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SANTHA KUMAR RAMIAH Mr

S K R ENGINEERING COLLEGE, santham74@gmail.com

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MOBILE TECHNOLOGY PUBLICATIONS RESEARCH OUTPUT AS INDEXED IN ENGINEERING INDEX: A SCIENTOMETRIC ANALYSIS

R. Santha kumar*

Librarian, SKR Engineering College, Chennai – 600 123
Email: santham74@yahoo.co.in
and

C. Velmurugan**

Librarian, Siva Institute of Frontier Technology, Chennai- 601 103
Email: murugan73@gmail.com

ABSTRACT

The present study analysis has been taken into account in the filed of mobile technology research output using Engineering Index database for selected period of ten years from 2003 to 2012. This study also explores the trend in authorship pattern and collaborative in mobile technology publications with sample of 1, 44,567 research articles during the period from 2003 to 2012. The findings of the study shows that in the year 2011 was the most productive year with 20318 articles (14.05%) published. Among the top ten country wise authors, the highest numbers of articles (22.83%) were contributed by the authors from China. USA has got second rank to contribute in this field with 13.26% followed by Japan 8.11% of articles and Korea 6.82% of articles respectively. It is also important to know that out of ten top countries, India was the seventh place contributed 6150 articles. Among the top ten languages, the maximum number of articles have been published in English Language (96.12%), followed by Chinese 3.13% articles, Japanese 0.27% articles and 0.14% in Russian and German. The authors who have published maximum number of articles are also identified. The relative growth rates (RGR) and Doubling Time (DT) and many more features identified.

Keywords: Scientometric analysis, Mobile Technology, Author productivity, Mobile Technology, Engineering Index, RGR, DT.

1. Introduction

According to Sengupta₁ (1990), viewed that scientometric as “organization, classification and quantitative evaluation of publications patterns of all macro and micro communications along with their authorship by mathematical and statistical calculus”. This study aims to apply the scientometric analysis to describe pattern of publication within a given field or body of literature. According to A.F.J. Van Raan₂ defined the scientometric research is devoted to quantitative analysis of science and technology. It aims at the advancement of knowledge and development of science and technology and also in relation to social and political questions. Basically the scientometric analysis focuses on the measurement of magnitude of the growth of literature along with various dimensions.

2. Need for the Study

Periodicals appear as the focal point for transmitting knowledge. Journals play an important role in scholarly communication. They are the pointers of literature growth and progress in any field of knowledge. Scientometric / Bibliometric analysis has many applications in the field of library and information science in finding research trends, core journals, etc., and thereby framing subscription policies for future. These research studies will be supportive for library professionals in collection development. The irresistible uses and different types of mobile phones in India and all over the world is the indicator of the growth over development mobile technology which results the enormous growth of mobile technology literature. The present study aims to investigate the scientometric analysis of the research work on Mobile technology publications using engineering index database selected ten years for a period between 2003 and 2012.

3. Objectives for the Study

The main objectives of the study are as follows:

- To study the total number of publications of mobile technology output based on Engineering Index database during the period of study.
- To identify the top 10 prolific authors in the field of mobile technology
- To depict the top 10 institution wise Distribution of Publications
- To study the top 10 geographical wise Distribution of Publications
- To explore the top 10 language wise distribution of Publications
- To determine the top 10 subject wise distribution of Publications
- To examine the growth rate and doubling time of mobile technology literature output

4. Literature Review

Research productivity is evaluated based on a methodology and use in other bibliometric studies. The research productivity was evaluated in relation to gross domestic product of each region and in relation to gross national income per capita and population of each region during 1995–2003 in the field of parasitology. Falagas, Papastamataki, and Bliziotis. (2006)

The growth pattern, core journals and authors' distribution in the field of bibliometric using data from *Library and Information Science Abstract* (LISA) and found that the growth of literature does not show any definite pattern. Patra, Bhattacharya and Verma (2006).

The publication output of Research in Higher Education for subject support in collection development in the light of growing interest in diversified domains of research in higher education. Consequently, analysis of 40 issues of publications revealed a diversified usage pattern of bibliographic reference sources by contributing researchers, with a cumulative total of citations being 8,374. A positive trend in research collaboration of contributing authors, and a steady growth in the use of reference sources, periodicals and web documents in the citations signify the trend of scholarly communication of research works in the electronic age. Yeoh and Kaur (2008).

