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# Library and information science research in BRICS countries

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## Abstract

**Purpose** – This paper aims to highlight the research output of library and information science of the BRICS (Brazil, Russia, India, China and South Africa) nations during the ten year period, i.e. 2005-2014, as reflected through the Web of Science database.

**Design/methodology/approach** – This study used Social Science Index (SSCI) of Web of Science (WoS) citation database to collect data for the ten year period. All records indexed in SSCI were refined by subject area of "Information Science and Library Science" and selected countries. The downloaded results were analyzed by using specific parameters.

**Findings** – WoS indexes different kinds of documents, such as articles, conference proceedings, biographical items, book reviews, corrections, editorial material, letters, reprints and reviews. Out of the BRICS output, almost 90 per cent of papers were articles. Other types of documents included conference papers, review papers and book reviews. China contributed nearly half of the documents followed by Brazil, South Africa, India and Russia. On an average, a document had cited 34 references. More than one-third of records did not receive any citations. It has been observed that the titles that had 11-16 words attracted the most number of citations. The top ten publishers in whose journals the researchers published included Emerald, Elsevier and Springer. The primary subject areas were information science and library science, information systems, interdisciplinary applications and management. About 85 per cent of the documents were published in English. Around 93 per cent of the non-English research publications were in Portuguese, the official language of Brazil.

**Originality/value** – There are not many studies on BRICS countries and that too about Library and Information Science (LIS) research output. This study may reveal insights into how LIS researchers interact with local and global issues in a specific spectrum of the world community.

**Keywords** China, Research, Information science, Russia, Bibliometrics, Library research, BRICS, Library science

**Paper type** Research paper

## Introduction

BRICS is an association of five major emerging economies, which are Brazil, Russia, India, China and South Africa. The association was earlier known as "BRIC" before the inclusion of South Africa in 2010. The BRICS members are all developing countries (DCs), but they are characterised by their large, fast-growing economies and they exert a significant influence

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on regional and global affairs and are taking renewed interest in research and development activities. BRICS brings together five major emerging economies, comprising 43 per cent of the world population, having 30 per cent of the world GDP and 17 per cent share in the world trade (BRICS, 2016).

The acronym BRIC was first used in 2001 by Goldman Sachs in their Global Economics Paper, "The World Needs Better Economic BRICs" on the basis of econometric analyses projecting that the economies of Brazil, Russia, India and China would individually and collectively occupy far greater economic space, and would be amongst the world's largest economies in the next 50 years or so (BRICS, 2016). Brazil, Russia, India, China and South Africa are all developing their way to provide better academic and research environment in their countries. What they have in common is their slow realization to turn research as a driver of economic and societal development, as a way to enhance the quality, impact and access to scientific solutions and technology products for improving the lives of their citizens. Bornmann *et al.* (2015) studied the publications of BRICS in scientific journals and compared them with other highly ranked nations of the world regarding a number of citations and collaboration among the researchers between 1990 and 2010. They highlighted that the BRICS, except Russia, produced more frequently cited papers than the top cited nations of the world.

Given the above, this paper has attempted to study the research output in the field of library and information science in the BRICS countries. This paper has examined the research activity in the library and information science and characterized its most important aspects. It has covered the bibliometric analyses of the year-wise distribution of articles, category-wise classification of papers, subject-wise categorisation of articles, authorship patterns, etc.

## Library and information science in BRICS countries

Volodin (2000) depicted the development of library and information science as a social science from "history of Librarianship" when it was also known as library history or information history. It had significant influence of "Marxist dialectical" and "historical materialism". The subject was not connected to the world science community in the initial phase of its existence.

Ocholla *et al.* (2015) detailed about 38 undergraduate library schools to educate the professional librarians and 13 graduate information science schools devoted to produce professors and researchers in information science in Brazil. Ferreira and Dudziak (2013) mentioned that there are currently 43 librarianship courses in Brazil (70 per cent) linked to public (state and federal) universities, the southeast region holding 45 per cent of them, followed by the south region, with 10 per cent. There are currently 15 graduate programs, at masters' and doctoral levels, in nine Brazilian states (Ferreira and Dudziak, 2013). There were 31 schools that offered Library and Information Science (LIS) programmes in 1985 in Brazil. In 1995, there were 13 schools that offered LIS programmes; the literature did not mention anything about the remaining 18 schools (Fang *et al.*, 1985; Maris and Giunti, 1999; Rodríguez Gallardo, 2007). Khayundi (2011) highlighted that the professionals did not have adequate education and training in Archival Sciences. In 1990s, archival science courses were started at five different universities. The National Archive and the Association of Brazilian Archivists had contributed remarkably in developing archival sciences as a subject in Brazil. Rodrigues and da Cunha Marques (2008) reported how archival science has evolved and emerged as an essential discipline. The universities in Brazil are offering research and training programmes in archival science at undergraduate and graduate levels.

The graduate levels include master's level and doctoral programmes and last for two and four years, respectively.

There are 26 institutions of higher education in Russia, providing training in LIS including state universities and higher specialized institutions of culture (Donchenko and Kerzum, 2006). Russian libraries hold unique collections but in most cases the development of electronic databases is not yet sufficient and they lack a modern information system for providing efficient access to their collections hindering their access to the outside world (Lahiri, 2001). Donchenko and Kerzum (2006) discussed implementation of the new State Standard aimed at training specialists dealing with both traditional and electronic information resources for the qualification of library and information science, which has replaced the previous professional Library Science and Bibliography Consulting. The Saint-Petersburg State University of Culture and Arts is a distinguished university among the three top institutions of higher education, which trains highly qualified specialists in library and information science (Donchenko and Kerzum, 2006). Richardson (1998) discussed about LIS education in this vital Russian institution. Lahiri (2001) opined to enable the Russian libraries to engage in various bibliographic activities in local, regional, national and international arenas, and to formulate the plan for modernization of library work, it is necessary to consolidate the intellectual and the financial resources as well as expert knowledge in the field of modern information technology.

