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Authorship Pattern and Authorship Productivity in Library and Information Science Literature

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The paper studies the authorship pattern and authorship productivity based on 2216 documents published in Library and Information Science from 1989 to 2023. The data was retrieved from the Web of Science and analyzed through the biblioshiny web app and MS Excel. The average number of citations for the overall research output was 12.49. The highest AGR (74.29) was observed in 1992 but fluctuated throughout the study period. The single authorship pattern dominated the rest of the authorship pattern. DC is registered as 0.50, while CC and MCC were calculated at 0.68 and 0.27, respectively. Hjorland B is the most prolific author who maintained his first position regarding highly published papers, fractionalized authorship, h-index, and g-index. Marshall, J. G. and Rathbun-Grubb, S. had the highest total link strength in the co-authorship network table. Authorship distribution in LIS literature did not satisfy Lotka's Law of Scientific Productivity.

Keywords: Authorship Pattern, Authorship Productivity, Library and Information Science Literature, Average Growth Rate, Collaboration Indicators, Co-authorship Network, Lotka's Inverse Square Law of Scientific Productivity

Introduction

Libraries have been in existence from time immemorial. However, library science gained ground in the second half of the 19th century. The information proliferation in the 20th century and various activities about organization and dissemination led to renaming 'Library Science' as 'Library and Information Science.' The organization, access, and preservation of information in print or digital form are central to the library and information centers. However, some practical experiences, problems at workplaces, implementation of tools, techniques, and technology, user studies, trends in services, and interdisciplinary aspects have often been the subjects of writing in LIS literature. Such literature is important because it keeps LIS professionals and faculty members up-to-date about the subject discipline and such contributions help develop the science from the perspectives of the objectives outlined in the LIS domain.

The article deals with authorship patterns and authorship productivity in Library Science Literature worldwide. The authorship pattern reflects the nature of co-authorship in contribution. Authorship study is one of the essential aspects of bibliometric studies. It deals with finding how authors contribute, assessing gender-wise productivity, determining the collaboration ratio and international productivity, identifying authorship networks, finding prominent authors, and testing the applicability of some hypothetical laws.

Review of literature

Some significant studies have been reproduced below, keeping relevance to the current topic discussed in the paper.

Kumar[1] studied authorship patterns and authorship productivity based on the documents from *the Journal of Documentation. T*he relative growth rate of the articles reduced from 0.79 in 2004 to 0.12 in 2015. The average RGR is calculated as 0.20 while the doubling time for publications increases. LIS literature in *the Journal of Documentation* primarily dealt with topics such as information retrieval (23.99%), information science (11.90%), digital libraries and internet (8.60%), cataloging and classification (8.08%), and user studies (6.57%). The United Kingdom, USA, Finland, and Canada were the

most contributing countries concerning publications output. Single authorship was the central authorship pattern observed. Collaborative Index, collaborative co-efficient, and degree of collaboration indicated less inclination towards multiple authorship. Lotka's inverse square law of authors' productivity fits the publications in *the Journal of Documentation*.

Wijewickrema[2] conducted the bibliometric analysis of the literature published in the LIS domain based on 21 quartile-first journals from the SJR portal during 2010-2019. Around 14910 documents authored by 24578 were the subjects of analysis. Chen Y, Li X, Liu X, Liu Y, Zhang X, and Zhang Y were prolific authors, representing themselves at the top in total publications, citations, link strength of co-authorship, and bibliographic coupling. The co-authorship network shows the nature of collaboration wherein Li X, Liu X, and Chen Y, the top three authors, were observed in the green clusters. The study revealed a higher degree of collaboration during the study period. Only three authors, i.e., Gandomi A, Hamari J, and Maddah-Ali, M A, from the top 20 authors, received more citations. The authors also highlighted influential documents and prominent journals and measured the performance of the institutions. 'Information science,' 'information theory, 'communication,' and 'information retrieval' were the topics of interest which authors mostly preferred to write.