The quantitative study conducted in the field of library and information science (LIS) in which total of 894 contributions published in 56 LIS journals indexed in SSCI during the years of 2000–2004 were analyzed. A total of 1361 authors had contributed publications during the five years. The overwhelming majority (89.93%) of them wrote one paper. The average number of authors per paper is 1.52. All the studied papers were published in English. The sum of research output of the authors from USA and UK reaches 70% of the total productivity. Davarpanah and Aslekia (2008)

The productivity of authors and core periodicals has been determined using Lotka's and Bradford's law. Literature growth, geographical distribution and language wise distribution has also been studied. Literature growth in this area of LIS has been found to be negative. Most of the papers have been contributed by single authors (72.8%) and two authors (20.69%) and 72 % of literature is published in 72 journals, Mittal et.al. (2006).

The literature output in the field of hepatitis from three bibliographic databases, namely MEDLINE, CINAHL and IPA, and found that collaboration in authorship pattern is prevalent, averaging 0.85. Ramakrishnan and Ramesh Babu (2007).

The bibliometric analysis of 203 articles appearing in Annals of Library and Information Studies journal selected six years for a period between 2007 and 2012. It was found that the most of the contributions are by two authored i.e., 88 (43.35 %). The degree of collaboration ranges from 0.57 to 0.82 and the average degree of collaboration is 0.64. The total average number of authors per paper is 1.87 and the average productivity per author is 0.53. Velmurugan (2013).

The study conducted during 1999 – 2005 with sample of 131 contributions of the journal entitled 'Annals of Library & Information Studies'. Most of the contributions of this journal are contributed by single author and state wise distribution shows that most of the contributions are contributed from New Delhi. It was also found citation analysis of 1456 citations includes finding out average number of citations per contribution, types of publications cited and preparing of ranked list of cited journals in contributions of this journal, Verma et.al. (2007).

The collaborative research and authorship trend in the area of veterinary sciences all over the world with special reference to India. The study was based on the data collected from 'CABI abstracts' for the period of 2006-2010. The findings of the study revealed that the average degree of collaboration was found 0.84 and subject analysis showed a good research in the area of animal nutrition and veterinary physiology. Arya & Sharma (2011).

The authorship pattern and collaborative research in physics with a sample of 11,412 journals and 1,328 book citations appended in the physics doctoral dissertations awarded by the Indian Institute of Science, during 1999-2003. The average number of authors per journal articles was 3 and for books it was 1.69. The degree of collaboration in different years was calculated and the average value of it for journals was 0.08 and 0.44 for books. Pillai et.al. (2007).

The citation analysis on Demography India from 1972-2001 and identified core areas of demographic studies, including article contributions by country and geographic areas,

authorship patterns and collaboration, most cited journals, bibliographic forms of cited documents, average age of citations, and rate of citations per article. Asha (2007).

Bibliometric analysis on research publications in the field of Biodiversity during the period 1975-2010 and it was analyzed 1, 57,557 articles of Scopus database and examined year wise distribution of articles, country wise distribution, languages distribution and bibliographic form of articles, authorship pattern, country wise authorship pattern, high productive Indian Institutes etc. inferences and findings were shown with relevant data analysis, Ravichandran. (2012).

The research output were highly scattered as indicated by the average number of papers per institution. It was found that the U.S.A share of papers were constantly declining while that of the Netherlands, India, France and Japan were on the rise analyzed with 1317 papers published in the first fifty volumes of the international journal of Scientometrics during 1978 to 2001. Dutt, Garg, & Bali (2003).

5. Methodology

The required data collected from Engineering Index database for selected period of ten years from 2003 to 2012. A total number of 144567 articles were collected and the analysis has been made on the basis of the parameters includes authorship pattern, country wise distribution, forms, language wise distributions and many more features.

6. Analysis and Interpretations

6.1. Source wise Distribution

Table No. 1 Source wise distribution of publications

S. No.	Source Type	No. of Publications	Percentage
1	Conference Articles	94205	65.16
2	Journal Articles	48363	33.46
3	Conference Proceedings	1634	1.13
4	Articles in Press	365	0.25
Total		144567	100