In India, LIS education was initiated in 1915 under the patronage of Maharaja of Baroda, when he set up a public library in the state of Baroda. After the country gained independence, library associations made efforts to impart LIS education across the country. LIS education flourished under the tutelage of Dr S.R. Ranganathan, whose many theories and philosophies are still taught across the globe. He started doctoral programme, which was first of its kind, in the University of Delhi in 1951. The first PhD degree was awarded in 1957; the second was awarded after a gap of 20 years in 1977 at LIS department of Panjab University, Chandigarh. Ever since then, LIS departments in many universities have come up. As far as universities are concerned, 131 are offering bachelor's degree course, 136 are offering master's degree course out of which 41 are offering two-year integrated course and 93 (including 10 distance education universities) are offering PhD degree (Singh and Babbar, 2014). The experts have also observed that there has been deterioration in the quality of education and research in LIS in India. The standard of PhDs submitted in LIS leaves much to be desired. The PhD degree has been made mandatory for upward mobility. More library professionals are undertaking doctoral programmes, though they may not necessarily have research aptitude (Satija, 2010). The rampant growth of LIS departments in the country has led to the deterioration of LIS education and research in the country (Kumar and Sharma, 2010). Pradhan (2014) also evaluated the status of LIS education offered by 33 universities across the country. The study has highlighted that there is a shortage of teaching staff and has recommended that more ICT-based courses should be offered. Singh and Babbar (2014) studied the 1,754 PhDs from 1957 to 2012, which were awarded by 81 LIS departments located in 22 states of the country. They reported that bibliometrics, scientometrics and webometrics attracted the most number of researchers; topics such as library personnel, information-seeking behaviour and services were also prevalent among the researchers. IT applications in libraries, networks and connectivity are emerging areas of research in LIS in India. The states of Karnataka, Maharashtra, Madhya Pradesh, Tamil Nadu and Andhra Pradesh together contributed 53.3 per cent of the total research output. Garg and Sharma (2017) studied the research output in LIS during 2000-2015, and found that the growth was very consistent throughout the period; the researchers mainly focused on bibliometrics and scientometrics.

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In China, there are 70 LIS credential programmes for imparting education at the graduate level and 11 universities offer programmes at the doctoral level. Xiao *et al.* (2015) evaluated 10 LIS educational institutes of China regarding research output. They found that there has been no balanced development in LIS educational institutions. The researchers focused more on theoretical research than on technical research. The topic of network technology was much actively pursued by the researchers. Cheng (1996) studied the trends that prevailed in LIS in China during 1985-1994. The history of LIS research in China could be divided into six periods: the embryonic period, 1900-1924; the rising period, 1925-37; the period of decline, 1938-1949; period of transformation, 1950-1965; period of suspension, 1966-1978; and Golden period, 1979. This golden period can also be divided into three phases: recovery phase, 1979-1985; flourishing phase, 1986-1990; and phase of further development, 1991 to date. The researchers elaborated upon the basic theory of LIS. They used the historical method in their research pursuits. The research focused on theory unlike the focus of the world, which was on practices followed in libraries. Library automation was one of the neglected areas.

South Africa has 25 public universities, 12 of which have LIS schools or information/library schools with different names (Ocholla *et al.*, 2015). LIS education and training in South Africa is not always offered within academic departments but in some cases is offered as programmes within a school (e.g. the University of KwaZulu Natal) or as a sub-programme within a larger academic programme (e.g. the erstwhile Technikon South Africa) (Raju, 2005). Walker (2006) highlighted different events and developments from 1929 to 2005 in South Africa, which unfolded and led to the emergence of LIS association. Ocholla and Bothma (2007) reported the status of LIS education and training in eastern and southern Africa. The LIS schools in these regions have adapted themselves following the needs of the market. They have launched new programmes, courses, redesigned curricula, changed their names and realigned themselves within the universities to keep themselves relevant and meaningful in the fast-evolving information landscape. Baro (2010) studied 45 library schools located in Africa and focused on 20 institutions, which offered digital library courses and suggested that the courses of digital libraries and information literacy should be offered as stand-alone courses in LIS schools. Onyancha and Minishi-Majanja (2009) reported that the researchers mainly pursued the subject areas of IT, information resource management, knowledge management, library science, the internet, and information retrieval. Onyancha *et al.* (2015) reported that there is a need for research in the field of archives and records management to respond to the needs and expectations of the changing needs of the society in Sub-Saharan Africa. The authors advocated that the LIS students should be given education and training in archival sciences. Ngoepe *et al.* (2014) also emphasised the importance of records management in government institutions in South Africa, which necessitates capacity building, education and training in the field of archives and record management. Davis (2015) cautioned that the western model of librarianship should not be blindly adopted in Africa. The author reminded the world acclaimed libraries of Ashurbanipal and Alexandria and asserted that the discipline of library science was well developed and well documented in Africa well before colonialism.

**Objectives of the study**
The objectives of the study are:

- to find out the research output of the library and information scientists of BRICS countries;
- to find out the different types of documents which the library and information scientists have published;

- to study the pattern of authorship of the documents;
- to find out the core journals and their impact factor in which the library scientists have published;
- to discover the emerging trends in the field of library and information science;
- to analyse the contents of the papers through keywords/descriptors;
- to highlight the different languages in which the library scientists have published; and
- to study the citations received by the published papers.

