GROWTH AND DEVELOPMENT OF PUBLICATIONS ON CLOUD COMPUTING: A SCIENTOMETRIC STUDY

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Abstract: The present study examines the growth and development of publication out put in the field of "Cloud Computing". Cloud Computing is an emerging technology which provides a lot of benefits to research and development activities especially in the field of Library and Information Science. In order to carry out the research, the related data were extracted from "Web of Science" database. The major objective of the study is to find out the number of publications related to "Cloud Computing" which are indexed in "Web of Science" during 2001-2010 only. The Scientometric analysis was applied to investigate and fulfill the objectives. It is found that 510 records related to Cloud Computing in "Web of Science' were appeared during the periods. It is found that the author "Buyya.R" and the country "USA" have produced the majority of records. Further, the study is also recommended that the teachers, research scholars, scientists should involve in the research activities related to "Cloud Computing" to increase the productivity of literature on "Cloud Computing"

Key words: Cloud Computing, Scientometrics, Web of Science

Introduction

The Cloud Computing has created a great deal of excitement as a key emerging technology. Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.[1] Cloud Computing is the fastest growing part of Information Technology. It gives tremendous benefits to customers of all sizes. Cloud Computing gives benefits like improves average server utilization, reduces power consumption, increases control over resource allocations, and improves application &data availability.[2] Scientometrics of published articles in refereed academic journals has been conducted in a variety of professional fields.[5]

Literature Review

Review of literature is an important for any research. It helps to analysis the growth of literature in a particular field. It enables the researcher to find out the contributions made

by various authors, type of publication, sources of publications and year of publication. Further, it also finds the publications available in multilingual languages. The research area "Cloud Computing" is an emerging technology and has wider applications. Summarily, a number of studies on "Scientometrics" have been carried out based on the data extracted from the database. The present study also highlights some of the studies. Begum and Rajendra (1990)[4] analyzed the Indian Zoological science literature covering the period 1975-1984 by extracting the data from 'Indian Science Abstracts'. The study identified the authorship pattern, collaborative research trend in the field of Zoological sciences and compared the results with the authorship pattern in other scientific fields. Karisiddappa, Maheswarappa and Shirol (1990)[7] studied the authorship pattern based on the data collected from 'Psychological Abstracts' for the year 1988 and found that multiple authorship and varies from one subject to another subject. Arunachalam (1991) [3] found that Liquid Crystal literature is developing and the share of Soviet Union is rising fast and the study was based on the bibliographic data from 430 journals articles on Liquid Crystals covered in "Physical Abstracts". The analysis of 'Science Citation Index' annual files for the years1987-1989 and 1992-1995 by Stefaniak (1998) [9] found that considerable increase in the number of publications were accompanied by the geographic development of co-authorship after the 1980's political changes in Poland. A similar study was conducted by Jacobs (2001) [6] covering the period 1992-1996, which demonstrates that there is a direct relationship between status and publication productivity. Further there are significant differences in productivity between areas of sciences but that there is no direct relationship between institutional funding and productivity**.**Macias-Chapula (2000**)** [8] analyzed AIDS research contributions from Haiti with the help of AIDSLINE database for the period 1980-1998 to identify the growth pattern in AIDS literature, as well as the types of documents published, authorship pattern, institutional affiliation of authors and subject contents.

Objectives of the Study

The major objectives of the present research study are to examine growth of publications on "Cloud Computing" by using Scientometric analysis

- To study the number of publications produced by the author
- To find out the number of publications produced during the years 2001-2010
- To analysis the number of publications produced in various languages
- To ascertain the type of publications produced during the perods
- To find out the number of publications produced by the institution
- To study the number of publications appeared in the various journals.
- To find out the number of publications produced by the country

Methodology

The Scientometic analysis was used in this study to investigate publications related to "Cloud Computing" that have been indexed by Web of Science only during the years

2001-2010.Web of Science provides researchers, administrators, academics and students with quick, powerful access to the world's leading citation database. In order to satisfy the objectives, the data were collected from the Web of Science database during the month of May 2011. HistCite software was used to extract the data from the database and to analysis the data for the study.

