



## The Electronic Library

A bibliometric study of literature on digital libraries

Gian Singh, Rekha Mittal, Moin Ahmad,

### Article information:

To cite this document:

Gian Singh, Rekha Mittal, Moin Ahmad, (2007) "A bibliometric study of literature on digital libraries", The Electronic Library, Vol. 25 Issue: 3, pp.342-348, <https://doi.org/10.1108/02640470710754841>

Permanent link to this document:

<https://doi.org/10.1108/02640470710754841>

Downloaded on: 10 May 2018, At: 02:14 (PT)

References: this document contains references to 8 other documents.

To copy this document: [permissions@emeraldinsight.com](mailto:permissions@emeraldinsight.com)

The fulltext of this document has been downloaded 2021 times since 2007\*

### Users who downloaded this article also downloaded:

(2011), "Journal bibliometric analysis: a case study on the Journal of Documentation", Journal of Documentation, Vol. 67 Iss 5 pp. 806-822 <<https://doi.org/10.1108/00220411111164682>><https://doi.org/10.1108/00220411111164682></a>

(2013), "Open source journals of library and information science: a bibliometric study", Collection Building, Vol. 33 Iss 1 pp. 15-20 <<https://doi.org/10.1108/CB-09-2013-0031>><https://doi.org/10.1108/CB-09-2013-0031></a>

Access to this document was granted through an Emerald subscription provided by emerald-srm:395687 []

### For Authors

If you would like to write for this, or any other Emerald publication, then please use our Emerald for Authors service information about how to choose which publication to write for and submission guidelines are available for all. Please visit [www.emeraldinsight.com/authors](http://www.emeraldinsight.com/authors) for more information.

### About Emerald [www.emeraldinsight.com](http://www.emeraldinsight.com)

Emerald is a global publisher linking research and practice to the benefit of society. The company manages a portfolio of more than 290 journals and over 2,350 books and book series volumes, as well as providing an extensive range of online products and additional customer resources and services.

Emerald is both COUNTER 4 and TRANSFER compliant. The organization is a partner of the Committee on Publication Ethics (COPE) and also works with Portico and the LOCKSS initiative for digital archive preservation.

\*Related content and download information correct at time of download.



# A bibliometric study of literature on digital libraries

Gian Singh

*Training and Translation Group,*

*National Institute of Science Communication and Information Resources,  
New Delhi, India*

Rekha Mittal

*National Science Digital Library Project,*

*National Institute of Science Communication and Information Resources,  
New Delhi, India, and*

Moin Ahmad

*Education, Training and Translation Group,*

*National Institute of Science Communication and Information Resources,  
New Delhi, India*

342

Received 13 June 2006

Revised 17 August 2006

Accepted 23 August 2006

## Abstract

**Purpose** – The study has been undertaken with the purpose of finding out the growth and characteristics of digital library literature.

**Design/methodology/approach** – Over 1,000 articles for the period 1998-2004 were collected from LISA Plus and were analyzed to study authorship patterns, authors' productivity and prominent contributors, language-wise and year-wise distribution of articles, country-wise distribution of journals, core journals in the subject area, and indexing term frequency.

**Findings** – Some of the important findings are that most articles (61 percent) are single-authored; author productivity is not in agreement with Lotka's Law, except in one case where number of articles is three; the maximum number of articles were published in 2003 with English being the most productive language; maximum articles were published in the journal *D-lib Magazine*; distribution of articles nearly follows Bradford's Law; and USA ranked first for maximum number of journals.

**Originality/value** – The paper is relevant to those interested in bibliometrics and provides a comprehensive overview of authorship in the library and information science community.

**Keywords** Digital libraries, Literature, Bibliographies, Data analysis

**Paper type** General review

## 1. Introduction

Digital libraries began to be heard about in the early 1990s, as universities and other institutions started to build discipline-based collections of information resources in digital form. Access to these collections was being provided through local and wide area networks. The emergence and development of the world wide web since 1993 has allowed developers to provide universal access to digital libraries.

According to the Digital Library Federation:

Digital libraries are organizations that provide the resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities (Das and Dutta, 2004).