## Method of study

The authors thought about using Scopus as a target database but avoided later due to their interest in identifying the best research in the field as the first study, as Web of Science is more selective in covering journals in comparison to the former. Web of Science is a citation database, which provides authoritative, multidisciplinary coverage from more than 12,000 high impact research journals from across the world. It also includes content from open access journals. The data from Web of Science is being used by 7,000+ institutions for scientific policymaking across the world. The study has been initiated past year and to give leverage to time involved in getting citations, data for a 10-year period backwards from 2014 were considered. As explained in the later part of the paper regarding language, the English bias of Web of Science (WoS) is not a major constraint for this study, as English is the preferred language of LIS research in at least three countries of BRICS, China, India and South Africa, as evidenced by more number of publications in English than in local languages.

We followed the following steps for extracting data from WoS:

In Basic Search, "2005-2014" was entered and "year published" option was selected. In the setting, Social Science Citation Index (SSCI) was chosen.

As a result, of the above query, all records indexed in SSCI were shown, which were further refined by subject area of "Information Science and Library Science". It generated a list of 84,533 records. The results mentioned above were further refined by countries (BRICS) which resulted in 3,667 records.

The results were downloaded in a batch of 500 records (only a maximum of 500 records can be downloaded at any one time from Web of Science) and saved as Excel files for further evaluation and analysis. The downloaded results were analysed using the following parameters:

- total number of publications and their types;
- number of authors;
- average number of authors per article;
- cited reference count, average number of references per article;
- number of citations received by the publications, average citation per publication;
- journal subject category and journal rank; and
- research interests as reflected through Keyword Plus.

We used Tagxedo to create a visual cloud of keywords. Tagxedo (www.tagxedo.com/) is freely available software which turns keywords which represent content or themes of the publications in to word cloud. Word clouds present prominently the words that occur very

frequently in the source texts. The words that are shown in the clouds are scaled by their frequency of occurrence.

*Time period*
The time period for this study is from 2005 to 2014. The data were collected in the last week of December 2015 to account for cases of delayed publication of source journals and their coverage in WoS.

## Review of research in library science

The subject of library science interalia focuses on providing numerous innovative services to the researchers of the other areas. Besides it in itself involves low-cost research with no or minimal demands for physical and computing infrastructure. The library scientists or professionals play an imperative role in the process of scholarly communication and in any country's vision of transforming it into a knowledge society. Library science also plays a pivotal role in supporting Millennium Development Goals. The research in LIS, if the findings are implemented, may yield better dividends by promoting and improving research activities in other fields through innovative services. It has also been observed that LIS also receives considerable contributions and citations from other fields such as management, business and psychology.

Aharony (2012) observed that the top contributing regions are North America, Europe and Asia and the contributors from South America, Africa and Australia contributed minimally. The papers in LIS are less in number as compared to the other subjects because LIS courses and programmes are not offered in all the universities.

Davarpanah and Aslekia (2008) analysed 56 LIS journals indexed in SSCI during 2000-2004. Their study highlighted that 70 per cent of the publications were from the USA and the UK, and on an average, each publication had 1.6 citations. Erfanmanesh *et al.* (2010) studied the scientific productivity of the LIS researchers by analysing 99,789 documents, published in 61 LIS journals in 1998-2007, indexed in WoS. The study highlighted that each LIS publication on an average received 0.27 citations and 40 per cent of all the citations were from the USA and 60 per cent of the papers were published in *Library Journal*.

Hessey and Willett (2013) studied how the subject of library and information science has exported knowledge to other disciplines. They have reviewed citations to 232 high-quality LIS publications and found that there were 1,061 papers from non-library science field, which cited that 232 LIS publications had Impact Factor above the average in their subject category. It also highlighted that the LIS papers are referred to and cited in non-LIS journals. Aharony (2012) analysed research journal publications in the top ten library and information science journals published during 2007-2008. Her study highlighted that the trend to collaborate was on the rise. The researchers from North America and Europe were the top contributors. She also noticed that the researchers actively pursued the subareas of IT, research methodology and information science.

The studies have analysed the different types of highly cited publications, such as journal papers, conference papers, websites and theses. It has also been studied and established that the subject of library science is closely associated with other fields such as business, management, computer science, education, communication and psychology (Sugimoto, 2011).

Kumar and Asheulova (2011) compared the scientific output of BRIC countries with the USA in terms of publications. They have reported that China and India are likely to lead in the publications of scientific papers in the years to come.

This paper takes in to consideration five countries to study their contributions in the field of LIS. The study hopes that given the qualitative and quantitative similarities as well as differences of these countries over a geographic spread among different continents would reveal interesting inferences about new areas of interest in a continuously evolving discipline.

## Data collection and analysis

WoS reflects that there were 84,533 publications in the field of library and information science from all over the globe. Out of this, BRICS countries contributed 3,667 (4.34 per cent) papers. Though the world output remains more or less the same, there is a consistent increase in the BRICS output from less than 2 per cent to over 6 per cent. This is presented in the Table I given below.

China contributed 1,764 (48.10 per cent) papers of the total during the past 10 years, 2005-2014. It was followed by Brazil and South Africa with 800 (21.82 per cent) and 605 (16.50 per cent) contributions, respectively, of the total. India was at the fourth rank in the group with 437 (11.92 per cent) contributions followed by Russia with 61 (1.66 per cent) publications. The breakdown of the contributions country wise is shown in the Figure 1 given below.

The relation between the national population and publications in LIS is moderately positively correlated (0.55) in this study.

