Authorship Pattern and Collaborative Research in Rainwater Harvesting

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Abstract

The study presents the trends in authorship pattern and authors collaborative research in Rainwater Harvesting with a sample of 959 articles during the period 2007-2016. Multi authored articles are dominant i.e. 878 (91.5%). The mean value for the overall degree of collaboration for the 2007-2016 is found to be 0.91, the collaboration index increased from 2.7 in 2007 to 3.59 in 2016 with an average of 2.75. The collaborative co-efficient for the year 2007 is 0.64 which increased gradually to 0.68 in 2016 with an average of 0.58. The total average number of authors per paper is 3.81 and the average productivity per author is 0.26. The most prolific author is Mahmoud S.H who contributed 7 publications followed by Lee J.Y.with 6 publications.

Keywords

Authorship pattern, Rainwater harvesting.

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INTRODUCTION

Authorship pattern and productivity are the important parameters in order to study citation analysis. Authorship studies provide valuable information concerning characteristics of authors, their collaboration, assessing and monitoring research activities among others.
Rainwater harvesting is a technology used for collecting and storing rainwater from rooftops, the land surface or rock catchments using simple techniques such as jars and pots as well as more complex techniques such as underground check dams. The techniques usually found in Asia and Africa arise from practices employed by ancient civilizations within these regions and still serve as a major source of drinking water supply in rural areas. Commonly used systems are constructed of three principal components; namely, the catchment area, the collection device, and the conveyance system.

PREVIOUS STUDIES

Elango & Rejendran (2012) have examined the authorship trend and collaboration pattern in Marine Sciences literature. For this purpose, the required data has been collected from the Indian Journal of Marine Sciences published from 2001 to 2010. Khaparde & Pawar (2013) studied the authorship pattern and author's collaborative research in Information Technology with a sample of 17917 articles collect from LISA during 2000-2009. Navaneethakrishnan (2014) in their study focused authorship patterns and degree of collaboration of Sri Lanka in humanities and social science research with a total of 1795 records of publications authored by 3521 authors during the period 1960 – 2012 (inclusive) derived from SCOPUS database. Shivcharan & Kumar (2015) have analyzed Authorship trends and collaborative research are studied in the field of Library & Information Science based on the data collected from Emerald database Library Hi – Tech e-Journal published during the 2005-2015.

METHODS & MATERIALS

The data has been extracted from SCOPUS international multidisciplinary database for database for the present study and the following search strategy has been used in the combined field of Title, Abstract & Keywords. TITLE-ABS-KEY (*rain* AND *water* AND *harvesting*) AND DOCTYPE (*ar*) AND PUBYEAR > *2006* AND PUBYEAR < *2017*

OBJECTIVE OF THE STUDY

1. To identify the authorship pattern of Rainwater Harvesting Research.
2. To identify the year-wise degree of collaboration.
3. To identify the Collaboration Index.
4. To identify the collaboration coefficient.
5. To study author productivity.
6. To identify most prolific contributors.

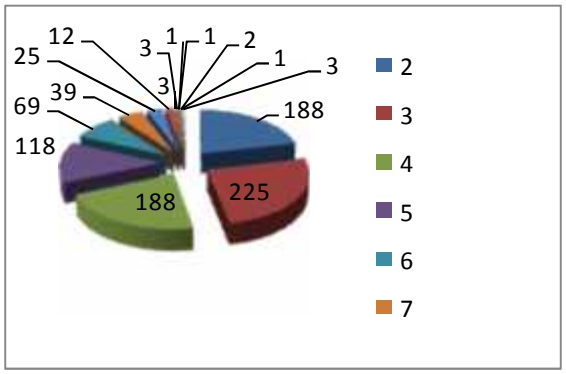
DATA ANALYSIS

Table 1: Authorship Pattern

No. of Authors	No. of Papers	%	Cumulative %
1	81	8.44	8.44
2	188	19.6	28.04
3	225	23.4	51.44
4	188	19.6	71.04
5	118	12.3	83.34
6	69	7.19	90.53
7	39	4.06	94.59
8	25	2.60	97.19
9	12	1.25	98.44
10	3	0.31	98.75
11	3	0.31	99.06
12	1	0.10	99.16
13	1	0.10	99.26
14	2	0.20	99.46
15	1	0.10	99.56
Unidentified	3	0.31	99.87
Total	**959**	**100**	**100**

Table no. 1 identified Number of authors range between 1 and 15. Out of 959 papers, a single author has contributed 81 with 8.44 %, 19.6 % of papers were published with two authors (188), 23.4 of papers were published by three authors (225), 19.6 % of the contributions were published by four authors (188), 12.3 % of the contributions were published by five authors (118), 7.19 % of the contributions were published by six authors (69), 4.06 % of articles were produced by seven authors (39). 4.06 % of articles were published by more than seven authors (39).Remaining 4.97 % papers are contributed with eight and more authors. Almost 0.31 % of contributed unidentified authors.