A relatively ambitious pre-web attempt to build a digital library was Project Mercury (1989-1992), a joint development of Carnegie Mellon University and Online Computer Library Center (OCLC). The TULIP Project (1993-1995) facilitated access to materials science journals. National Digital Library Program (NDLP) of the Library of Congress, and the American Memory project (1990-1994) are the important initiatives in this direction.

It was in the second half of 1990s that this field of study was recognized in India. Several software packages for library automation and services have been developed and are being used in the Indian libraries. The emergence of several information networks at the national level such as INFLIBNET, DELNET, CALIBNET, BONET, MALIBNET, NICNET, INDONET, ERNET, indicate development of digital libraries in India. Some of the publishing houses are now releasing the sources in multimedia, promoting the Indian libraries to go for development of local databases, networking and multimedia databases. Further the report of the National Task Force on Information Technology and Software Development (1998), which recommended information technology (IT) for all by 2008, is also a supportive thrust for the Indian libraries to digitize their collection (Fox and Logan, 2005).

## 2. Aims and methodology

Looking into this emerging significance of digital libraries and increased publication activity on this subject it was thought to carry out a bibliometric analysis of scientific output in this area. The major aims and objectives were to study:

- authorship patterns;
- author productivity;
- prolific authors;
- core journals in the subject area;
- indexing terms frequency;
- bradford distribution of articles;
- year wise distribution of articles;
- language wise distribution of articles; and
- country wise distribution of journals.

Articles on digital libraries were collected in July 2005 from Library and Information Science Abstracts (LISA) plus for the period January 1, 1998 to December 31, 2004. LISA Plus, an electronic version of LISA published by Bowker-Saur (UK) covers the articles in the field of librarianship and information science. An advanced search was made in the LISA Plus using keywords such as digital, library, libraries, etc. occurring in title field and combining these with Boolean operator for the date range from 1998-2004. This resulted in 1062 records covering all types of publications in all languages. These articles were published in journals, reports and conference proceedings. It was noticed that the author's name was not mentioned in 46 articles. Therefore these articles were not included for studying the authorship pattern and author productivity.

## 3. Data analysis

### 3.1. Authorship pattern

It has been observed that out of 1,062 articles 46 were without authors. Data reveal that a total of 1,016 articles contributed by 1,721 authors were published in journals, reports

and proceedings. The average number of authors per article is 1.69. Single authors contributed the maximum articles (61.32 percent) while the maximum number of authors in an article is found to be 13. Figure 1 shows that 21.06 percent, and 9.64 percent articles are by two and three authors respectively. The rest of the articles are jointly contributed by four and more than by four authors. The data point out that the large number of articles by single authors means that there are no well-established research groups in the area and the subject is a new and emerging one. Chen and Chen (2005) have also found that in the area of metadata research in library and information science maximum papers are published by single authors.

3.2. Author productivity

Table I shows the author productivity considering all the authors and also the first author only. Table I indicates that, considering all authors, 1,127 authors have one, 142 authors have two, 38 authors have three, and 13 authors have four articles each to their credit. While considering only first author 718 authors have one, 76 authors have two, 23 authors have three, and seven authors have four articles each. Lotka suggested a formula to measure author productivity. To what extent author productivity conforms to Lotka’s Law has also been tested. Table II shows the author productivity considering all the authors, and also the first author only.

According to Lotka’s law, number of articles(y) produced is inversely proportional to number of authors(f(y)) producing them.