Uzun (2002) analysed 21 core journals in LIS to find out the contributions from the DCs and East European Countries (EECs). The study highlighted that only 7.9 per cent of the 10,400 articles were from DC or EECs. It also showed that there were more articles published from China than from India and Brazil. The issues that concern LIS researchers and

| Year | World output | BRICS share | (%) |
|---|---|---|---|
| 2005 | 8,579 | 136 | 1.59 |
| 2006 | 8,651 | 191 | 2.21 |
| 2007 | 8,597 | 182 | 2.12 |
| 2008 | 8,471 | 325 | 3.84 |
| 2009 | 7,650 | 392 | 5.12 |
| 2010 | 8,513 | 374 | 4.39 |
| 2011 | 8,650 | 438 | 5.06 |
| 2012 | 8,105 | 513 | 6.33 |
| 2013 | 8,610 | 527 | 6.12 |
| 2014 | 8,707 | 589 | 6.76 |
| Total | 84,533 | 3,667 | 4.34 |

Table I.
World output and
BRICS output of LIS
research as per WoS



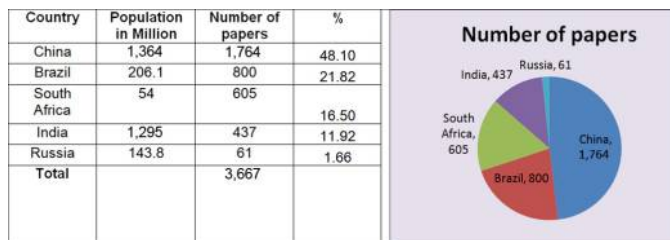| Country | Population in Million | Number of papers | % |
|---|---|---|---|
| China | 1,364 | 1,764 | 48.10 |
| Brazil | 206.1 | 800 | 21.82 |
| South Africa | 54 | 605 | 16.50 |
| India | 1,295 | 437 | 11.92 |
| Russia | 143.8 | 61 | 1.66 |
| Total | | 3,667 | |

Figure 1.
Research output of
BRICS countries

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practitioners of non-western countries may differ from the issues of the faculty members of North America, UK and Europe. Walters and Wilder (2015) studied the contributions of particular disciplines, countries and academic departments to the LIS literature using data published in 51 journals published from 2007 to 2012. Their study has identified different types of journals like LIS core journals, journals oriented towards practice, computer science or management and other LIS journals.

*Types of documents in which the library and information scientists published*
WoS indexes different kinds of documents, such as articles, conference proceedings, biographical items, book reviews, corrections, editorial material, letters, reprints and reviews. The researchers have taken in to consideration the following types of documents: journal articles, reviews, book reviews and conference papers. During 2005-2014, 3,224 (87.92 per cent) articles, 73 (1.99 per cent) conference papers, 317 (8.65 per cent) book reviews and 53 (1.45 per cent) reviews were published in library and information science. This is shown in Table II. Table III shows the output of BRICS countries vis-a-vis the total global output.

Sugimoto (2011) observed that equal importance should be given to the different types of publications through which the researchers communicate. Analyses of citations and references of journal articles may generate erroneous results and prevent clear understanding of interrelationships of various disciplines. The study analysed 15,870 references from 97 LIS dissertations to show the importance of different genre across disciplines, which also impacts author rankings.

*Number of references cited in the documents*
There were in total 122,880 references that were cited during the reported period. There were 18 publications that had no references; 310, 17 and 15 publications had one, two and three references, respectively, whereas 90 publications had 100 or more references (100-231). It implies that 3,649 documents had 122,880 references, i.e. on an average, a document had cited 34 previous sources.

| Type of document | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Article | 106 | 148 | 130 | 269 | 337 | 330 | 395 | 464 | 485 | 560 | 3224 |
| Conference paper | 8 | 10 | 7 | 12 | 10 | 7 | 0 | 15 | 2 | 2 | 73 |
| Book review | 20 | 32 | 42 | 37 | 42 | 35 | 37 | 29 | 25 | 18 | 317 |
| Review | 2 | 1 | 3 | 7 | 3 | 2 | 6 | 5 | 15 | 9 | 53 |
| Total | 136 | 191 | 182 | 325 | 392 | 374 | 438 | 513 | 527 | 589 | 3,667 |

**Table II.**
Types of documents in which the researchers published

| Type of document | World output | BRICS share | (%) |
|---|---|---|---|
| Articles | 30,922 | 3,224 | 10.43 |
| Proceeding papers | 1,045 | 73 | 6.99 |
| Book reviews | 51,699 | 317 | 0.61 |
| Reviews | 867 | 53 | 6.11 |
| Total | 84,533 | 3,667 | 4.34 |

**Table III.**
Share of BRICS output

*Number of citations received by published documents*
Out of the total 3,667 documents published, 1,306 did not receive any citation; the remaining
2,361 documents received 21,928 citations. There were 14 documents that attracted 3,151
citations. On an average, a document received nine citations. Table IV shows the list of 14
publications that accrued more than 100 citations. Table IV shows that the three reviews,
ten articles and one conference paper had attracted 1,083 (34.37 per cent), 1,947 (61.79
per cent) and 121 (4 per cent) citations, respectively.

After 1994, Journal Citation Reports (JCR) dropped many journals that dealt with the
profession of librarianship and replaced those with the journals that focus on empirical

