub-Saharan LIS Journals**

	CIT (2007,2006) [a]	CIT (2007, 2005) [b]	PUB (2006) [x]	PUB (2005) [y]	Total Cites [a + b]	Total Publications [x + y]	IF [a+b]/ [x+y]
SAJLIS	9	17	68	54	26	122	0.21
INNOVATION	5	1	15	15	6	30	0.20
MOUSAION	0	4	14	9	4	23	0.17
SAJIM	2	4	19	22	6	41	0.15
AJLAIS	0	4	16	18	4	34	0.12
ESARBICA	0	2	10	10	2	20	0.10
LJLIS	0	1	0	10	1	10	0.10
INDILINGA	0	5	10	46	5	56	0.09
UDSLJ	0	0	8	18	0	26	0.00

shows how the IF for each journal was computed. At the top of the table is *SAJLIS* with a total of 122 records in 2005 and 2006 and a total of 26 citations in 2007, thereby recording an IF of 0.21; followed by *Innovation* (0.20), *Mousaion* (0.17), *SAJIM* (0.15), *AJLAIS* (0.12), *ESARBICA* (0.10) and *LJLIS* (0.10).

In comparison, the top ISI-indexed LIS journals produced relatively high impact factors within the same time frame. The top ranked journal (i.e. *MIS QUARTERLY*) recorded an IF of 5.826, followed by *J AM MED INFORM ASSN* (3.094), *INFORM SYST RES* (2.682), *ANNU REV INFORM SCI* (1.963), *J MANAGE INFORM SYST* (1.867) and *J HEALTH COMMUN* (1.836). At the bottom of the list of ISI's 56 LIS journals are journals that can

be said to compare with sub-Saharan African journals. These include *ECONTENT* (0.196), *REF USER SERV Q* (0.175), *PROGRAM-ELECTRON LIB* (0.111) and *Z BIBL BIBL* (0.000) (Source: 2007 JCR Social Science Edition - Online)

### Discussion

The findings of this study reveal that the publication of LIS journals is a relatively recent practice in sub-Saharan Africa compared to LIS journals in the developed countries. Table 1 shows that only three countries publish at least one LIS journal in sub-Saharan Africa with citations in Google Scholar. Nigeria and South Africa account for almost all.

Focusing on South Africa, the *South African Journal of Libraries and Information Science* is the oldest, having started its publication in 1933. Since then, a total of 14 journals have been published, with

*Indilinga* being the latest to start in 2002. The situation is unlike in other disciplines, such as medicine and public health, which have witnessed a tremendous growth in the number of journals in South Africa (Mouton, Boshoff and Tijssen, 2006; Onyanacha, 2008). Table 1 also shows that most of the South African journals were started in the second half of the 20th century, and few have been introduced in the 21st century. This situation may be having a negative impact on the publication of LIS research on the continent.

An examination into the number of publications per journal indicates that there are about five core LIS journals in which LIS researchers publish their research findings in sub-Saharan African countries,

namely: *SAJLIS*, *AJLAIS*, *Mousaion*, *SAJIM* and *Indlinga*. These journals published a combined total of 1017 articles, which constitutes 71% of the 1423 records published by the 14 journals. Citation-wise, core journals (i.e. the most consulted journals by researchers) include *AJLAIS*, *SAJLIS*, *Mousaion* and *SAJIM*.

An analysis of the journals' performance according to the citation impact factor reveals a relatively strong input from *SAJLIS*, *Innovation* and *Mousaion*. The three journals recorded higher IFs than the rest of the journals in the region. Their IF values compared favourably with those of ISI-indexed LIS journals that have the lowest IFs (e.g. *ECONTENT*, *REF USER SERV Q*, *PROGRAM-ELECTRON LIB* and *Z BIBL BIBL*). However, when compared to the high impact journals in ISI (e.g. *MIS QUARTERLY*, *J AM INFORM ASSN*, *INFORM SYST RES*, etc), the journals covered in this study can be said to have low impact factors.