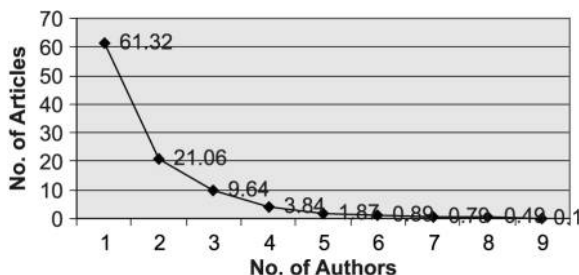


Figure 1. Authorship pattern

No. of articles (A)	Considering first author		Considering all authors	
	No. of authors (B)	Authorship (A × B)	No. of authors (B)	Authorship (A × B)
1	718 (85.99)	718 (69.24)	1,127(83.98)	1,127 (65.49)
2	76 (9.1)	152 (14.66)	142 (10.58)	284 (16.5)
3	23 (2.75)	69 (6.65)	38 (2.84)	114 (6.62)
4	7 (0.84)	28 (2.7)	13 (0.97)	52 (3.03)
5	4 (0.48)	20 (1.93)	7 (0.52)	35 (2.03)
6	2 (0.24)	12 (1.16)	6 (0.45)	36 (2.09)
7	3 (0.36)	21 (2.02)	4 (0.3)	28 (1.63)
8	1 (0.12)	8 (0.77)	1 (0.07)	8 (0.46)
9	1 (0.12)	9 (0.87)	3 (0.27)	27 (1.57)
10	–	–	1 (0.07)	10 (0.58)
Total	835	1,037 (100)	1,342 (100)	1,721 (100)

Table I. Author productivity during 1995-2004

No. of articles (A)	Considering first author		Considering all authors	
	No. of authors (observed)	Authorship (expected)	No. of authors (observed)	Authorship (expected)
1	718	718	1,127	1,127
2	76	180	142	282
3	23	80	38	125
4	7	45	13	70
5	4	29	7	45
6	2	20	6	31
7	3	15	4	23
8	1	12	1	18
9	1	9	3	14
10	–	–	1	11

**Table II.**  
No. of expected authors  
derived with the value of  
 $\alpha = 2$

Lotka's Law is:

$$f(y) = \frac{A}{y\alpha}$$

where  $f(y)$  stands for the authors producing  $y$  articles, and  $A$  and  $\alpha$  are constants.

Putting the value  $f(y)$  1,127 and  $y$  as 1, the equation is:

$$1,127 = \frac{A}{y\alpha} = A.$$

When the law was applied taking the value of  $\alpha$  as 2, the results in Table II are obtained.

The results suggested that in this case the law is not applicable. It was observed that the number of expected authors is more than observed authors. The difference between observed and expected authors is very wide.

### 3.3. Prolific authors

It was observed that three authors, R. Tennant, G.G. Chowdhury and S. Harum have contributed nine articles each and two authors have contribution of eight articles and seven articles each, six authors contributed six articles each, whereas 11 authors have contribution of five articles each. The data showed that 32 authors have contributed 180 articles, which have been published in different journals.

### 3.4. Core journals in the subject area

The journal publishing maximum number of papers in any area is considered as a core journal. Out of 1,062 articles collected for this study 1,037 articles were published in 212 journals, while remaining 25 articles published in proceedings, etc. The study shows 128 journals cover 90.07 percent articles. *D-lib Magazine* is at first rank with the contribution of 73 (7.05 percent) articles, *Journal of the China Society for Scientific and Technical Information* ranked second with 30 articles. The study revealed that the concept of core journals is not applicable to digital library literature. The literature on this subject is therefore highly scattered.

### 3.5. Indexing terms frequency

It has been observed that 1,062 articles can be searched by 25 Indexing terms and these have been used 4,467 times. The average number of indexing terms per article is 4.2. Analysis of the data shows that more than 50 percent (percentage is based on number of articles) articles have digital library as a indexing term and electronic media, library materials and world wide web occurred 16.94 percent, 11.77 percent, and 9.41 percent respectively. Other indexing terms used were world wide web, internet, digitization, preservation, online databases, etc.

### 3.6. Bradford distributions of articles

Bradford law states that if a large collection of articles is ranked in order of decreasing productivity of journals (sources) relevant to a given topic, three zones can be marked off so that each zone produces one-third of the total relevant papers. In this case 1,037 articles were published in 212 journals. Figure 2 depicts the number of articles in each zone with corresponding number of journals. Each zone should account for roughly one third of this number i.e. 345.

According to Bradford law the ratio between three zones should be in the ratio  $1:\alpha^2$ , while the ratio in the present study is 16:41:55 i.e.  $1:3:3^2$ . It can be inferred that the distribution nearly follow the Bradford's law. These results are at variance with other works in the field of library and information science (Deo *et al.*, 1995).

### 3.7. Year-wise distribution of articles

During the period January 1,1998 to December 31, 2004, 1,062 articles were published and on average 151.71 articles every year. Figure 3 shows that up to the year 2000, the number of articles increases every year, but in 2001 and 2002 the number of articles decreased while in 2003 maximum (i.e. 178) articles were published, and again in the year 2004 it decreased from 16.76 percent to 13.18 percent.