| Title | Year of publication, country, type of document | Journal | NY | Citations |
| --- | --- | --- | --- | --- |
| Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology | 2012, China, Article | *MIS Quarterly* | 3 | 216 |
| Social network, social trust and shared goals in organizational knowledge sharing | 2008, China, Article | *Information & Management* | 7 | 144 |
| Understanding digital inequality: comparing continued use behavioural models of the socio-economically advantaged and disadvantaged | 2008, China, Review | *Mis Quarterly* | 7 | 123 |
| Research approaches to mobile use in the developing world: a review of the literature | 2008, India, Proceedings Paper | *Information Society* | 7 | 121 |
| How habit limits the predictive power of intention: the case of information systems continuance | 2007, China, Review | *Mis Quarterly* | 8 | 222 |
| Migration to open-standard inter organizational systems: network effects, switching costs and path dependency | 2006, China, Article | *Mis Quarterly* | 9 | 130 |
| Is it possible to compare researchers with different scientific interests? | 2006, Brazil, Article | *Scientometrics* | 9 | 191 |
| Understanding the adoption of multipurpose information appliances: the case of mobile data services | 2006, China, Article | *Information Systems Research* | 9 | 154 |
| Science in Brazil. Part 1: a macro-level comparative study | 2006, Brazil, Article | *Scientometrics* | 9 | 137 |
| Acceptance of internet-based learning medium: the role of extrinsic and intrinsic motivation | 2005, China, Article | *Information & Management* | 10 | 187 |
| Web personalization as a persuasion strategy: an elaboration likelihood model perspective | 2005, China, Article | *Information Systems Research* | 10 | 103 |
| Development and validation of an instrument to measure user perceived service quality of information presenting Web portals | 2005, China, Article | *Information & Management* | 10 | 141 |
| Behavioural intention formation in knowledge sharing: examining the roles of extrinsic motivators, social-psychological forces and organizational climate | 2005, China, Review | *Mis Quarterly* | 10 | 738 |
| Contributing knowledge to electronic knowledge repositories: an empirical investigation | 2005, China, Article | *Mis Quarterly* | 10 | 544 |

**Note:** NY = total number of years in which the publications attracted citations

**Table IV.**
Fourteen
publications with
more than 100
citations each

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LIS. The newly added journals attracted more readerships and resulted in citations from other disciplines. The LIS journals, focusing on librarianship did not receive that kind of citations (Odell and Gabbard, 2008).

Wuchty *et al.* (2007) observed that the collaborative research yields better results across all the fields, sciences, engineering, social sciences, arts and humanities. They examined 19.9 and 2.1 million papers and patents, respectively, of five decades to show that the teamwork leads to more production of knowledge across all the fields of scholarship. Collaborative research gets more citations than the research communicated by single authors.

The data (Figure 2) show that the publications by three authors attracted the most number of citations. There were 823 such publications that accrued 6,531 (30.73 per cent) of the total number of citations. But, when the number of authors exceeded three, it did not have any impact on the number of citations.

There were 14 publications that attracted more than 100 citations each. Table IV shows that the list of 14 publications that attracted more than 100 citations.

The above 14 publications received 123-738 citations each within 3-10 years. This is shown in Table IV. Table V shows that among the BRICS nations, China received 75 per cent of the citations, followed by India (9.17 per cent), Brazil (7.83 per cent), South Africa (6.33 per cent) and Russia (1.45 per cent).

It is pertinent to mention here that SSCI does not index books, which are one of the means of carrying research publications in LIS at least in countries like India. Sanderson (2008) and Vaughan and Shaw (2007) observed that all publications should be given equal importance; their exclusion in the analysis may adversely affect the H-index of researchers especially in computer science who actively publish conference papers.



| Number of Authors | Total citations | % |
|---|---|---|
| 1 | 2,110 | 9.93 |
| 2 | 6,028 | 28.36 |
| 3 | 6,531 | 30.73 |
| 4 | 4,051 | 19.06 |
| 5 | 1,437 | 6.76 |
| >5 | 1,096 | 5.16 |
| Total | 21,253 | 100% |
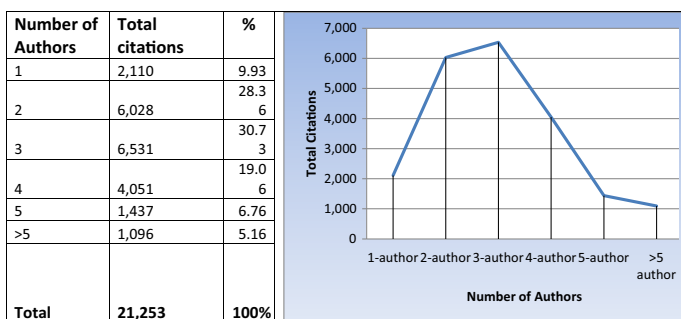
**Figure 2.**
Collaborative research and citations

| Country | Publications without citations (% of total for the country) | Publications with citations (% of total for the country) | Total no. of citations (%) |
|---|---|---|---|
| Brazil | 533 (66.63) | 267 (33.37) | 1,717 (7.83) |
| Russia | 18 (29.51) | 43 (70.49) | 317 (1.45) |
| India | 109 (24.94) | 328 (75.06) | 2,011 (9.17) |
| China | 277 (15.70) | 1,487 (84.30) | 16,494 (75.22) |
| South Africa | 369 (60.99) | 236 (39.01) | 1,389 (6.33) |
| Total | 1,306 | 2,361 | 21,928 |

**Table V.**
Number of citations received by BRICS

*Tile length vs number of citations*

The experts have studied the impact of length (number of words) of titles on the citations, which they get. They have observed that the titles of the articles can be descriptive, declarative or interrogative in nature. Jamali and Nikzad (2011) analysed the impact of titles on the number of citations and download, which they attract. They highlighted that titles that are interrogative in nature are downloaded and cited less. The shorter titles are downloaded more as compared to the longer ones. The titles which bear colon are longer and attract less number of downloads and citations.
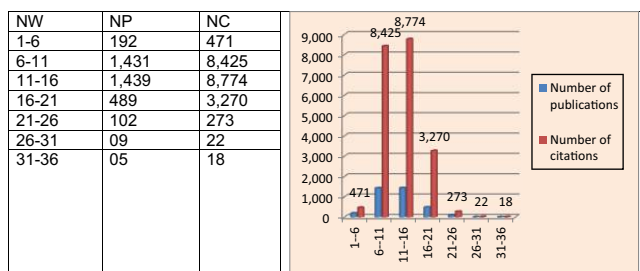
Letchford *et al.* (2015) compared the length of highly cited 140,000 titles with the count of the citations they had received. They observed that the papers that have shorter titles receive more citations as they are easy to understand. Jacques and Sebire (2010) noted that the number of citations is positively correlated with the length of the title, use of colon and acronyms in medical sciences. If a title has reference to a country, it is likely to attract less number of citations.