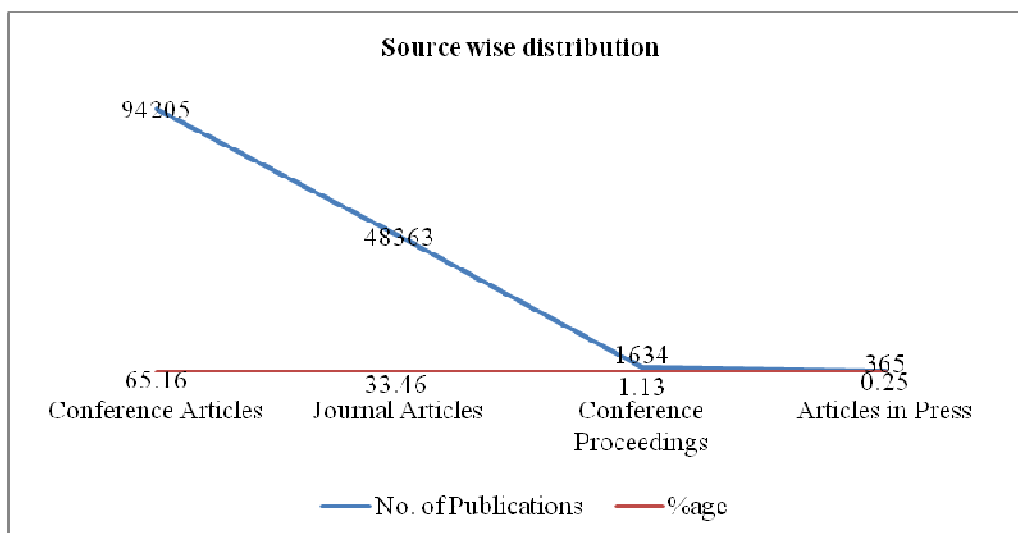


Chart. 1: Source wise distribution of publications

Table 1 Chart 1 shows that the forms of publications. Among 129191 publications, the conference articles contributes to 65.88%, followed by Journal articles 33.33% and only 0.06% articles were in press. All these forms of publications have been taken into account for the period of analysis.

6.2. Year wise distribution of research publications

Table No. 2 Year wise distribution of publications

S. No.	Year	No. of Publications	Percentage
1	2003	5789	4.00
2	2004	9587	6.63
3	2005	11358	7.86
4	2006	12652	8.75
5	2007	13920	9.63
6	2008	17515	12.11
7	2009	16966	11.74
8	2010	18253	12.63
9	2011	20318	14.05
10	2012	18209	12.60

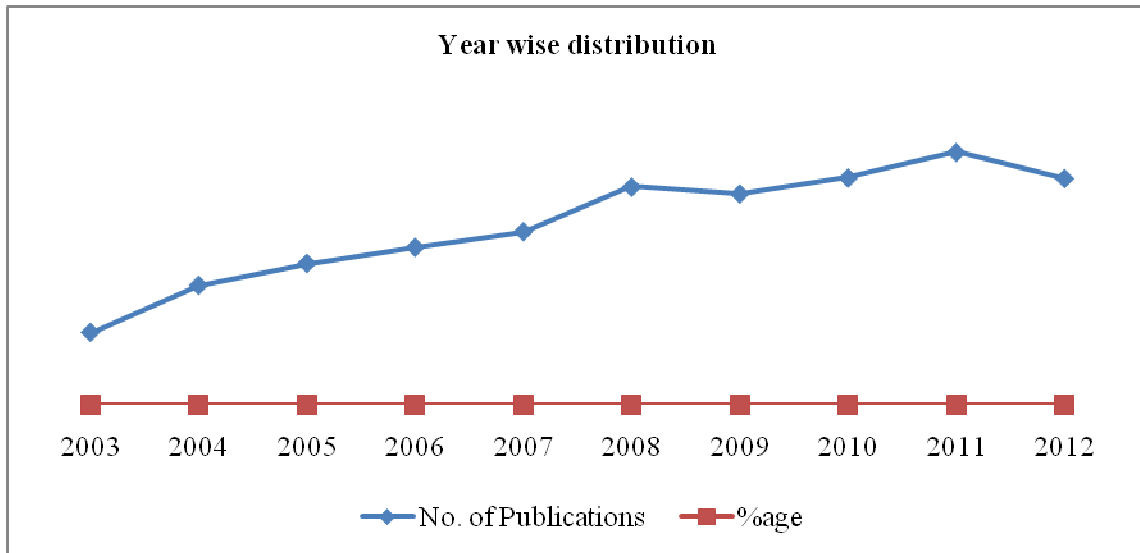


Chart. 2. Year wise distribution of publications

Table 2 Chart 2 represents the year wise distribution of publications and the result is also indicate that the exponential growth of the literature over the period.

6.3. Relative Growth Rate (RGR) and Doubling Time

The mean relative growth rate (R) over the specific period of interval can be calculated as per the following formula.

