

Citation Analysis of the Journal IEEE/ACM Transactions on Networking during 1998-2017

V. Swarnamugi¹, J. Santhi² and R. Loganayaki³

¹Research Scholar, Research and Development Centre, DLIS, Bharathiar University, Coimbatore, Tamil Nadu, India

²Librarian, Arumugam Pillai Seethai Ammal College, Thiruppathur, Sivagangai, Tamil Nadu, India

³Librarian, Mannar Thirumalai Naicker College (Autonomous), Madurai, Tamil Nadu, India

E-Mail: vswarnamugi@gmail.com, shanthi_gs04@yahoo.co.in, loganayakivnr@gmail.com

Abstract - This paper presents a citation analysis of articles published in the Journal of IEEE/ACM Transactions on Networking from 1998-2017 is carried out. For the analysis of the study 20 volumes containing 120 issues have been taken up for evaluation. In total 78062 citations have been appended to 2535 articles during the period 1998-2017. Seminar/conference proceeding 41.19 per cent are the major source of information used and continued to follow by Journal 35.39 per cent. Results show that an average number of citations per paper are 32.16. The overall Journal self-citation is calculated as 66.04%. This indicates that the journal commands great repute in its own field and attracts articles pertaining to the high profile areas of research.

Keywords: Bibliometrics, Scientometrics, Authorship pattern, Citation analysis, Journal IEEE/ACM Transactions on Networking

I. INTRODUCTION

The Terms Bibliometrics and Scientometrics were almost simultaneously introduced by Pritchard and by Nalimov and Mulchenko in 1969. While Pritchard explained the term bibliometrics as “the application of mathematical and statistical methods to books and other media of communication” [1]. Nalimov and Mulchenko defined scientometrics as “the application of those quantitative methods which are dealing with the analysis of science viewed as an information process” [2]. These studies have been conducted on journals related mainly to scientific fields and are based principally on various metadata elements such as author, title, subject, citations and so forth. The bibliometric analysis determined the impact of the articles, authors, citation analysis, and document type-wise distributions of citations of publications. Citation analysis is one of the tools for bibliometric study. The development of citation analysis has been marked by the invention of new techniques and measures, the exploitation of new tools and the study of different units of analysis [3]. These trends have led to rapid growth in both the number and types of studies using citation analysis. Citation analysis is one of the popular methods employed in recent years for the identification of core documents and complex relationships between citing and cited documents for a particular research community in geographical proximity. (Thanuskodi 2012) [4]. The study discussed in this journal article provides some of these analyses related to the authorship patterns and citation pattern in the IEEE/ACM Transactions on

Networking published in the field of Engineering and Technology.

II. SCOPE OF JOURNAL IEEE/ACM TRANSACTIONS ON NETWORKING

The journal of IEEE/ACM Transactions on Networking is one of the foremost research journals in the communication and networking field. It is published as a Bimonthly online Electronic Journal. It is published cosponsored by the IEEE communications Society, IEEE computer society and the ACM (Association for Computing Machinery). This journal covers the subjects like network architecture and design, communication protocols, network software, network technologies, network services and applications and network operation management. The scope of the journal includes all topics on communication and networking [5].

III. REVIEW OF LITERATURE

Fagbola, BolanleOluyemisi and AdefunkeAdejoro (2012) [6] have analyzed Citation Pattern of the Nigerian Journal of Horticultural Science from 1990-2005. 240 article and 1865 citations appeared during the study period. The result indicates that Ahmadu Bello University contributed the highest number of articles 72(30%). The National Horticultural Research Institutes (NIHORT) has the highest number of contributors among the 45 (72.6%).46.86% (874reference)of journals occupy the most cited sources in the study period.

Gunasekera, Chamani (2013) [7] has analyzed the citations of Masters Theses on Sociology at the University of Peradeniya submitted from 1995-2012.the study reveals that 12 masters theses (1232) references were found. The study discovered that most of the cited sources were monographs with 692 (56.2%) of the total citations. And followed by journals with 274 (22.2%) of the most commonly cited format. The study observed more than 80% of the resources cited were 10-30 years old. It intended that postgraduate students desire to use old materials than current resources.