This study has taken into consideration the number of words in the titles to examine its impact on the citations they received. A total of 3,667 publications had 42,233 words in their titles. We observed that the titles that had 11-16 words attracted the most number of citations. There is almost similar chance for titles having words between 6 and 11. When the number of words exceeded 15, the citations took a downward trend. The same is shown in Figure 3.

*Core journals where researchers published*

The researchers published 3,667 documents in 86 journals. The journal Scientometrics had published 446 (12.16 per cent) publications from the BRICS countries. It was followed by Informacao & Sociedade-Estudos Journal, which attracted 246 (6.71 per cent) papers from BRICS. This journal is published in the Portuguese language from Brazil. The *International Journal of Geographical Information Science*, published by Taylor and Francis, published 203 (5.53 per cent) papers. The *Electronic Library*, published by Emerald, covered 199 (5.43 per cent) articles. Another journal, *Perspectivas Emciencia da Informacao* is an open access journal, published by School of Information Science, University of Minas Gerais, Brazil. It published 189 (5.15 per cent) papers. The list of 26 journals is shown in Table VI.

Ni *et al.* (2013) studied 58 journals categorised under information science and library science category of JCR 2008 and analysed the network proximity by authors, subjects, concepts, artefacts, covered in the journals and expertise areas of the members of the

| NW | NP | NC |
|---|---|---|
| 1-6 | 192 | 471 |
| 6-11 | 1,431 | 8,425 |
| 11-16 | 1,439 | 8,774 |
| 16-21 | 489 | 3,270 |
| 21-26 | 102 | 273 |
| 26-31 | 09 | 22 |
| 31-36 | 05 | 18 |



**Notes:** NW – number of words in the titles; NP – number of publications; NC – number of citations

**Figure 3.**
Words and citations
of publications

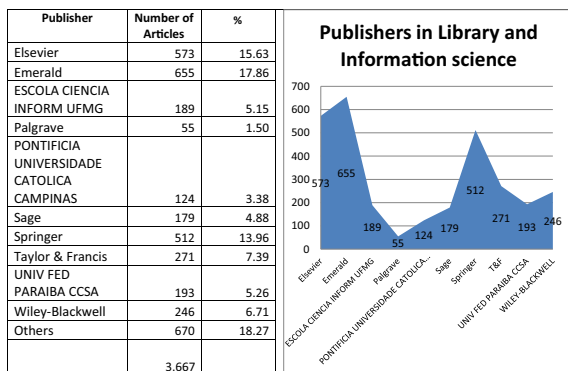| Name of the journal | Documents | (%) |
|---|---|---|
| *Scientometrics* | 446 | 12.16 |
| *Informacao & Sociedade-Estudos* | 246 | 6.71 |
| *International Journal of Geographical Information Science* | 203 | 5.53 |
| *Electronic Library* | 199 | 5.43 |
| *Perspectivas Em Ciencia Da Informacao* | 189 | 5.15 |
| *Journal of the American Society for Information Science and Technology* | 175 | 4.77 |
| *Online Information Review* | 173 | 4.72 |
| *Transinformacao* | 124 | 3.38 |
| *Information Processing & Management* | 112 | 3.05 |
| *Information & Management* | 85 | 2.32 |
| *Journal of Informetrics* | 83 | 2.26 |
| *Library Hi Tech* | 75 | 2.04 |
| *Telecommunications Policy* | 69 | 1.88 |
| *Journal of Information Science* | 64 | 1.74 |
| *International Journal of Information Management* | 60 | 1.64 |
| *Journal of Management Information Systems* | 57 | 1.55 |
| *Information Technology & Management* | 57 | 1.55 |
| *Information Development* | 56 | 1.53 |
| *Program-Electronic Library and Information Systems* | 55 | 1.49 |
| *Information Systems Research* | 55 | 1.49 |
| *Journal of Knowledge Management* | 54 | 1.47 |
| *Libri* | 49 | 1.34 |
| *Journal of Global Information Management* | 43 | 1.17 |
| *Learned Publishing* | 43 | 1.17 |
| *Knowledge Organization* | 42 | 1.14 |
| *Mis Quarterly* | 40 | 1.09 |
| Others (60) | 813 | 22.17 |
| *Total number of titles* | *3,667* | *100* |

**Table VI.**
Core journals of
library and
information science

editorial board. They reported that there was agreement about the core journals of LIS, but significant variations about some journals were also observed. Abrizah *et al.* (2015) categorised 83 journal titles of JCR 2011 into three distinct categories of information science, library science and information system. Of 83, 25 did not clearly fit into any of these categories.

The category of LIS under WoS is not homogeneous. It also includes two subdivisions: computer science: information system category, which includes journals such as *MIS Quarterly*, *Journal of Informetrics* and *Journal of Management Information Systems*. The other category is information system and information systems management. This category includes journals such as *JASIST*, *Information System Research and Information Processing and Management*. WoS does not give adequate coverage to the national and regional journals of LIS. Besides, there are 17 journals listed in LIS in WoS, which are not there in the Z category of LCC. There are many other databases besides WoS, which provide coverage to the LIS literature.