Relative Growth Rate (RGR)

$$1-2^R = \frac{\text{Log}_e W_2 - \text{Log}_e W_1}{T_2-T_1}$$

Whereas

$1-2^R$ - mean relative growth rate over the specific period of interval

$\text{Log}_e W_1$ - log of initial number of articles

$\text{Log}_e W_2$ - log of final number of articles after a specific period of interval

T_2-T_1 - the unit difference between the initial time and the final time

Doubling Time (DT) = $0.693/R$

Therefore,

$$\text{Doubling time for articles } Dt(a) = 0.693/1-2^R$$

Table No.3 Relative growth rate (RGR) and Doubling time (DT) of publications

Year	No. of Publications	Cumulative Total	RGR			DT
			W1	W2	(a1 - y2)	
2003	5789	5789		8.663715		
2004	9587	15376	8.663715	9.640563	0.976848	0.709425
2005	11358	26734	9.640563	10.193691	0.553128	1.252875
2006	12652	39386	10.193691	10.581166	0.387475	1.788502
2007	13920	53306	10.581166	10.883804	0.302638	2.289864
2008	17515	70821	10.883804	11.167911	0.284107	2.439222
2009	16966	87787	11.167911	11.382669	0.214758	3.226888
2010	18253	106040	11.382669	11.571572	0.188903	3.668549
2011	20318	126358	11.571572	11.746874	0.175302	3.953178
2012	18209	144567	11.746874	11.881498	0.134624	5.147671

