

Bibliometric Analysis of Literature on Application of Mobile Technologies in Libraries (2006-2016) using LISTA

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Abstract

The study presents a bibliometric analysis of 128 research publications in the subject area of application of mobile technology in libraries covered by the LISTA database during the year 2006-2016 (July). The study has focused to discover the authorship pattern, degree of collaboration, frequency of distribution, geographical distribution, co-occurrence of authors and co-word analysis. All the data were collected and analyzed in tabular format and on the basis of the analysis some inferences were made.

Keywords: Bibliometric, Authorship Pattern, Degree of Collaboration, Author Co-Occurrence, Co-Word Analysis, Frequency Distribution

1. Introduction

Bibliometrics is the study dealing with evaluation of written communications which helps to measure the published knowledge in terms of growth of literature, authorship pattern, most productive authors, degree of co-authorship, finding out the core journals in a particular field, geographical distribution of the publishing journals and many more. This is the technique which is being used for a variety of purposes like determination of different scientific indicators, evaluation of scientific output, selection of journals for libraries and even forecasting the potentiality of a particular field. It is used to examine the research trends in a subject.

Library, Information Science & Technology Abstracts (LISTA) database is a free resource provided by EBSCOhost in the field of libraries and information management. This is a bibliographic database which covers librarianship, classification,

information management, and more, which indexes more than 700 periodicals, books, research reports, and proceedings around the world, with coverage dating back to the mid-1960s.

2. Literature Review

Bibliometric studies have been conducted so far in large numbers by analyzing authorship and author collaboration pattern, output of publications that identifies the core areas of research activities, citation analysis and other bibliometric indicators.

A study was made by Ramakrishnan & Ramesh Babu¹ to identify the growth of hepatitis literature covered in three online databases as well as the authorship pattern and degree of collaboration in hepatitis research. Mamdapur [et. al.]² studied the bibliometric analysis of Baltic Astronomy (2000-2008) to identify the percentage and range of references per article, to examine the authorship pattern of the contributions, and the average number of contributions per volume, to analyze the use of various types of documents by authors, length of



articles and to prepare a ranked list of periodicals cited in the references. Hartinah [et. al.]³ studied on nutrition problems in Indonesia published during 1979-2000, and discussed the authorship pattern, institutional affiliation and the half life of the literature on nutrition. Bibliometric analysis of medical informatics literature had been made by Sundari Bai [et. al.]⁴ in regard to authorship pattern, collaboration index, degree of collaboration, collaborative coefficient and country wise production. Zhu and Wallet⁵ made a study on Chinese super conductivity research conducted from 1986-2007 and discussed about the growth of publications, subject areas and their core journals, key research institutions, country wise collaborations, citations of different countries based on source articles on top subject areas and citing journals.

3. Objectives of the Study

The objectives of the study are as follows:

- ❖ To analysis year wise distribution of articles
- ❖ To identify the authorship pattern
- ❖ To determine degree of collaboration
- ❖ To find out frequency distribution of authors
- ❖ To find out co-occurrence of authors
- ❖ To find distribution of authors by country wise
- ❖ To know about journals indexed in the database
- ❖ To classify regional distribution of journals
- ❖ To find out occurrences of the keywords
- ❖ To check cword analysis

4. Methodology

The data for the study period 2006 to 2016 (July) were retrieved from the LISTA database using “mobile technology” and “library” as the keywords for search. For restricting the search results, other defined search criteria like Publication Date – 2007-2016, Publication type - Academic journal, Language - English, Document type- Article, were used to find out the relevant data. A total of 128 numbers of articles were retrieved which have been published during 2007-2016 (July). All the bibliographic data of the retrieved 128 articles were recorded and analyzed with the Bibexcel⁶ software and MS excel.

5. Results and Discussions

5.1 Year-wise Distribution of Contributions in the Journals Indexed in LISTA

The Table 1 provides the number of articles got published in different journals those were indexed in the database during the period of study with the annual growth rate. The annual growth rate has been calculated by applying the following formula:

$$\text{Annual Growth Rate} = \left\{ \frac{(\text{End value} - \text{First value})}{\text{First value}} \right\} \times 100$$

Table 1 Year-wise Distribution of Publications

Year	No. of Publications	% age	Annual Growth rate (in %)
2006	0	0	—
2007	3	2.34	—
2008	1	0.07	-66.66
2009	3	2.34	200
2010	8	6.25	166
2011	20	15.62	150
2012	22	17.18	10
2013	20	15.62	-10
2014	20	15.62	0
2015	22	17.18	10
2016 (July)	9	7.03	-59
Total	128	99.25≈100	Mean = 44.48

It was observed that, in the year 2012 and 2015, the number of publications in the concept of application of mobile technology in libraries was the highest having 22 number of articles indexed in the database followed by year 2011, 2013 and 2014 having 20 articles indexed in each year. It was also found that, in 2006 there were no articles published in any

journal indexed by LISTA. The average annual growth rate of publications is 44.48%.