Data Analysis and Findings

Distribution of Publication by Author

The study was analyzed the publications of first ten authors which are indexed in "Web of Science" database and same is shown in Table 1.

Table 1
Distribution Of Publications by Auhtor

S.No	Name of Author	No. of Publications	%	Rank
1.	Buyya R	8	1.6%	1
2.	Barker HW	5	1.0%	2
3.	Raisanen P	5	1.0%	2
4.	Chen JJ	4	0.8%	4
5.	Rodero-Merino L	4	0.8%	4
6.	Vaquero LM	4	0.8%	4
7.	Yang Y	4	0.8%	4
8.	Yuan D	4	0.8%	4
9.	Jin H	3	0.6%	10
10.	Langmead B	3	0.6%	10

It is found from table 1 that the majority of publications 8 (1.6%, Rank 1) were produced by the first author during the period, the second position was shared by second and third author 5 (1%, Rank 2), it is followed by 4-8 authors they produced 4 records each (0.8%, Rank 4) and 3, (0.6%, Rank 10) of publications were contributed by last two authors.

Distribution of Publication by Year

The study is analyzed the publications by year wise and the same is given in Table 2.

Table 2
Distribution of Publication by Year

S.No	Year	No. of Publications	%	Rank
1.	2001	13	2.8%	8
2.	2002	12	2.6%	10
3.	2003	20	4.4%	6
4.	2004	14	3.1%	7
5.	2005	22	4.8%	3

6.	2006	13	2.8%	8
7.	2007	22	4.8%	3
8.	2008	21	4.6%	5
9.	2009	102	22.3%	2
10.	2010	167	36.5%	1

It is found from table 2 that most number of Publications (167, 36.5%, Rank 1) were produced in the year 2010.It is followed by 2009 102(22.3%, Rank 2), 22(4.8% Rank 3) publications were produced in 2005 and 2007 each . It is further found that less number of 12(2.6%, Rank 10) publications were produced in the year 2002.

Distribution of Publications by Language

The study is analyzed to find out the number of publications produced in various languages and the same is given in Table 3.

Table 3
Distribution of Publications by Language

S.No	Language	No. of Publications	%	Rank
1.	English	506	99.2	1
2.	Chinese	2	0.4%	2
3.	Polish	1	0.2%	3
4.	Portuguese	1	0.2%	3

It is found from table 3 that most number of the publications 506(99.2%, Rank 1) were produced in English language. It is further observed that only 2(0.4%, Rank 2) of publications were published in Chinese and 1(0.2%) of publication was produced in Polish and Portuguese each.

Distribution of Publications by Types of Documents

The study is also ascertained to find out the type of publications published on "Cloud Computing" and the same is given in figure1.

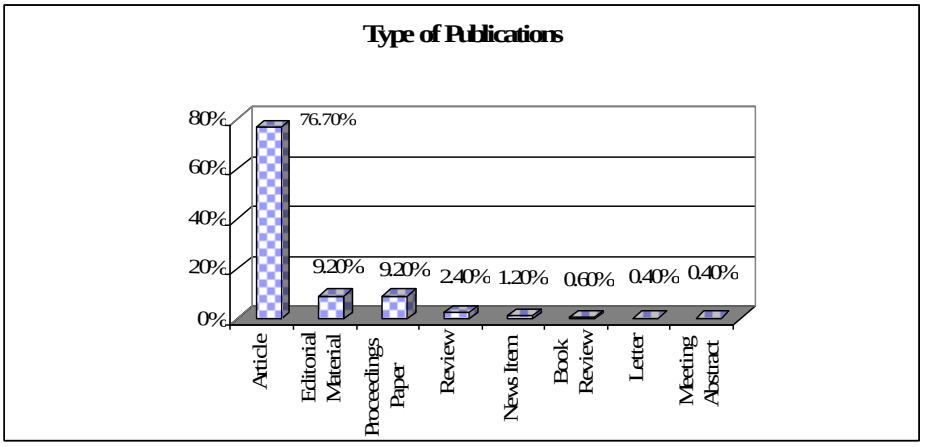

Figure 1. Type of Publications

It is found from figure 1 that most number of publications (76.7%, Rank 1) were produced in the form of "Articles" , 9.2%, Rank 2 were published as "Editorial Materials" and "Proceedings Paper". It is further found that 2.4%, Rank 4 of publications were produced in the form of "Review". It is only 0.4% of publication was produced in the form of "Letter" and "Meeting Abstract" each.