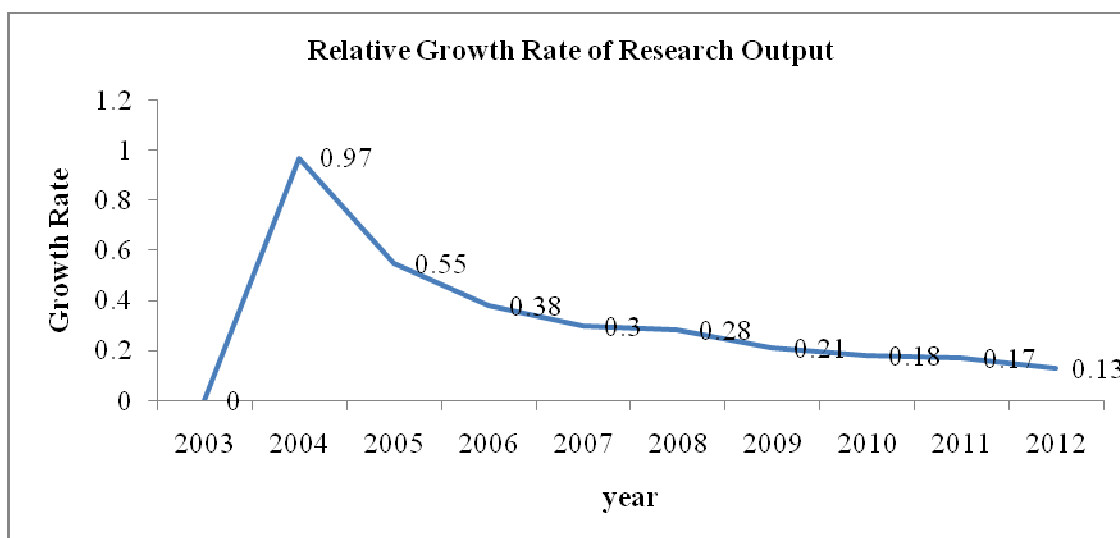


Chart. 3. Relative growth rate (RGR) of publications

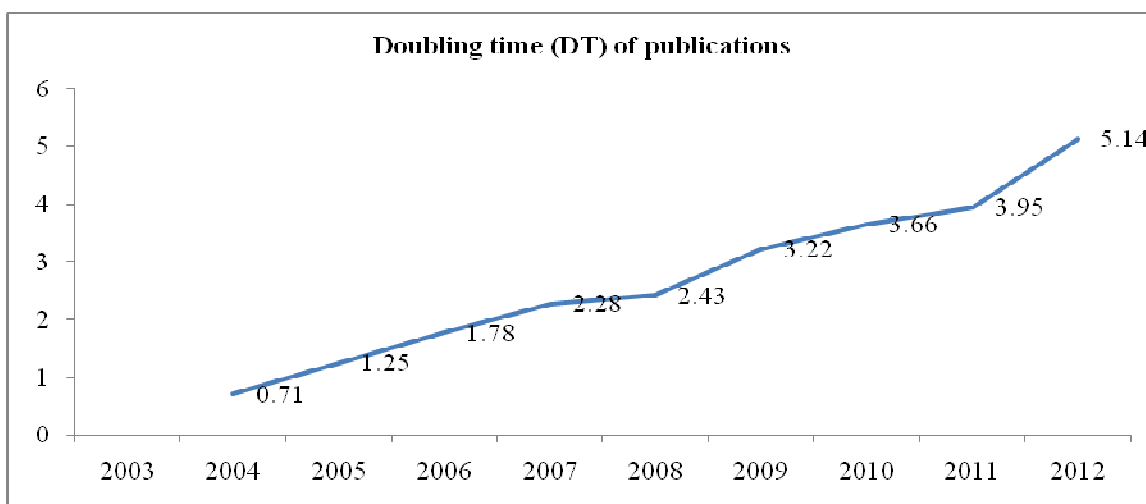


Chart. 4. Doubling time (DT) of publications

It has been observed from Table 3 and Chart 3 & 4 the relative growth rates (RGR) has decreased from 2003 (0.98) to 2012 (0.13) in the span of 10 years. The doubling time (DT) has increased while calculated year wise. The Doubling Time increases from 0.71 in 2003 to 5.15 in 2012.

6.4. Distribution of Top Ten Prolific Authors

Table No.4 Distribution of Top Ten Prolific Authors

S. No.	Author	No. of Publications	Percentage
1	Wang, Wei	223	0.154
2	Baroli, Leonard	160	0.110
3	Wong, Kin Lu	154	0.106
4	Zhang, Ping	147	0.102
5	Harada, Hiroshi	142	0.098
6	Zhang, Yan	139	0.096
7	Li,Wei	130	0.090
8	Wang, Jing	123	0.085
9	Fettweis, Gerhard	122	0.084
10	Liu, Wei	120	0.083

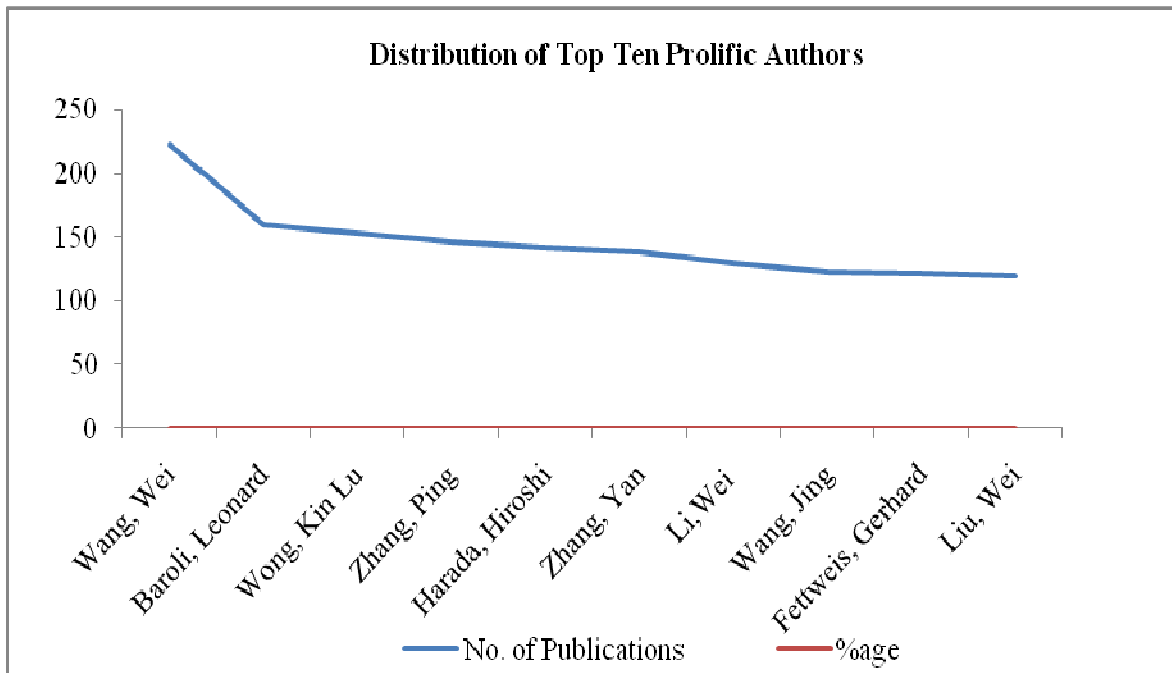


Chart. 5. Distribution of Top Ten Prolific Authors

Table 4 and Chart 5 shows that the rank lists the authors who have contributed more than 80 articles or more are taken into account to avoid a long list. It indicates that the top ten prolific authors in which Wang, Wei is the most productive author contributing 223 articles (0.154 %) followed by Barolli, Leonard with 160 articles (0.110 %) and Wong, Kin Lu with 154 articles (0.106 %) respectively. But, the lowest number of articles contributed by Liu, Wei with 120 (0.083 %) articles among the top ten authors.