Fig. 1: Authorship pattern



Collaborative Measures

Measures of collaboration to show the trend towards multiple authorships in a discipline, many studies have used either the mean number of authors per paper, termed the CI by Lawani (1980) and the proportion of multiple authored papers, called Degree of Collaboration (DC) by Subramanyam (1983) as a measure of the strength of collaboration in a discipline. Assuming that these two measures were seems to be inadequate, Ajiferuke et al. (1988), who derived a single measure that incorporates some of the merits of both of the above. Ideally, it is desired that a quantification of collaboration should have a value between 0 and 1, with 0 corresponding to single authored papers, and 1 for the case where all papers are maximally authored, i.e. every publication in the collection has all authors in the collection as coauthors. All the above mentioned formulas to find the collaboration coefficient (CC) value have one or other demerit. To overcome some of the demerits of previously explained measures, and propose a simple modification of CC.

Degree of Collaboration

The Degree of Authors Collaboration is shown in Table No. 2. Various methods have been proposed to calculate the degree of research collaboration. Here in this study the formula proposed by Subramanyam (1983) has been used**.**

The degree of collaboration

$$C = \frac{NM}{Nm+Ns}$$

Where,

C = degree of collaboration
Nm = number of multi author
Ns = number of single author

$$C = \frac{878}{878+81} = 0.91$$

Thus the degree of collaboration (C) 0.91

So, in the study the degree of collaboration during the overall 10 years (2007-2016) is 0.91.

Table 2: Degree of Collaboration

Year	Single Author (NS)	Multi Author (NM)	Total NM+NS	Degree of Collaboration
2007	3	34	37	0.91
2008	8	40	48	0.83
2009	16	68	84	0.80
2010	19	90	109	0.82
2011	10	79	89	0.88
2012	6	90	96	0.93
2013	2	112	114	0.98
2014	5	117	122	0.95
2015	7	134	141	0.95
2016	5	114	119	0.95
Total	81	878	959	0.91 (Mean)

Table 2 degree of collaboration of authors by year-wise falls between 0.91 and 0.95 with an average of 0.91 during the study period. From 2007 to 2016, it has been increased gradually. The multi author articles are higher and predominant than single author. The multi authored articles are highest in year 2015 with 134 papers. Single authored articles are highest in the year 2010 with 19 papers.

Collaboration Index

The simplest of the indices presently employed in the literature is the Collaboration Index, CI, which is to be interpreted merely as the mean number of authors per paper.

$$CI = \frac{\sum_{j=1}^{n} = jf_j}{Zu}$$

Table 3: Collaboration Index

Sl.No.	Year	Single Author	Two Authors	Three Authors	Three & above authors	CI
1	2007	3	6	11	15	2.7
2	2008	8	6	14	20	2.39
3	2009	16	19	8	41	2.5
4	2010	19	21	27	42	2.23
5	2011	10	21	14	43	2.58
6	2012	6	17	31	42	2.58
7	2013	2	22	33	57	2.95
8	2014	5	28	27	61	2.91
9	2015	7	29	30	75	3.09
10	2016	5	19	30	65	3.59
Total		81	188	225	461	2.75

Table 3 reveals that the number of authors per publication has increased from 2.7 in 2007 to 3.59 in 2016 with an average of 2.75 indicating the trend towards multi-authorship publications.

Collaborative Co-efficient

The patterns of co-authorship among different countries have been examined by making use of Collaborative Coefficient (CC) suggested by Ajiferuke et al (1988). The formula used for calculating CC is given below:

$$CC = 1 \quad \frac{\sum_{j=1}^{n} = \left(\frac{1}{j}\right) f_j}{N}$$

Table 4: Collaborative Co-efficient

Sl. No.	Year	Single Author	Two Authors	Three Authors	Three & above authors	CC
1	2007	3	6	11	15	0.64
2	2008	8	6	14	20	0.58
3	2009	16	19	8	41	0.56
4	2010	19	21	27	42	0.56
5	2011	10	21	14	43	0.62
6	2012	6	17	31	42	0.67
7	2013	2	22	33	57	0.68
8	2014	5	28	27	61	0.58
9	2015	7	29	30	75	0.65
10	2016	5	19	30	65	0.68
Total		81	188	225	461	0.58

Table 4 The collaborative co-efficient for the year 2007 is 0.64 which increased gradually to 0.68 in 2016 with an average of 0.58. According to Ajiferuke6 , CC tends to be 0 as single-authored papers dominate and near 1 tends to be co-authored papers dominate. The mean value is 0.58 which indicates the better collaboration rate among the

authors. The total average number of authors per paper is 3.81 and the average productivity per author is 0.26.