Distribution of Publication by Institution

It is further analyzed to find out the number of publications produced by various institutions and the same is given in figure 2.

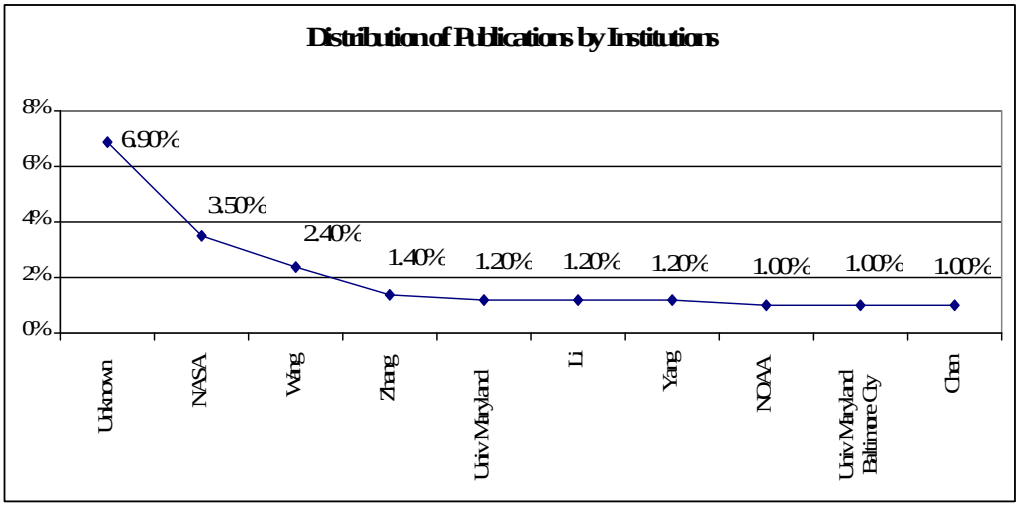

FIGURE 2.PUBLICATIONS BY INSTITUTIONS

It is found from figure 2 that majority of (6.9%, Rank 1) publications were produced by "Unknown" institutions on "Cloud Computing" and NASA has produced (3.5%, Rank 2) publications. It is followed by (2.4%, Rank 3) publications were produced by Wang, 1.4%, Rank 4 publications were also produced by Zhang. Further, it found that a very few publications (1.0%, Rank 10) were produced by NOAA, Univ Maryland Baltimore City and Chen each.

Distribution of Publication in the Journals

The publication on "Cloud Computing" in the journals is analyzed and the same is given in Table 6.

Table 5
Publication in the Journals

S.No	Name of the Journal	No. of Publications	%	Rank
1.	IEEE Internet Computing	21	4.1%	1
2.	Computer	15	2.9%	2
3.	Journal of Geophysical Research-Atmospheres	14	2.7%	3

4.	Astrophysical Journal	12	2.4%	4
5.	Communications of the ACM	10	2.0%	5
6.	Fujitsu Scientific & Technical Journal	10	2.0%	5
7.	Future Generation Computer Systems-The International Journal of Grid Computing-Theory Methods and Applications	10	2.0%	5
8.	Journal of Internet Technology	8	1.6%	9
9.	Astronomy & Astrophysics	7	1.4%	10
10.	Computer Communication Review	7	1.4%	10

It is found from table 5 that "IEEE Internet Computing" has published more number of publications 21(4.1%, Rank 1) on "Cloud Computing", followed by "Computer", published 15 (2.9%, Rank 2). It is further found that 14(2.7%, Rank 3) publications related to "Cloud Computing" have been published in "Journal of Geophysical Research-Atmospheres". It is also showed that 7(1.4%, Rank 10) of publications have been published in both journals "Astronomy and Astrophysics" and "Computer Communication Review".