6.5. Top Ten Institutional Distribution of Authors

Table No.5 Institutional Distribution of Authors

S. No.	Author Affiliation	No. of Publications
1	Institute of Electrical and Electronics Engineering (IEEE)	1248
2	Southeast University	508
3	Nokia Research Center	502
4	School of EEE, Nanyang Technological University	290
5	School of Electrical and Computer Engg, Georgia Inst. Of Technology	282
6	Beijing University	238
7	Tokyo Institute of Technology	226
8	School of Computer Engg, Nanyang Technological University	224
9	IMEC	214
10	National Institute of Information and Communications Technology	212

Table 5 and Chart 6 depicts that the top ten prolific institutions. Findings revealed that Institute of Electrical and Electronics Engineering (IEEE) with 1248 articles is the most productive institutions in the field of mobile technology literature.

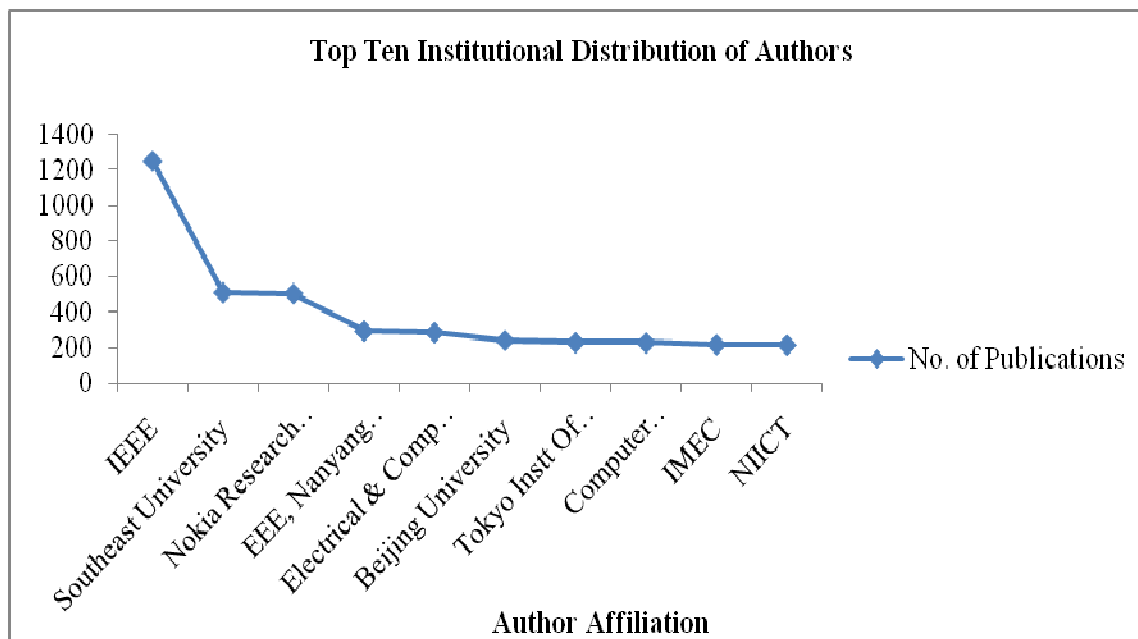


Chart. 6. Top Ten Institutional Distribution of Authors

6.6 Country - wise Top Ten Distribution of Publications

Table No.6 Geographical Distribution of Publications

S. No.	Country	No. of Articles	Percentage
1	China	33010	22.83
2	USA	19166	13.26
3	Japan	11730	8.11
4	Korea	9855	6.82
5	Germany	7923	5.48
6	Taiwan	6340	4.38
7	India	6150	4.25
8	UK	6015	4.16
9	France	4286	2.96
10	Canada	3756	2.60