Figure 2.  
Bradford distribution of  
articles

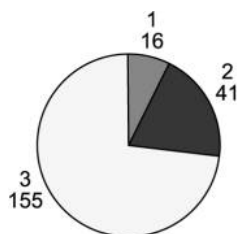
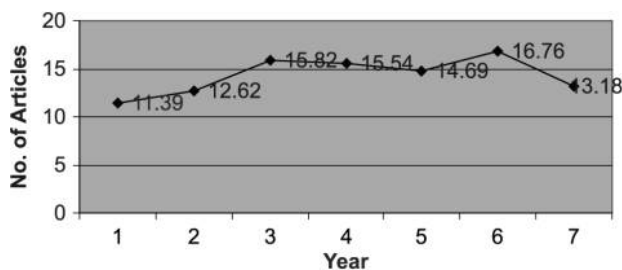


Figure 3.  
Year-wise distribution of  
articles



### 3.8. Language-wise distribution of articles

All the articles on digital libraries were published in 19 languages with the majority (82 percent) being published in the English language followed by Chinese (4 percent), German (3 percent), French (2 percent), Japanese and Spanish (1 percent) each. Iceland has only one article and ranked as fifteenth.

### 3.9. Country-wise distribution of articles

Bibliometrically, the value of place of publication points to the “nationality” of a document. Place of publication is the best guide available to nationality of a document. The study indicates that while the USA takes the top position with its contribution of 77 journals and 489 (47.15 percent) articles, the UK is second on the list of contributing countries with 51 journals and 197 (18.99 percent) articles. Germany stands third with 14 journals and 67 (6.46 percent) articles. India and Japan contributed eight journals and 21 and 14 articles respectively. A maximum number of articles were covered in the journals published from USA, while minimum numbers of articles were in the journals published from other countries such as Finland, Iceland, Spain and Switzerland.

Bibliometric study of doctoral dissertations on English language and literature has also revealed that the USA ranked first in country-wise distribution of periodicals, an increasing trends towards multiple authorship; data also did not exactly fit into the Bradford’s law of scattering (Deo *et al.*, 1995). Another study on the *Journal of Oilseeds Research* identified that two-authored papers are in the majority; author productivity is in agreement with Lotka’s law, especially when the value of  $\alpha$  is 2.07; citation appended to articles do not follow Bradford’s law (Kalyane and Sen, 1995).

## 4. Conclusion

This study has looked at patterns of authorship in articles published in LISA Plus over a seven-year period. Single authors were responsible for the most articles published. The expected values and observed values in author’s productivity does not follow Lotka’s law. No set pattern has been observed in year wise growth of literature. Distribution of articles in different journals nearly follows Bradford’s law. Most of the articles dealt with the digital library initiatives whereas some of the articles dealt with music digital libraries, thesis and dissertation digital library, digital preservation and archiving, etc.

## References

- Chen, Y.-N. and Chen, S.-J. (2005), “Analysis of metadata research and application development in LIS based on a hybrid approach of quantity and quality”, *Bulletin of Library and Information Science*, No. 55, pp. 51-77.
- Das, A.K. and Dutta, B. (2004), “An introduction to auditing and control of digital library systems”, *Annals of Library Science and Documentation*, Vol. 51 No. 3, pp. 99-103.
- Deo, V.N., Mohal, S.M. and Survey, S.S. (1995), “Bibliometric study of doctoral dissertations”, *Annals of Library Science and Documentation*, Vol. 42 No. 3, pp. 85-95.
- Fox, E.A. and Logan, E. (2005), “An Asian digital libraries perspective”, *Information Processing & Management*, Vol. 41 No. 1, pp. 1-3.
- Kalyane, V.L. and Sen, B.K. (1995), “A bibliometric study of the *Journal of Oilseeds Research*”, *Annals of Library Science and Documentation*, Vol. 42 No. 4, pp. 121-41.



---

National Task Force on Information Technology and Software Development (1998), *Information Technology Action Plan*, National Task Force on Information Technology and Software Development, Bombay.