Joginder Singh Burman and Sonia Gupta (2014) [8] have analyzed citation analysis of library philosophy and practice (e-journal) from 2008-2012.They analyzed 9966 references

appended, 620 articles from the journal. They reveal that bibliographic forms of cited documents such as journals with 3269 (32.80%) are highly cited by the contributors and newsletters were observed as a very poor cited source with 134 (1.35%). It reveals that single-authorship of cited journals 1575 (48.18%) contributions dominated. It observed the geographical distribution of citations indicated that maximum citations with 904 (27.65%) contributed first place from USA and India has occupied the fourth position with 216 (6.6%) citations. It is found that „African journal of library archive & information science“ secured the first rank for cited more number of times with 132(3.73%).

Vivekanandhan Sand Sivasamy K (2016) [9] have analyzed publications and citations analysis of pollution control research output from Scopus Database during the period 2005-2014. The study observed that the highest number of 17867 (73.01%) Journals publications appended with 519562. Hao, J. had published the highest number of 51 (19.69%) publications 1816 (27.29%) citations, and RCI was 1.39 publications. Out of this maximum number of 16139 (90%), publications are in the English language, followed by Chinese 1280 (7.14%) publications. The degree of collaboration during the period was 0.89, Citation index was 4.26.the journal Federal Register contribute a 1087 (21.83%) publications, 93 (0.1.%) Citations and had an h-index is 5. China has published the highest number of 3846 (28.41%) publications, 43873(18.53%) citations and relative citation index were 0.65.

Chaman Sab, M and Dharani Kumar P (2016) [10] has done citation analysis of annals of library and information studies during the period 2007-2010. The study indicates that the 4 volumes have 2562 citations appended to the 140 articles. The average number of citations per contribution is 18.3. The study observed that the journal articles are the preferred cited sources with the highest percentage of 1811(70.68%). The study shows that Annals of LIS is the leading journal to have (125) citations.

IV. OBJECTIVES OF THE STUDY

1. To find out year wise distribution of citations.
2. To find out the distribution of citations according to bibliographic forms.
3. To find out author wise distribution of citation.
4. To find out observed degree of collaboration.
5. To find out journal self-citation.
6. To observe citation study of the journal.

V. METHODOLOGY OF THE PRESENT STUDY

The data required for the study was collected from the online website of IEEE Explore transactions on networking journal for the period 1998-2017.The reference appended to each paper were download and tabulated. Following sections discuss the analysis of the data collected and presented under the different table heading as per the objectives of the study.

VI. DATA ANALYSIS

TABLE I YEAR WISE DISTRIBUTION OF CITATIONS

| S. No. | Publication Year | No of Articles | Percentage of Articles | No. of Citations | Percentage of Citations | Average Citation per Article |
|--------|------------------|----------------|------------------------|------------------|-------------------------|------------------------------|
| 1 | 1998 | 68 | 2.68 | 1559 | 1.99 | 22.93 |
| 2 | 1999 | 72 | 2.84 | 1695 | 2.17 | 23.54 |
| 3 | 2000 | 65 | 2.56 | 1530 | 1.96 | 23.54 |
| 4 | 2001 | 65 | 2.56 | 1688 | 2.16 | 25.97 |
| 5 | 2002 | 65 | 2.56 | 1650 | 2.11 | 25.38 |
| 6 | 2003 | 76 | 2.99 | 2067 | 2.65 | 27.20 |
| 7 | 2004 | 89 | 3.51 | 2375 | 3.04 | 26.69 |
| 8 | 2005 | 106 | 4.18 | 2946 | 3.77 | 27.79 |
| 9 | 2006 | 107 | 4.22 | 3010 | 3.86 | 28.13 |
| 10 | 2007 | 124 | 4.89 | 3402 | 4.36 | 27.44 |
| 11 | 2008 | 113 | 4.46 | 3305 | 4.23 | 29.25 |
| 12 | 2009 | 151 | 5.96 | 4721 | 6.05 | 31.26 |
| 13 | 2010 | 150 | 5.92 | 4631 | 5.93 | 30.87 |
| 14 | 2011 | 141 | 5.56 | 4194 | 5.37 | 29.74 |
| 15 | 2012 | 149 | 5.88 | 4977 | 6.38 | 33.40 |
| 16 | 2013 | 147 | 5.80 | 4770 | 6.11 | 32.45 |
| 17 | 2014 | 148 | 5.84 | 4931 | 6.32 | 33.32 |
| 18 | 2015 | 147 | 5.80 | 4891 | 6.27 | 33.27 |
| 19 | 2016 | 280 | 11.06 | 9707 | 12.43 | 34.67 |
| 20 | 2017 | 272 | 10.73 | 10013 | 12.84 | 36.81 |
| Total | | 2535 | 100 | 78062 | 100 | 30.79 |