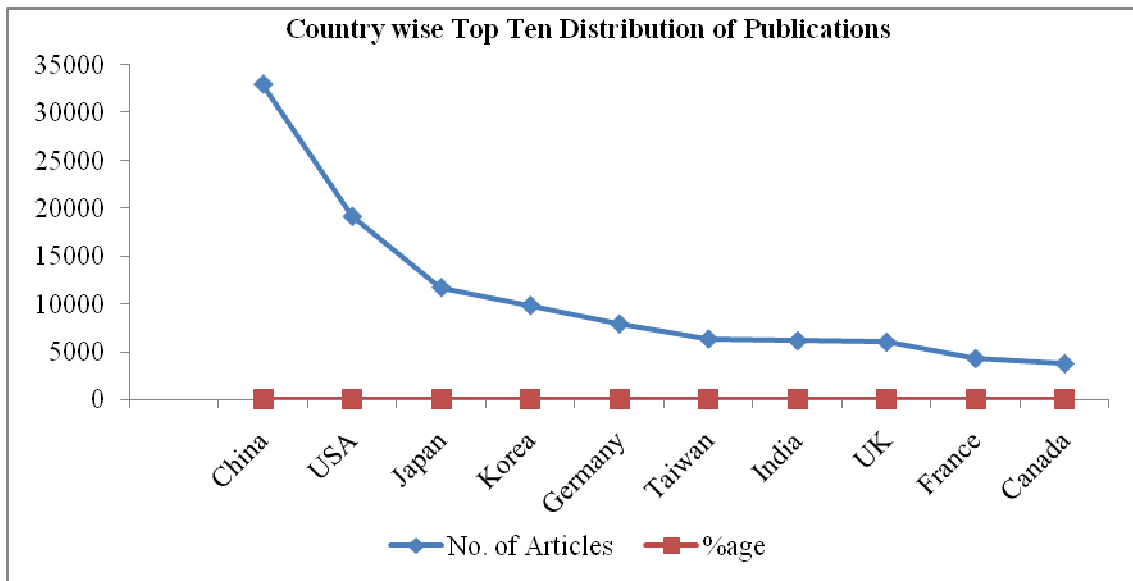


Chart. 7. Country wise Top Ten Distribution of Publications

An attempt has been made to study the country wise top ten distributions of publications in Table 6 and Chart 7. It is revealed that 22.83% of the total articles were contributed by the authors from China. USA has got second rank to contribute in this field with 13.26% followed by Japan 8.11% of articles and Korea 6.82% of articles respectively. It is also important to know that out of ten top countries, India was the seventh place contributed 6150 articles. It was noticed that the lowest (2.60 %) 3756 articles were contributed by Canada among the top ten countries.

6.7. Top Ten Language wise Distributions

Table No. 7 Top Ten Language wise distributions

S. No.	Language	No. of Articles	Percentage
1	English	138965	96.12
2	Chinese	4533	3.13
3	Japanese	391	0.27
4	Russian	204	0.14
5	German	198	0.14
6	Korean	53	0.04
7	French	48	0.03
8	Portuguese	45	0.03
9	Spanish	43	0.03
10	Ukrainian	17	0.01

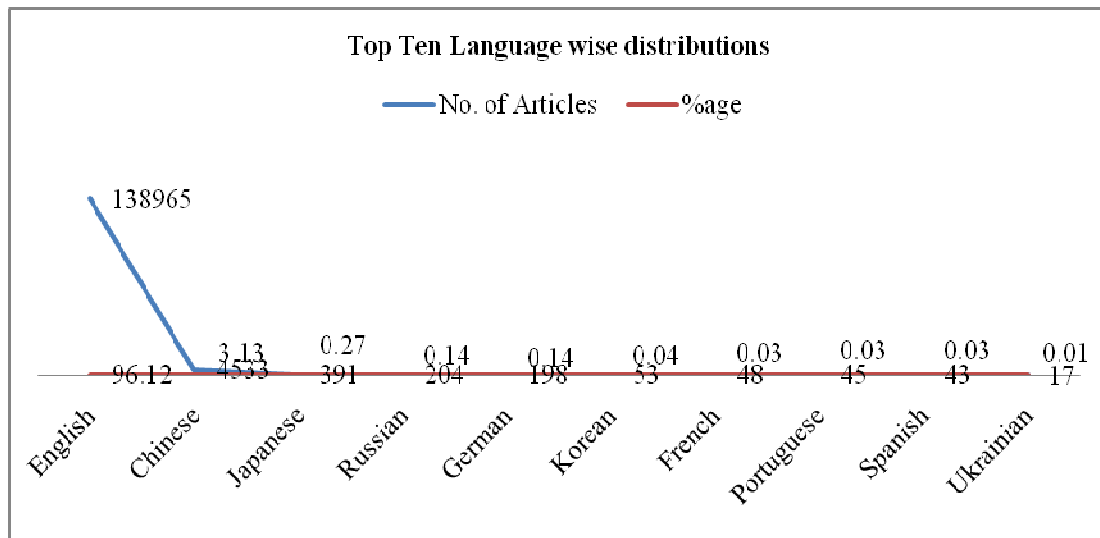


Chart. 8. Top Ten Language wise distributions

Table 7 and Chart 8 shows that the maximum number of articles have been published in English Language (96.12%), followed by Chinese 3.13% articles, Japanese 0.27% articles and 0.14% in Russian and German.