#### Further reading

Dalai, B.K. and Ramesh, D.B. (1995), "Publication pattern in scientific and industrial research in India: a bibliometric study", *Annals of Library Science and Documentation*, Vol. 42 No. 1, pp. 35-8.

Subramanian, R. and Navaneethan, R. (1992), "Library science with a slant to documentation and information studies, 1981-1990: a bibliometric study", *Library Science*, Vol. 29 No. 3, pp. 157-61.

#### About the authors

Gian Singh, MSc. PhD BLibSc. is Head, Education, Training and Translation Group, National Institute of Science Communication and Information Resources (NISCAIR), New Delhi. He has worked as Editor of *Medicinal and Aromatic Plants Abstracts (MAPA)* for 30 years. He has contributed a number of papers in the field of medicinal plants and information science. He is a life member of the Society of Information Science, New Delhi.

Rekha Mittal, MSc.(Botany) MLibSc. is a Scientist working for the National Science Digital Library Project, National Institute of Science Communication and Information Resources (NISCAIR), New Delhi, a constituent laboratory under Council of Scientific and Industrial Research, India. Formerly she worked in Indian Science Abstracts. She has experience of 27 years in various fields like library management; database development; abstracting and indexing; bibliographic services etc. She has written 15 papers. Rekha Mittal is the corresponding author and can be contacted at: rekha@niseair.res.in

Moin Ahmad, BA MLibSc. is an intern in the Education, Training and Translation Group, National Institute of Science Communication and Information Resources (NISCAIR), New Delhi.



**This article has been cited by:**

1. Kollshankar Reddy, Shankar Reddy Kollé. 2017. Global research on information literacy: a bibliometric analysis from 2005 to 2014. *The Electronic Library* 35:2, 283-298. [[Abstract](#)] [[Full Text](#)] [[PDF](#)]
2. Cristina Faba-Pérez, Ana-María Cordero-González. 2015. The validity of Bradford's Law in academic electronic mailing lists. *The Electronic Library* 33:6, 1031-1046. [[Abstract](#)] [[Full Text](#)] [[PDF](#)]
3. Raj Kumar Bhardwaj, P. K. Jain. 2015. Research trends in mobile learning: A global perspective. *Collnet Journal of Scientometrics and Information Management* 9:2, 205-224. [[Crossref](#)]
4. Jeffrey Sootheran. 2014. Academic libraries and development. *The Bottom Line* 27:3, 107-122. [[Abstract](#)] [[Full Text](#)] [[PDF](#)]
5. Adeyinka Tella, Ayotola Aisha Olabooye. 2014. Bibliometric analysis of African Journal Of Library, Archives and Information Science from 2000-2012. *Library Review* 63:4/5, 305-323. [[Abstract](#)] [[Full Text](#)] [[PDF](#)]
6. Sunil Kumar Satpathy, Rabindra K. Maharana, Ashok Kumar Das. 2013. Open source journals of library and information science: a bibliometric study. *Collection Building* 33:1, 15-20. [[Abstract](#)] [[Full Text](#)] [[PDF](#)]
7. Fei Xu. 2012. Journal based current awareness services for systems librarianship. *VINE* 42:2, 152-171. [[Abstract](#)] [[Full Text](#)] [[PDF](#)]
8. Fei Xu. 2011. A standard procedure for Bradford analysis and its application to the periodical literature in systems librarianship. *Library Hi Tech* 29:4, 751-763. [[Abstract](#)] [[Full Text](#)] [[PDF](#)]
9. Jadhav Vandana Sheshrao, V. S. Khaparde. 2011. Citation Analysis of Ph.D. Theses on Physics Submitted to Dr. Babasaheb Ambedkar Marathwada University. *Collnet Journal of Scientometrics and Information Management* 5:1, 115-127. [[Crossref](#)]
10. Chern Li Liew. 2009. Digital library research 1997-2007. *Journal of Documentation* 65:2, 245-266. [[Abstract](#)] [[Full Text](#)] [[PDF](#)]
11. G. Stephen, T. Balamurugan. Open Access Literature Productivity of Library and Information Science 153-169. [[Crossref](#)]
12. Gary G. Yen. Information Fusion for Scientific Literature Classification 1023-1033. [[Crossref](#)]