5.2 Authorship Pattern

The authorship pattern was analyzed to determine the rate of single author, two authors, three authors and multiple authors. The data has been presented in Table 2.

Table 2 Authorship Pattern along with Year Wise Distribution of Articles

Year	Single author	Two authors	Three authors	More than three authors	Total
2006	0	0	0	0	0
2007	1	2	0	0	3
2008	1	0	0	0	1
2009	3	0	0	0	3
2010	6	1	1	0	8
2011	14	6	0	0	20

Year	Single Author	Two Authors	Three Authors	More than three authors	Total
2012	11	6	2	3	22
2013	13	4	1	2	20
2014	12	7	1	0	20
2015	7	6	6	3	22
2016 (July)	3	3	1	2	9
Total	71	35	12	10	128
%age	55.46	27.34	9.37	7.81	99.98H*100

From the analysis of the data from the Table 2, it was observed that most of the articles have been authored by single author by making it to 55.46% followed by two authors which makes 27.34%. More than three authors are the list choice by the contributors.

5.3 Degree of Collaboration

To determine the degree of joint effort in quantitative terms, the formula given by K. Subramanyam⁷ was used. The formula is as follows-

$$C = N_m / (N_m + N_s)$$

Where, C=Degree of Collaboration

N_m=Number of multi authored contributions

N_s= Number of single authored contributions

Table 3: Degree of Collaboration of Authors

Year	Single authored papers (N _s)	Multi authored papers (N _m)	Degree of collaboration (C=N _m /(N _m +N _s))
2006	0	0	0
2007	1	2	0.66
2008	1	0	0
2009	3	0	0
2010	6	2	0.25
2011	14	6	0.3
2012	11	11	0.5
2013	13	7	0.35
2014	12	8	0.4
2015	7	15	0.68
2016 (July)	3	6	0.66
Total	71	57	0.44

After analyzing data in Table 3, it was known that in the year 2015, the degree of collaboration was the highest with 0.68% followed by in the year 2007 and 2016 with 0.66% each.

5.4 Frequency distributions of authors

The frequency distribution of articles was made to analyze how many publications have been made by individual authors during the period on the particular topic.

Table 4 :Frequency Distributions of Authors Published >1 paper in Journals Indexed in LISTA Database

Sl. No.	Author	Whole counts	Fractional counts
1	Bomhold C	3	3
2	Aharony N	3	3
3	Bridges L	2	0.833
4	Hahn J	2	2
5	Haddow G	2	1.5
6	Honisset A	2	0.7
7	Thompson S	2	2
8	Bounford S	2	2
9	Cocciolo A	2	2
10	Evans B	2	2
11	Crichton C	2	1
12	ClayJ	2	2
13	Canuel R	2	1
14	Chang C	2	1.167
15	Murphy J	2	2
16	Kaliyaperumal K	2	1
17	Lombardo N	2	0.7

From the analysis of Table 4, it was found that total 204 authors have contributed in the 128 articles. Table 3 shows that, out of 204 authors only 17 (8.33%) authors have produced more than one scholarly article on use of mobile technology in libraries in the journals indexed by the LISTA database. And rest 187 authors have contributed only one article in the journals indexed by the database. Here the whole count shows the publication of n articles as n whole counts and fractional count shows the publication with a shared responsibility.

5.5 Co-occurrence of Authors

The co-occurrence of authors was analyzed to know how many authors have published their papers with same set of authorship and with what frequency.

It was found that, out of 204 authors, there were only two co-occurrences (0.9%) of the authors. They have produced two articles each in mutual collaboration.

5.6 Distribution of Authors by Country Wise

The authors' addresses were analyzed to prepare a rank of the countries of the authors belonging to the highly producing articles. Out of 204 authors, no addresses were mentioned for 51 authors in the database. Hence, the analysis was made into taking consideration of the addresses of the rest 153 authors.