6.8. Top Ten Subject wise distribution of Publications

Table 8 Top Ten Subject wise distribution of Publications

S. No.	Subject	No. of Articles	Percentage
1	Wireless Telecommunication Systems	20585	14.24
2	Mobile Telecommunication Systems	18423	12.74
3	Wireless Networks	15320	10.60
4	Mobile Computing	12782	8.84
5	Computer Simulation	11688	8.08
6	Algorithms	10707	7.41
7	Mobile Devices	8890	6.15
8	Mobile Robots	7283	5.04
9	Telecommunication Networks	6480	4.48
10	Internet	6473	4.48

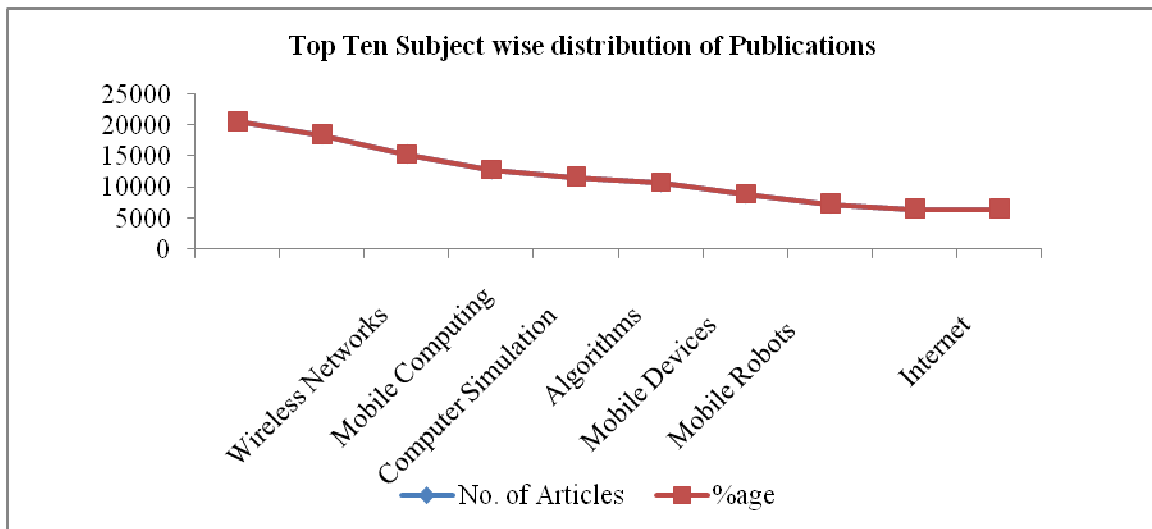


Chart.9. Top Ten Subject wise distribution of Publications

Table 8 and Chart 9 depicts that the highest number of articles contributed on Wireless Communication Networks among the top ten subject wise distributions of publications during this study period and followed by Mobile Communication Networks constituted second rank and followed by Wireless Networks. The fourth highest articles belonged to the subject Mobile Computing.

7. Findings and Conclusion

Scientometric and Bibliometric analysis is an appropriate tool to evaluate the trends and development of scholarly peer-reviewed scientific publications. It was found that from this study that mobile technology is a developing area in communications and the major findings are: The relative growth rates (RGR) has decreased from 2003 (0.98) to 2012 (0.13) in the span of 10 years. The doubling time (DT) has increased from 0.71 in 2003 to 5.15 in 2012. The highest numbers of articles (22.83%) were contributed by the authors from China. USA has got second rank to contribute in this field with 13.26% followed by Japan 8.11% of articles and Korea 6.82% of articles respectively. It is also important to know that out of ten top countries, India was the seventh place contributed 6150 articles. The maximum number of articles have been published in English Language (96.12%), followed by Chinese 3.13% articles, Japanese 0.27% articles and 0.14% in Russian and German. The highest number of articles contributed on Wireless Communication Networks among the top ten subject wise distributions of publications during this study period and followed by Mobile Communication Networks constituted second rank and followed by Wireless Networks. The fourth highest articles belonged to the subject Mobile Computing.

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