Table 5: Author's Productivity

Year	Total no. of Article	Total no. of Authors with %	AAPP*	Productivity per Author
2007	37	137(1.01)	3.70	0.27
2008	48	163(4.44)	3.39	0.29
2009	84	294(8.02)	3.5	0.28
2010	109	353(9.63)	3.23	0.30
2011	89	319(8.70)	3.58	0.27
2012	96	344(9.39)	3.58	0.27
2013	114	451(12.3)	3.95	0.25
2014	122	478(13.0)	3.91	0.25
2015	141	577(15.7)	4.09	0.24
2016	119	547(14.9)	4.59	0.21
Total	**959**	**3663**	3.81	0.26
AAPP-Number of authors/Number of papers Productivity per author = Number of papers/Number of authors				

Table 5 shows that data related to author's productivity. The total average number of authors per paper is 3.81 and the average productivity per author is 0.26. The highest number of author's productivity 577 (15.7) in 2010 and 2015. The minimum number of author's productivity 37 (0.27) in 2007

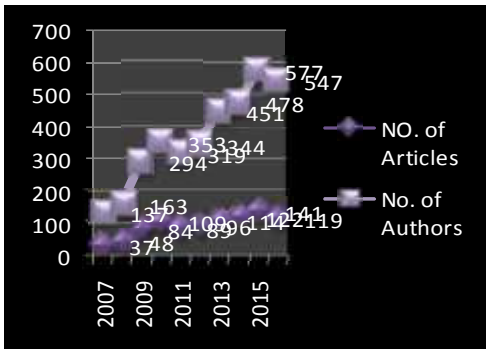


Fig. 2: Author's Productivity

Table 6: To identify most prolific contributors

Sl. No.	Name	No. of Contributions	Country	Rank
1	Mahmoud S.H.	7	Saudi Arabia	1
2	Lee J.Y.	6	South Korea	2
3	Morales-PinzÃ³n T.	6	Spain	2
4	Mwenge Kahinda J.	6	South Africa	2
5	Ward S.	6	UK	2
6	Amin M.T.	5	Pakistan	3
7	Dobrowsky P.H.	4	South Africa	4
8	Makurira H.	4	Zimbabwe	4
9	Ren X.	4	China	4
10	Singh G.	4	India	4
11	Zhang Y.	4	United States	4
12	Andersson J.C.M.	3	Sweden	5
13	Belmeziti A.	3	France	5
14	Campisano A.	3	Italy	5
15	Campos C.J.A.	3	UK	5
16	Chidamba L.	3	South Africa	5
17	Cook S.	3	Australia	5
18	Elhag M.	3	Saudi Arabia	5
19	Ghisi E.	3	Brazil	5
20	Imteaz M.A.	3	Australia	5
21	Islam M.M.	3	Taiwan	5
22	Jebamalar A.	3	India	5
23	Karim M.R.	3	Bangladesh	5
24	Moglia M.	3	Australia	5
25	Peters E.J.	3	TrinidadandTobago	5
26	RockstrÃ¶m J.	3	Sweden	5
27	Tesfuhuney W.A.	3	UK	5
28	Vialle C.	3	France	5
29	Vieira A.S.	3	Brazil	5
30	Wang Y.	3	China	5
31	Welderufael W.A.	3	South Africa	5
32	Zhang X.	3	China	5

Table 6 shows that the most prolific authors are Mahmoud S.H (Saudi Arabia) who published 7 articles followed by Lee J.Y. (South Korea) published 6 articles; Morales-PinzÃ³n T. (Spain) contributed 6 articles, Mwenge Kahinda J (South Africa) contributed 6 articles, Ward S. (UK), Amin M.T (Pakistan) published 5 articles, Dobrowsky P.H (South Africa)published 4 articles.

FINDINGS

1. Multi authored contributions are dominated in the field of Raiwater harvesting from 2007-2016.
2. The mean value for the overall and Degree of Collaboration for the year 2007-2016 is found to be 0.91.
3. Average number of authors per joint authored paper is 2.7.
4. Average Collaboration rate (0.58) shows the better collaboration among the authors.
5. .The total average number of authors per paper is 3.81 and the average productivity per author is 0.26.
6. Mahmoud S.H has identified most productive author

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