Distribution of Publications by Country

The study is also focused to analysis the number of publications produced on "Cloud Computing" by country and the same is given in figure 3.

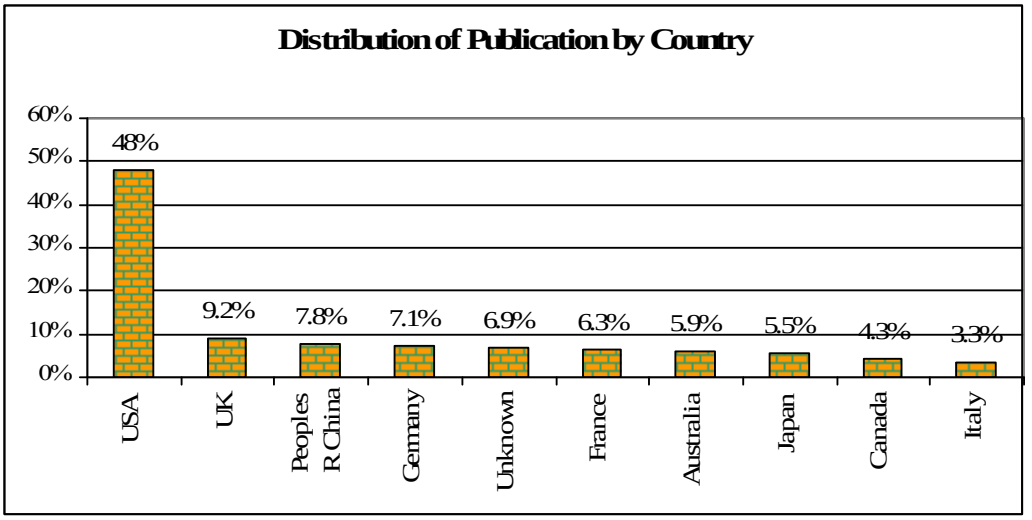

FIGURE 3.DISTRIBUTION OF PUBLICATIONS BY COUNTRY

It is found from table 3 that USA has produced majority (48%) of publications on "Cloud Computing", followed by UK (9.2%), Peoples of R China (7.8%) and Italy have produced less number of publications (3.3%).

Conclusion and Recommendations

It is found from the study that the publication out put on "Cloud Computing "during 2001-2008 was very low when it is compared with 2009-2010.The first author Buyya has

contributed more number of publications. It is surprise to record that unknown organization has contributed most number of publications. When it is compared with other countries, USA has contributed most number of publications. The study is also recommended that the teachers, research scholars, scientists should involve in the research activities related to "Cloud Computing" and increase the growth of literature on the subjects. Since it is an emerging technology, teachers, research scholars, and scientists should increase the growth and development of publication output on "Cloud Computing"

References

Arunachalam, S. Srinivasan, R and Raman V. (1994). International Collaboration in Science: participation by the Asian Giants, Bibliometrics, 30 (1): 7-22.

Begum, Khaiser Jahan and Rajendra, N. (1990). Research Collaboration in Zoological Sciences, IASLIC Bulletin, 35(2): 79-82.

Husein Uzunboylu, Hasan Eris and Zehra, Ozcinar(2009). Results of a citation analysis of knowledge management in education. British Journal of Educational Technology.42 (3) 527-538

Jacobs, Daisy (2001). A bibliometric study of the publication patterns in South Africa 1992-1996, with particular reference to status and funding, Information Research, 6 (3): 9-18.

Karisiddappa, C.R., Maheswarappa, B.S. and Shirol, M.V. (1990). Authorship Pattern and Collaborative Research in Psychology, IASLIC Bulletin, 35(2): 73-78.

Macias-Chapula, Cesar (2000). Aids in Haiti: a bibliometric analysis, Bulletin of Medical Library Association, 88 (1): 56-61.

Stefaniak, Barbara. (1998). International cooperation of Polish Researchers with partners from abroad: a bibliometric study, Bibliometrics, 41 (1-2): 155-167.

http://www.mendeley.com/research/nist-definition-cloud-computing-v15/

http://netseminar.standford.edu/cloud.pdf accessed on 20/10/2011