*Publishers in library and information science*
The top ten publishers in whose journals the researchers published their research are given in the Figure 4. Emerald, Elsevier and Springer published 655 (17.86 per cent), 573 (15.63 per cent), 512 (13.96 per cent) publications, respectively.

| Publisher | Number of Articles | % |
|---|---|---|
| Elsevier | 573 | 15.63 |
| Emerald | 655 | 17.86 |
| ESCOLA CIENCIA INFORM UFMG | 189 | 5.15 |
| Palgrave | 55 | 1.50 |
| PONTIFICIA UNIVERSIDADE CATOLICA CAMPINAS | 124 | 3.38 |
| Sage | 179 | 4.88 |
| Springer | 512 | 13.96 |
| Taylor & Francis | 271 | 7.39 |
| UNIV FED PARAIBA CCSA | 193 | 5.26 |
| Wiley-Blackwell | 246 | 6.71 |
| Others | 670 | 18.27 |
| | 3,667 | |



**Publishers in Library and Information science**

**Figure 4.**
Major publishers of
library and
information science

## Major subject areas

The major subject areas were information science and library science, information systems, interdisciplinary applications and management with 1,693 (46.17 per cent), 930 (25.36 per cent), 461 (12.57 per cent) and 413 (11.26 per cent) publications, respectively, during 2005-2014. The other areas of communication; telecommunications (98, 2.67 per cent), medical informatics (26, 0.71 per cent), multidisciplinary and interdisciplinary aspects (20, 0.55 per cent), ethics, philosophy, humanities, history (16, 0.44 per cent), education and educational research (8, 0.22 per cent) and law libraries (2, 0.05 per cent) were also studied and reported upon. The same is shown in Table VII. It is important to mention here that the journals that are categorised under information science and library science category are also classified and counted in other categories. For instance, "computer science-information systems" is not a subdivision of library and information science, but is a separate category, and includes several of the same journals that appear in "information science and library science" category. It has been observed that some journals included in JCR in information science, and library science categories are not central to LIS (Abrizah *et al.*, 2013).

Lin (2012) showed that LIS and technology is the most popular topic in the journal articles, whereas LIS technology and user services have been well discussed in the graduate theses. The researchers have undertaken the government-funded projects on the topics of LIS and technology, IS theory and foundation and user services.

| Subject area | NP | P |
|---|---|---|
| Law libraries | 2 | 0.05 |
| Education and educational research | 8 | 0.22 |
| Ethics, philosophy, humanities, history | 16 | 0.44 |
| Multidisciplinary and interdisciplinary aspects | 20 | 0.55 |
| Medical informatics | 26 | 0.71 |
| Communication; telecommunications | 98 | 2.67 |
| Management | 413 | 11.26 |
| Computer science-interdisciplinary applications | 461 | 12.57 |
| Computer science-information systems | 930 | 25.36 |
| Information science and library science | 1,693 | 46.17 |
| *Total* | *3,667* | *100%* |

**Notes:** NP = number of Publications; P = %

**Table VII.**
Major subject areas
of library and
information science

ILS

*Use of keywords*

Web of Science generates and provides Keyword Plus. They are words and phrases that appear in the titles of the references, which are cited by the authors. Besides, these are the words and phrases that the authors do not use in their article titles and as keywords. We analysed the Keyword Plus to find out the areas on which the researchers focused and worked upon during the 10-year period. Garfield (1990) noted that the statistical analysis of keywords can highlight the emerging and future trends in a field. The keywords highlight the contents of the research interests being pursued. The subject experts provide Keyword Plus, and so they reflect a more comprehensive and exhaustive coverage of themes covered in articles. Keywords also convey precisely the thought content of the literature and are one of the major bibliometric indicators to know and grasp immediately the thought content of the publications. It also depicts the growth of the subject in the field of study and helps in knowing in which direction the knowledge is emerging. Keyword Plus is as effective as Author Keywords in highlighting the structure of subject domains.

There were 13,951 keywords in total, out of which 11,455 (82.11 per cent) were unique in nature. There were 10,266 (89.26 per cent), 718 (6.2 per cent) and 212 (1.85 per cent) keywords which occurred once, twice and thrice, respectively, whereas 259 (2.26 per cent) keywords had occurred 4-26 times. This is shown in Table VIII and Table IX. A large number of the keywords used less than four times indicate that the researchers followed very diverse areas of interest. Li *et al.* (2009) observed in stem cell research that a large number of the keywords used once or twice also show that the researchers do not follow control vocabulary; they use synonymous terms, different spellings, abbreviation and acronyms. This may also be appropriately said for library and information science.

The cloud clusters of 50 most used keywords during 2005-2009 and 2010-2014 are shown below in Figures 5 and 6. The major keywords used during 2005-2009 included libraries, research, management, information, technology and data systems. The major keywords used during 2010-2014 included library, technology, management, knowledge, information, network, analysis, communication and social.

| Year | Total keywords in the year | Unique keywords | (%) |
|---|---|---|---|
| 2005 | 303 | 260 | 85.80 |
| 2006 | 475 | 412 | 86.74 |
| 2007 | 462 | 398 | 86.15 |
| 2008 | 1,110 | 940 | 84.68 |
| 2009 | 1,300 | 1,017 | 78.23 |
| 2010 | 1,425 | 1,118 | 78.46 |
| 2011 | 1,747 | 1,419 | 81.22 |
| 2012 | 2,227 | 1,827 | 82.04 |
| 2013 | 2,291 | 1,913 | 83.51 |
| 2014 | 2,611 | 2,151 | 82.38 |
| Total | 13,951 | 11,455 | 82.11 |

**Table VIII.**
Number of unique keywords plus

| | | | | |
|---|---|---|---|---|
| *Number of unique keywords* | 10,266 | 718 | 212 | 259 |
| *Frequency of keywords* | 1 | 2 | 3 | 4-26 times |