Since impact factors are generally perceived to be measures of quality and/or influence, the low IFs of the sub-Saharan LIS journals may imply low quality on their part. This, however, is not conclusive as IFs are not absolute measures of quality.

It was of concern to note that some of the 14 journals focused upon in this study have not published an issue for close to 5 years. These journals include *LJLIS*, *SAAJ*, *JLISA*, and *NLISR*. Although the Ulrich's Periodical Directory designates these journals as 'active', some of them have actually ceased publication. Also noteworthy is that most of the journals that had ceased publication were being sponsored, owned and/or published by library associations, a situation that leads us to question the LIS associations' ability to sustain the sponsorship, ownership and/or publication of journals in sub-Saharan Africa.

Not only have some of the journals ceased publication, but also others that are still active have had irregular publication patterns. These journals include *SAJLIS*, *Innovation* and *ESARBICA*. The irregular publication of journals can largely be attributed to lack of funding or irregular or late payments for publication on the part of sponsors. In the case of *SAJLIS*, the non-publication of articles in 1999 (see Table 2) was partly due to changes in the management team, sponsors and publisher. The transition temporarily interrupted the publication of

the journal. Murray and Crampton (2007) have explained that scholarly publishing and dissemination in Africa face a number of challenges, some of which include: skills shortages; language barriers; inadequate ICT infrastructure; economic constraints; online publication and maintenance costs, especially in the face of rapid changes in technology; Open Access initiatives; levels of quality and perception; and digital access to African scholarly publications.

## Conclusion and Recommendations

This study has shown that citation data from Google Scholar may be used to evaluate non-ISI indexed journals, in this case sub-Saharan African LIS journals. Whereas the citation information (e.g. number of citations, IFs, etc) would have been difficult to compute using data from the ISI citation databases (as the journals are not indexed in the databases), Google Scholar has made it possible to compare the journals in this study using both publications and citation data. Google Scholar provides a variety of citation statistics that can be used to compare and evaluate different journals otherwise not indexed in any of the ISI's citation indexes. The limitations of Google Scholar, which some scholars have argued are rectifiable, are outlined in Bar Ilan (2008); Harzing (2007); Noruzi (2005); and Onyancha and Ocholla (2008). In view of the findings of this study, the following recommendations are proffered:

- Irregularity and delays in the publication of journals should be addressed by existing journal publishers in Africa because these problems affect the visibility and impact of their affected journals.
- LIS associations and other proprietors that sponsor the publication of LIS journals should ensure that adequate and assured fund is allocated yearly to cater for the publication expenses of the journals. This would facilitate the regular publication of their journals.
- The publishers or sponsors in sub-Saharan Africa should consider joint or co-publication of their journals with foreign-based institution(s)/publishers with similar interests. In this way, journal visibility and impact can be improved.
- In order for African journals to have much wider circulation and thereby increase their visibility

and impact, they should be published online – more so through Open Access (OA) initiatives.

- LIS professionals and associations in other African countries than Nigeria and South Africa should begin to publish LIS journals, as this would allow their researchers to have more avenues to publish research.