A. Year Wise Distribution of Citations

Table I year-wise distribution of citation in Journal IEEE/ACM Transactions on Networking during the period 1998 to 2017 in 120 issues of 20 volumes is 78062. Table I also represents the year-wise distribution of citation during the period of study. It reveals that a total of 78062 citations are appended to 2535 articles. Average Citation per Article is 30.79.

B. Distribution of Citations According to Bibliographic Forms

Table II shows the analysis of citations according to bibliographic forms of the 78062 citations, seminar/conference proceeding are 32156 (41.19 percent) citations, followed by Journals (IEEE Journals and other journals included) 27626 (35.39 percent), Online Resources 5474 (2.88 percent), book 5414 (6.94 percent) others (such as meetings reports and unknown sources) 1043(3.92 percent), reports 1185(1.52 percent).

TABLE II DISTRIBUTION OF CITATIONS ACCORDING TO BIBLIOGRAPHIC FORMS

| S. No. | Bibliographic Form | No. of Citations | Percent |
|--------|--------------------------------|------------------|---------|
| 1 | Books | 5414 | 6.94 |
| 2 | IEEE Journals | 15464 | 19.81 |
| 3 | Other journals | 12162 | 15.58 |
| 4 | Seminar/Conference proceedings | 32156 | 41.19 |
| 5 | Workshop | 2252 | 2.88 |
| 6 | E.Resources | 5474 | 7.01 |
| 7 | Tech.Report | 986 | 1.26 |
| 8 | Records | 1185 | 1.52 |
| 9 | Thesis | 128 | 0.16 |
| 10 | Ph.D.Dissertation | 372 | 0.48 |
| 11 | Standards | 288 | 0.37 |
| 12 | Others | 2181 | 2.8 |
| Total | | 78062 | 100 |

TABLE III AUTHOR WISE DISTRIBUTION OF CITATION

| Year | Single | Two | Three | Four | Five | Six<More | Unknown | Total |
|---------|--------|-------|-------|-------|------|----------|---------|-------|
| 1998 | 422 | 520 | 320 | 98 | 47 | 20 | 132 | 1559 |
| 1999 | 445 | 617 | 351 | 123 | 39 | 18 | 102 | 1695 |
| 2000 | 439 | 482 | 339 | 97 | 34 | 17 | 122 | 1530 |
| 2001 | 441 | 609 | 320 | 127 | 46 | 33 | 112 | 1688 |
| 2002 | 389 | 551 | 335 | 141 | 56 | 36 | 142 | 1650 |
| 2003 | 425 | 712 | 458 | 209 | 64 | 51 | 148 | 2067 |
| 2004 | 450 | 825 | 524 | 212 | 93 | 66 | 205 | 2375 |
| 2005 | 586 | 1015 | 668 | 288 | 98 | 51 | 240 | 2946 |
| 2006 | 535 | 976 | 699 | 351 | 126 | 76 | 247 | 3010 |
| 2007 | 639 | 1119 | 857 | 382 | 138 | 89 | 178 | 3402 |
| 2008 | 559 | 1056 | 863 | 433 | 158 | 84 | 152 | 3305 |
| 2009 | 764 | 1370 | 1207 | 647 | 251 | 181 | 301 | 4721 |
| 2010 | 777 | 1372 | 1161 | 638 | 224 | 171 | 288 | 4631 |
| 2011 | 587 | 1175 | 1123 | 586 | 275 | 201 | 247 | 4194 |
| 2012 | 604 | 1310 | 1323 | 751 | 347 | 240 | 402 | 4977 |
| 2013 | 544 | 1299 | 1251 | 746 | 328 | 272 | 330 | 4770 |
| 2014 | 633 | 1246 | 1268 | 713 | 345 | 326 | 400 | 4931 |
| 2015 | 758 | 1238 | 1218 | 810 | 366 | 177 | 324 | 4891 |
| 2016 | 1895 | 2371 | 2274 | 1483 | 766 | 133 | 785 | 9707 |
| 2017 | 1262 | 2116 | 2334 | 1652 | 1005 | 773 | 871 | 10013 |
| Total | 13154 | 21979 | 18893 | 10487 | 4806 | 3015 | 5728 | 78062 |
| Percent | 16.85 | 28.16 | 24.2 | 13.43 | 6.16 | 3.86 | 7.34 | 100 |