**Table IX.**
Frequency of keywords

**Figure 5.**
Cloud clusters of 50
keywords, 2005-2009



**Figure 6.**
Cloud clusters of 50
keywords, 2010-2014

*Language of communication*
The library and information scientists published and communicated their research
mainly in English. They published 3,095 (84.40 per cent), 532 (14.50 per cent) and
31 (0.84 per cent) documents in English, Portuguese and Spanish, respectively, as
displayed in Table X. So non-English research publications contribute to only
15.60 per cent (around 93 per cent of these are in Portuguese, the official
language of Brazil) in total share. It is well acknowledged that if the researchers

communicate their research findings in English, they are highly likely to get wider readership and gain visibility and recognition at the global level. This is largely the case in India where many local languages exist in which education and teaching even at the university level are conducted. Though there are few journals in local languages, research in LIS is largely reported in the English language. The absence of quality research level resources in local languages adds to the problem. This may be the case in China and South Africa also. English is the international language of the scholarly communication. Besides, it is also important to caution here that Web of Science does not give wider coverage to non-English journals. This has also been observed by Zhi and Ji (2012). It is clearly documented that English language journals and western science were over-represented, whereas small countries, non-western countries and journals published in non-Roman scripts were under-represented (Larsen and von Ins, 2010).

*Pattern of authorship*
There were 15,579 authors who contributed 3,667 publications. On an average, four authors worked per publication. During the period under the study, 893 (24.35 per cent), 1,108 (30.22 per cent), 823 (22.44 per cent), 479 (13.06 per cent), 209 (5.70 per cent) and 155 (4.23 per cent) publications were authored by one, two, three, four, five and more than five authors, respectively. This is shown in Table XI.

The average number of authors has increased substantially since across all the disciplines including LIS (Aharony, 2012; Larivière *et al.*, 2012). The same trend has been observed in the present study.

| Language | No. of records | (%) |
|---|---|---|
| English | *3,095* | 84.40 |
| French | *7* | 0.19 |
| Hungarian | *2* | 0.05 |
| Portuguese | *532* | 14.50 |
| Spanish | *31* | 0.84 |
| *Total* | *3,667* | *100* |

**Table X.**
Languages in which the researchers published

| Year | 1-author | 2-author | 3-author | 4-author | 5 author | >5 author | |
|---|---|---|---|---|---|---|---|
| 2005 | 56 | 40 | 20 | 11 | 7 | 2 | 136 |
| 2006 | 72 | 55 | 33 | 20 | 5 | 6 | 191 |
| 2007 | 64 | 52 | 32 | 20 | 9 | 5 | 182 |
| 2008 | 105 | 119 | 56 | 26 | 9 | 10 | 325 |
| 2009 | 111 | 130 | 75 | 40 | 20 | 16 | 392 |
| 2010 | 94 | 120 | 90 | 44 | 16 | 10 | 374 |
| 2011 | 96 | 128 | 120 | 55 | 27 | 12 | 438 |
| 2012 | 112 | 151 | 110 | 78 | 30 | 32 | 513 |
| 2013 | 104 | 144 | 130 | 79 | 41 | 29 | 527 |
| 2014 | 79 | 169 | 157 | 106 | 45 | 33 | 589 |
| *Total* | *893* | *1,108* | *823* | *479* | *209* | *155* | *3,667* |

**Table XI.**
Pattern of authorship

## Conclusion

WoS covers a highly restricted spectrum of quality journals. Most publications from BRICS countries appear also in journals not covered by WoS. Similar studies covering such journals need to be undertaken to get a balanced and inclusive understanding of research publications from these countries. More studies need to be undertaken by retrieving the data from the indigenous databases and non-English journals of the BRICS nations to get a more accurate and comprehensive picture of the contributions of the LIS researchers. Further research may be undertaken to find out the major collaborating institutions, authors and research groups. There is a need to do trend and level analysis. The methods used in the publications, geographic distributions of the collaborating institutions can be further investigated and spotlighted. The impact of interdisciplinary research also may be unveiled. There is also a need to repeat the study for back years to analyse the changed preferences in subject areas and impact of new technologies in library and information research.

Vaughan and Shaw (2007) searched 1,483 publications in WoS and found that the median number of citations was greater in Google than that found in Google Scholar (GS), which was higher than the median number found in WoS. The study concluded that WoS citation is not a useful measure for comparing average publication in LIS. Meho and Yang (2007) also used Scopus, WoS and GS to locate citations to the publications of 25 LIS faculty members. The number of citations was 35.1 per cent more in Scopus than what was in WoS. The non-journal publications like conference papers also received a considerable number of citations and thus the number of citations for different kinds of publications was higher in GS. It also indexes non-English language journals. This affects the ranking of the researchers in LIS. The use of Scopus and GS, besides WoS, should be used to get a comprehensive picture of the research output in LIS.

This study has attempted to highlight the research output of BRICS countries in the field of library and information science during the 10-year period 2005-2014 from the data available through Web of Science. These countries generated 4.34 per cent of the total output of the world in library and information science as indexed in Web of Science, which has a strong bias to English language publications from English speaking countries itself is proof of the importance they attach to information and library research. This may also be a reflection of the increased importance these countries place to reap information for solving various socio-cultural problems they face due to population growth, illiteracy and poverty. Though three countries of China, India and Russia in the BRICS share borders, there has not been any collaborative research or uniform research interests among researchers in these countries due to language, cultural and political barriers. As far as other two members are concerned, situation is more or less the same. As the grouping is now focusing more on economic and political aspects at present, it remains to be seen how they plan and evolve collaborative research of mutual interest among these countries. Only when that happens, the combined strength of their research gets augmented to create impact, both local as well as global, on a larger scale than what it is at present. Similar studies need to be conducted on other databases such as Scopus and LISA to identify further trends in library and information research in these important countries and vital economies of the third world.

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