Table 5: Country wise Distribution of Authors

Sl. No.	Countries belonged by authors	No. of affiliated institutions	%age
1	United States	76	58.76
2	United Kingdom	11	9.27
3	India	10	7.21
4	Canada	9	6.18
5	Australia	5	5.15
6	Oregon	2	2.06
7	Sweden	2	2.06
8	Thailand	2	1.03
9	New Zealand	2	1.03
10	Israel	2	1.03
11	China	2	1.03
12	Cuba	1	1.03
13	Nigeria	1	1.03
14	South Africa	1	1.03
15	Korea	1	1.03
16	Greece	1	1.03
	Total	128	99.96H'100

From the analysis of Table 5, it was found that the highest number of authors belong to United States with 58.76% of different institutional affiliations followed by United Kingdom with 9.27%. From Table 6, it is evident that, Indian authors have occupied third position with 7.21% contributions from different institutions of India.

5.7 Journals Indexed in the Database

Analysis was done to know the journals which are generally being used for the publication of articles in the context of mobile applications/technologies in the libraries.



Table 6: Journals usually used to do Publications Indexed in LISTA

Sl. No.	Name of the journal	Published from	No. of publications	Cumulative publications
1	Reference Librarian	United States	12	12
2	Library Hi Tech	United Kingdom	9	21
3	New Library World	United Kingdom	5	26
4	Serials	United Kingdom	5	31
5	DESIDOC Journal of Library & Information Technology	India	5	36
6	Reference Services Review	United Kingdom	5	41
7	Medical Reference Services Quarterly	United States	4	45
8	CILIP Update	United Kingdom	4	49
9	Library Technology Reports	United States	3	52
10	Journal of Electronic Resources in Medical Libraries	United States	3	55
11	Information Technology & Libraries	United States	3	58
12	Against the Grain	United States	3	61
13	Journal of Academic Librarianship	United Kingdom	3	64
14	Australian Academic & Research Libraries	Australia	3	67
15	Journal of Hospital Librarianship	United States	3	70
16	Electronic Library	United Kingdom	3	73
17	Journal of Consumer Health on the Internet	United States	2	75
18	Journal of Library & Information Science	India	2	77
19	Access (10300155)	Australia	2	79
20	Serials Librarian	United States	2	81
21	Journal of Web Librarianship	United States	2	83
22	Journal of Medical Internet Research	Canada	2	85
23	Journal of Library & Information Services in Distance Learning	United States	2	87
24	Program: Electronic Library & Information Systems	United Kingdom	2	89
25	Information Development	United Kingdom	2	91
26	Others having one publications	Different parts of the world	37	128

In the present data set, 6 journals covered 41 articles, next 19 journals covered 50 articles and next 26 journals covered 37 articles. In other words, one third of the total publications were covered by each group of the journals. Hence the first 6 journals may be considered as the core journals for the subject area of use of mobile technology in the libraries. Reference Librarian from United States is the most preferred journal for publication of articles.

5.8 Regional Distribution of Retrieved Journals

The following Table shows the country wise dispersion of the place of publications of the journals indexed in the database.

Table 7 : Distribution of Journals According to its place of Publication

Sl. No.	Region of Publication	No. of Journals Published	%age
1	United States	56	43.75
2	United Kingdom	51	39.84
3	India	7	5.46
4	Australia	6	4.68
5	Canada	3	2.34
6	Sweden	1	0.78
7	South Korea	1	0.78
8	Germany	1	0.78
9	Netherlands	1	0.78
10	New Zealand	1	0.78
	Total	128	99.97≈100

From the analysis, it was observed that from United States (US) the highest number of journals, i.e. 43.75% have been published followed by and United Kingdom (UK) which covers 39.84% of published journals. More than 83% of journals have been published by US and UK. India has stood in third position by publishing 7 journals making it to 5.46%.

5.9 Occurrences of the Keywords

The analysis of occurrence of the keywords used in the articles was accomplished to evaluate the frequency of occurrences of the keywords. Total 681 keywords have been used in the 128 articles. Table 8 represents the keywords used in the articles with its frequency of occurrence and percentage in comparison to total frequencies.