C. Author Wise Distribution of Citation

The authors are classified according to their citations that are published. The total references cited by scientists are calculated to 78062 over the study period. It could be noted

that two authored citation rank first in order sharing 28.16 percent of the total citations. The year wise analyses show that the performance of two authored citations is better in almost all years. The three authored citation follows the second in order taking 24.2% of the total citations.

D. Degree of Collaboration

Table IV explains the degree of collaborations in publications during the study period.

TABLE IV DEGREE OF COLLABORATION

| Year | Degree of Collaboration |
|-----------|-------------------------|
| 1998-2007 | 0.78 |
| 2008-2017 | 0.85 |
| Over all | 0.83 |

The first phase of the study period (1998 to 2007) has registered a great level of collaboration that is calculated to 0.78 %. The second phase of the study period (2008 to 2017) has recorded a 0.85 % level of collaboration, which is greater than the first phase. Whereas the overall study period revealed 0.83 level of collaboration in publications during the study period.

E. Distribution of Journal Self Citation

TABLE V DISTRIBUTION OF JOURNAL SELF CITATION

| Distribution of Journal Self Citation | | | |
|---------------------------------------|----------------------|-----------------------|---------|
| Year | No. of contributions | No. of self-citations | Percent |
| 1998 | 68 | 54 | 79.41 |
| 1999 | 72 | 46 | 63.88 |
| 2000 | 65 | 47 | 72.31 |
| 2001 | 65 | 46 | 70.76 |
| 2002 | 65 | 43 | 66.15 |
| 2003 | 76 | 50 | 65.78 |
| 2004 | 89 | 63 | 70.78 |
| 2005 | 106 | 73 | 68.86 |
| 2006 | 107 | 74 | 69.15 |
| 2007 | 124 | 79 | 63.71 |
| 2008 | 113 | 73 | 64.6 |
| 2009 | 151 | 104 | 68.87 |
| 2010 | 150 | 94 | 62.66 |
| 2011 | 141 | 84 | 59.57 |
| 2012 | 149 | 89 | 59.73 |
| 2013 | 147 | 86 | 58.5 |
| 2014 | 148 | 96 | 64.86 |
| 2015 | 147 | 102 | 69.38 |
| 2016 | 280 | 185 | 66.07 |
| 2017 | 272 | 186 | 68.38 |
| Total | 2535 | 1674 | 66.04 |

Table V records the year-wise distribution of Journal Citation. It is noted that the year 1998 comes in the first order of JSC accounts to 79.41 %. The second and third rank is attained by 2000 & 2004 by accounting 72.31 &

70.78 %. The overall Journal Self Citation is 66.04 % of the journal possibly indicates that the journal commands great repute in its own field and attracts articles pertaining to the high profile areas of research.

F. Citation Study

Table VI reveals present data on the range and percentage of references per paper. It is clear that the papers having references ranging from 21 to 30 form the largest group, that is 974 (38.42 percent) and papers having references ranging from 1 to 20 from the lowest group that is 406 (16.02 percent).