## References

- Adusumilli, P.S., Chan, M., Ben-Porat, L., Stiles, B.M. and Fong, Y. (2003). Basic Science Research Publications in General Surgical Journals: Are they obsolete? *Journal of Surgical Research*, 114(2) 258-259.
- Aina, L.O. (2002). African Journal of Library, Archives and Information Science as a Resource Base for Library and Information Science Research in Africa. *African Journal of Library, Archives and Information Science*, 12(2) 167-175.
- Alloro, G., Casilli, C., Taningher, M., and Ugolini, D. (1998). Electronic Biomedical Journals: How they appear and what they offer. *European Journal of Cancer*, 34(3) 290-295.
- Altmann, K.G. & Gorman, G.E. (1998). The Usefulness of Impact Factors in Serial Selection: A Rank and Mean Analysis Using Ecology Journals. *Library Acquisitions: Practice & Theory*, 22(2) 147-159.
- Bar-Ilan, J. (2006). An Ego-centric Analysis of the Works of Michael O. Rabin based on Multiple Citation Indexes. *Information Processing and Management*, 42: 1553-1566.
- Bar-Ilan, J. (2008). Which h-index? – A Comparison of WoS, Scopus and Google Scholar. *Scientometrics*, 74(2):257-271.
- Bar-Ilan, J., Levene, M., & Lin, A. (2007). Some Measures for Comparing Citation Databases. *Journal of Informetrics*, 1: 26-34.
- Black, S. (1999). An Assessment of Social Sciences Coverage by Four Prominent Full-text Online aggregated journal packages. *Library Collections, Acquisitions, and Technical Services*, 23(4) 411-419.
- Charbonneau, L. (2006). Google Scholar Service Matches Thomson ISI Citation Index. *University Affairs: Canada's Magazine of Higher Education*, March 2006. Retrieved 22 July 2008, from [http://www.universityaffairs.ca/issues/2006/march/google\\_scholar\\_01.html](http://www.universityaffairs.ca/issues/2006/march/google_scholar_01.html)
- Coats, A.J.S. (2005). Top of the Charts: Download versus Citations in the International Journal of Cardiology. *International Journal of Cardiology*, 105(2) 123-125
- Costas, R. and Bordons, M. (2008). Is g-index better than h-index? An Exploratory Study at the Individual Level. *Scientometrics*, 1-21.
- Egghe, L. (2006). Theory and Practice of the g-index. *Scientometrics*, 69(1) 131-152.
- Harzing, A-W. (2007). Google Scholar – A New Data Source for Citation Analysis. Retrieved on 22 July 2008, from [http://www.harzing.com/resources.htm#/pop\\_gs.htm](http://www.harzing.com/resources.htm#/pop_gs.htm).
- Hirsch, J.E. (2005). An Index to Quantify an Individual's Scientific Research Output. *PNAS*, 102(46)16569-16572.
- Jamal, T., Smith, B. & Watson, E. (2008). Ranking, Rating and Scoring of Tourism Journals: Interdisciplinary Challenges and Innovations. *Tourism Management*, 29(1) 66-78.
- Jones, A.W. (2007). The Distribution of Forensic Journals, Reflections on Authorship Practices, Peer-Review and Role of the Impact Factor. *Forensic Science International*, 165(2-3)115-128.
- Miguel-Dasit, A., Aleixandre, R., Valderrama, J.C., Martí-Bonmatí, L., & Sanfeliu, P. (2005). Hypothetical influence of Non-indexed Spanish Journals on the Impact Factor of Radiological Journals. *European Journal of Radiology*, 54(3) 321-326.
- Mouton, J., Boshoff, N. and Tijssen, R. (2006). A Comprehensive Analysis of South African Research Journals. In: *Report on a Strategic Approach to Research Publishing in South Africa*. Pretoria: Academy of Science of South Africa. pp 29-60.
- Murray, S. & Crampton, M. (2007). Access to African Published Research: The Complementary approaches of NISC SA and African Journals OnLine. Retrieved 12 February