Table 8 Occurrences of the Keywords used in Articles in the Indexed Journals

Sl. No.	Frequency of Occurrence	Keyword	%age
1	56	Mobile communication systems	8.22
2	38	Academic libraries	5.58
3	37	Mobile technology	5.43
4	29	Libraries	4.25
5	25	Wireless communication systems	3.67
6	24	Smartphones	3.52
7	23	Mobile apps	3.37
8	22	Research	3.23
9	17	Pocket computers	2.49
10	16	Library applications	2.34

Sl. No.	Frequency of Occurrence	Keyword	%age
11	Information services	16	2.34
12	Surveys	14	2.05
13	Mobile computing	13	1.9
14	Medical libraries	13	1.9
15	Students	11	1.61
16	Mobile devices	11	1.61
17	Information literacy	11	1.61
18	Cell phones	10	1.46

From the above table, it was observed that the 18 keywords have been used more than or equal to 10 times. The keyword 'Mobile communication

systems' was found highest in number in comparison to others by making 8.22% of total.

5.10 Co-word Analysis

Co-word analysis is based upon the analysis of the co-occurrence of the keywords used to index articles in the LISTA database. This method is useful for mapping the content of research in the field of application of mobile technologies in libraries. In the present study a total of 681 keywords were used by the articles.

Out of 681 keywords, which had been used equal to or more than 10 times were considered for co-word analysis. An analysis was made to know the co-occurrences of the keywords as mentioned in Table 8. After analysis, 197 combinations were found, where any of the two keywords listed in Table 8 were present. The co-occurrence of the keywords can be viewed in Figure 1 as follows:

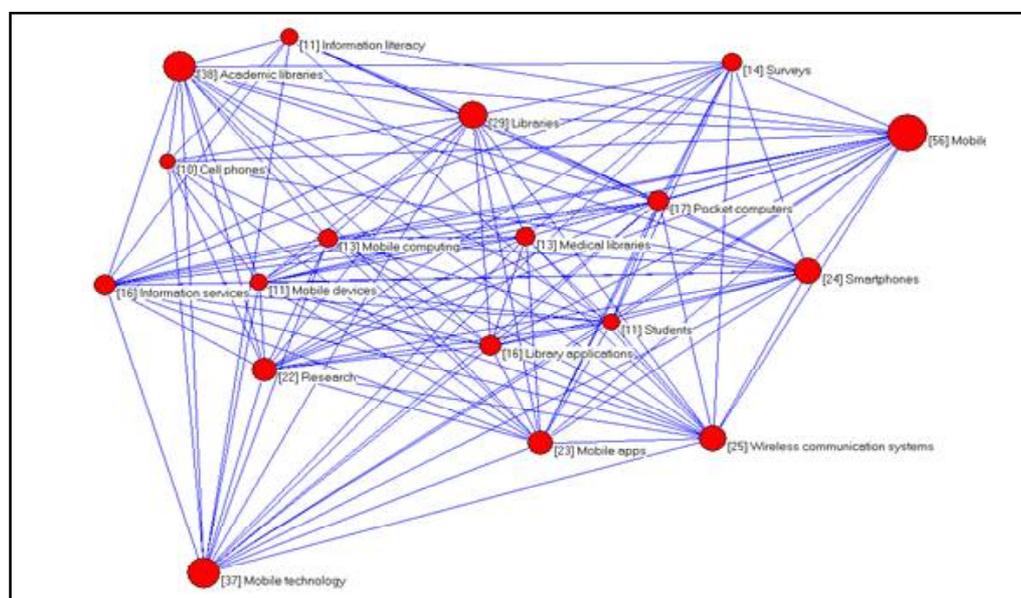


Figure 1: Co-occurrence of Keywords in the Articles in the Journals

The map displayed in Figure 1 has been created with Pajek. The coword analysis map shows the co-occurrences of the keywords used in the articles in the journals indexed in the database. The vertices are represented by frequency of occurrences with the keywords used by the articles in the journals indexed in the database.

6. Conclusion

In the field of application of mobile technology in libraries, the major portion of the publications have been made by single author. The average degree of collaboration of authorship was observed to be 0.44%. In the year 2012 and 2015, the publications were highest. There are 204 authors who have contributed to the journals, amongst whom only 17 authors have written more than one article. Only 2 co-occurrences of authors were found where the authors have jointly produced 2 papers each. Most of the authors are from different organizations located in United States. The highest number of journals is being published from United States and the journal Reference Librarian, published from United States only, has published the highest 12 number of publications. The keyword 'mobile communication system' have been used the most in the published articles.

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