TABLE VI CITATION STUDY

| Year | No. of Citations | | | | Total |
|---------|------------------|-------|-------|--------------|-------|
| | 1-20 | 21-30 | 31-40 | 41 and above | |
| 1998 | 23 | 33 | 10 | 2 | 68 |
| 1999 | 29 | 31 | 8 | 4 | 72 |
| 2000 | 26 | 23 | 13 | 3 | 65 |
| 2001 | 19 | 32 | 9 | 5 | 65 |
| 2002 | 22 | 26 | 13 | 4 | 65 |
| 2003 | 21 | 33 | 14 | 8 | 76 |
| 2004 | 20 | 46 | 15 | 8 | 89 |
| 2005 | 24 | 48 | 19 | 15 | 106 |
| 2006 | 23 | 47 | 29 | 8 | 107 |
| 2007 | 34 | 47 | 33 | 10 | 124 |
| 2008 | 24 | 41 | 29 | 19 | 113 |
| 2009 | 19 | 58 | 49 | 25 | 151 |
| 2010 | 22 | 65 | 40 | 23 | 150 |
| 2011 | 17 | 66 | 42 | 16 | 141 |
| 2012 | 8 | 51 | 64 | 26 | 149 |
| 2013 | 14 | 55 | 50 | 28 | 147 |
| 2014 | 14 | 53 | 48 | 33 | 148 |
| 2015 | 18 | 51 | 42 | 36 | 147 |
| 2016 | 18 | 100 | 81 | 81 | 280 |
| 2017 | 11 | 68 | 103 | 90 | 272 |
| Total | 406 | 974 | 711 | 444 | 2535 |
| Percent | 16.02 | 38.42 | 28.05 | 17.51 | 100 |

VII. FINDINGS AND CONCLUSION

Citation analysis is a measurable method that transcends limited needs and assures that core collections representing specific disciplines are in the journal collections of academic libraries. This study has highlighted quantitatively the contributions made by the researchers during the year 1998-2017 as on journal IEEE/ACM Transactions on Networking. In this study observed that number of citations per year varied from a minimum of 1530 citations to a maximum of 10013 citations. The average number of citations per article is calculated as 30.79. The overall form-

wise distribution is calculated among 78062 citations, the Journal is cited as references are 27626 (35.39 %) and Seminar/Conference proceedings of references are 32156 (41.19%). This shows that the authors have mostly cited from the Seminar/Conference proceedings. The authorship citation encourages the journal publications, particularly above two authored combination, gets 21979 (28.16%) respectively whereas the single-authored citation is 13154 (16.85%). The degree of collaboration is 0.83. The overall Journal self-citation is calculated as 66.04%. This indicates that the journal commands great reputation in its own field and attracts articles pertaining to the high profile areas of research. Its observed references ranging from 21_30 form the largest group 974 (38.42%). It can be concluded that The Journal IEEE/ACM Transactions on Networking is most ideal journal for scholarly communication and publish the research work in the field of Networking and communication field for the researchers around the global level.

REFERENCES

- [1] Pritchard, A. (1969). Statistical bibliography or bibliometrics. *Journal of documentation*, 25(4), 348-349.
- [2] Nalimov, V. V., & Mulchenko, B. M. (1969). *Scientometrics. Studies of science as a process of information. Moscow: Science.*
- [3] https://shodhganga.inflibnet.ac.in/bitstream/10603/94510/7/07_chapter%203.pdf
- [4] Thanuskodi, S. (2012). Citation analysis of doctoral research in botany submitted to Annamalai University. *International Journal of Library Science*, 1(1), 8-12.
- [5] <http://ieeexplore.ieee.org/xpl/aboutJournal.jsp?punumber=90>
- [6] Fagbola, B. O., & AdefunkeAdejoro, M. (2012). Citation pattern of the Nigerian Journal of horticultural science from 1990-2005. *Library Philosophy and Practice*, <http://digitalcommons.unl.edu/libphilprac/715>.
- [7] Gunasekera, C. (2013). Citation analysis of masters theses: As a tool for collection development in academic libraries. *Journal of the University Librarians Association of Sri Lanka*, 17(2), 88-103.
- [8] Joginder Singh Burman & Sonia Gupt A (2014). Citation analysis of library philosophy and practice (e-journal) from 2008-2012. *E-Library Science Research Journal*, 2(12). <http://oldlsrj.lbp.world/UploadedArticles/367.pdf>.
- [9] Vivekanandhan, S., Sivasamy, K., & Prabhakar, S. Publications and Citations Analysis of Pollution Control Research Output from SCOPUS Database: A Scientometrics Analysis. *International Journal of Next Generation Library and Technologies*, 2(3). <http://www.ijnlgt.com/files/v2i3/Vivekanandhan.pdf>.
- [10] Chaman Sab, M., Dharani Kumar, P., & Biradar, B. S. (2016). Citation Analysis of Annuals of Library and Information Studies–2007–2010. *International Journal of Information Studies*, 6(3), 77-90. http://ijlis.org/img/2016_Vol_6_Issue_3/77-90.pdf.