- 2008, from <http://www.ifla.org/iv/ifla73/index.htm>.
- Noruzi, A. (2005). Google Scholar: The New Generation of Citation Indexes. *LIBRI*, 55(4) 170-180.
- Nwagwu, W.E. (2005) Deficits in the Visibility of African Scientists: Implications for Developing Information and Communication Technology (ICT) Capacity. *World Review of Science, Technology and Sustainable Development*, 2(3/4):244-260.
- Nwagwu, W.E. (2007). Creating Science and Technology Information Databases for Developing and Sustaining Sub-Saharan Africa's Indigenous Knowledge. *Journal of Information Science*, 33: 737-751.
- Ocholla, D.N. and Ocholla, L. (2007). Research in library and information science in South Africa: an analysis of journal research output from 1993-2006. *South African Journal of Libraries and Information Science*, 73(2) 109-118.
- Olalude, F.O. (2007). Utilization of Internet Sources for Research by Information Professionals in Sub-Saharan Africa. *African Journal of Library, Archives and Information Science*, 17(1)53-58.
- Onyancha, O.B. (2007). LIS Research in Africa: How much is it Worth? A Citation Analysis of the Literature, 1986-2006. *South African Journal of Libraries and Information Science*, 73(2) 95-108.
- Onyancha, O.B. (2008). Growth, Productivity, and Scientific Impact of Sources of HIV/AIDS Research in Eastern and Southern Africa, 1980-2005. *African Journal of AIDS Research*, 7(1)55-70.
- Onyancha, O.B. and Ocholla, D.N. (2008). Assessing Researchers' Performance in Developing Countries: As Google Scholar an alternative? In P.A. van Brakel (ed). *Proceedings of the 10<sup>th</sup> Annual Conference on World Wide Web Applications*, 3-5 September 2008. Cape Town: Cape Peninsula University of Technology.
- Pauly, D. & Stergiou, K.I. (2005). Equivalence of Results from Two Citation Analyses: Thomson ISI's Citation Index and Google's Scholar Service. *Ethics in Science and Environmental Politics*, 33-35.
- Rousseau, R. (2002). Journal Evaluation: Technical and Practical Issues. *Library Trends*, 50(3) 418-439
- The STIMULATE 4 Group (2005). Impact of African Journals in ISI Databases. *LIBRES*, 15(2) Retrieved 4 August 2008, from, <http://libres.curtin.edu.au/libres15n2/>.
- Thomson Reuters. (2009). The Thomson Scientific Impact Factor. Retrieved 12 February 2009, from [http://www.thomsonreuters.com/business\\_units/scientific/free/Essays/impactfactor](http://www.thomsonreuters.com/business_units/scientific/free/Essays/impactfactor).
- Togia, A. & Tsigilis, N. (2006). Impact Factor and Education Journals: A Critical Examination and Analysis. *International Journal of Educational Research*, 45(6) 362-379.
- Tsay, M. (2006). Journal Self-citation Study for Semiconductor Literature: Synchronous and Diachronous Approach. *Information Processing & Management*, 42(6) 1567-77.
- World Bank. (2008). Data and Statistics. Retrieved 5 February 2009, from <http://web.worldbank.org>.
- Yang, K. & Meho, L.I. (2006). Citation Analysis: A Comparison of Google, Scopus, and Web of Science. In 69th Annual Meeting of the *American Society for Information Science and Technology (ASIST)*, Austin (US), 3-8 November 2006. [Conference paper]. Retrieved 5 February 2009, from, <http://eprints.rclis.org/8121/>.

## Appendix

The h-index was proposed by JE Hirsch in 2005 as a "useful index to characterise the scientific output of a researcher" (Hirsch, 2005:16569). Hirsch (2005:16569) defined it as follows:

"A scientist has index  $h$  if  $h$  of his or her  $N_p$  papers have at least  $h$  citations each and the other  $(N_p - h)$  papers have  $\leq h$  citations each".

Bar-Ilan (2008:262) outlines several studies that have made use of the h-index in the analysis of the productivity and influence of journals (e.g. Braun &

AL. 2005, 2006; Rousseau, 2006; Schubert & Glanzel, 2006; and Miller, 2006).

The g-index was introduced by Leo Egghe in 2006 as an improvement on the h-index and was aimed at “giving more weight to highly-cited articles”. Egghe (2006:131) defines it as follows:

*“If [a set of articles] is ranked in decreasing order of the number of citations that they received, the g-index is the (unique) largest number such that the top articles received (together) at least  $g^2$  citations”.*

**\*Dr. Omwoyo Bosire Onyancha** holds a doctorate degree from the University of Zululand, South Africa. He is currently senior lecturer at the Department of Information Science, University of

South while on a leave of absence from the University of Eastern Africa, Baraton, Kenya, where he is the deputy librarian. His areas of research interest include informetrics, information resource management, management of information services, knowledge management, information searching and retrieval, informatics, and research evaluation.