Pratheepan and Suthakaran[3] analyzed 1057 documents from the LIS domain retrieved from the Web of Science during 2009-2019. There was a steady increase in the publication output. USA was the leading contributor with 63 publications and even got the maximum citations, e.g., 4602. People R China, the UK, and Australia are other prolific contributors. Surla D, Chen Y, Wu, B and Zha, X J were the significant authors. *Electronic Library*, *Library High Tech*, and *Journal of the American Medical Informatics Association* have been primarily preferred source journals by the authors for the publications. The documents written by two authors have dominated the authorship pattern followed by single authorship.

Walia and Kaur[4] studied the authorship pattern of library and information science literature in the USA, UK, and India. The results were based on nine LIS journals selected from these countries. Single authorship was prevalent in LIS literature. The average degree of collaboration was 0.75. Males dominated with 57.32% contributions compared with females. The authors from Singapore, Finland, Australia, and Canada dominated UK-based journals, while authors from USA and India dominated USA-based and Indian journals, respectively. LIS faculty members were more productive in terms of publications than LIS professionals.

Barik and Jena[5] studied authors' productivity patterns and the applicability of Lotka's law on selected LIS open-access journals indexed in SCOPUS and available on DOAJ. They found that single authors contributed a maximum (54%) of publications. The collaborative index ranged between 2.42 and 1.59, the degree of collaboration ranged between 0.67 and 0.31, and the collaborative coefficient ranged between 0.43 and 0.19 during 2001-2015. The highest collaboration was in the year 2014. The author predicted that using Pao's method, Lotka's Law did not fit the LIS literature from open-access journals.

Sahoo et al.[6] did an authorship study of 166 highly cited articles (HCA) in library and information science. The study revealed that there were more multi-authored papers than single-authored contributions. The productivity index confirmed that occasional producers produced 85% of articles, intermediate authors produced 13.85%, and large producers produced 10.38%. As the D value was smaller than K-S statistics, i.e., 0.0947, Lotka's inverse square law of scientific productivity applied to HCA in library and information science. Loet Leydesdorff, Lutz Bornmann, and Ludo Waltman were prominent authors based on straight count and equal credit sharing. The straight count method denoted that most authors have the Netherlands as the affiliating country followed by the USA, but equal credit puts the USA ahead.

Ullah and Ameen[7] presented a bibliometric picture of Pakistani authors in LIS research. The growth rate of Pakistani LIS Literature was 63% between 2008 and 2016. Around 166 authors contributed as the first author. The faculty members were ahead (51%) regarding the first authorship. Pakistani authors collaborated mostly with national authors. There was an increasing trend to propagate collaborative research. Garg and Singh[8] analyzed 69 papers in library and information science with the help of data retrieved from Google. The study showed consistent growth in LIS literature. Overall, 1290 authors contributed, most from USA and Canada. About

97% of the documents were cited for one or more than one time.

Several studies deal with quantitative aspects of LIS literature. Buckland[9], Mukherjee[10], Singh & Chander[11], Thavamani[12], Usman & Ewulum[13], Qadri & Shukla[14], attempted to analyze library and information science literature by analyzing individual or group of journals. Some studies studied LIS publications from specific geographic areas. For example, Siddique et al.[15] analyzed LIS publications in the Arab World from 1951 to 2021. Okeji[16] studied the LIS publications to trace the development academic librarians' research output from Nigeria.

Some studies reflect library science literature in a global context. For example, Wang[17]studied patterns and trends of papers by Chinese Library and Information Science authors and compared them with LIS publications worldwide. Jabben et al.[18], comparing LIS literature in the global context, concluded that the USA is the highest producer of LIS publications, followed by the UK and Canada. A decreasing trend in growth was observed from 2003 to 2012. Self-citation behavior was increasing among the authors. China was ahead in producing collaborative publications. Pandita and Singh[19] studied the development of the LIS field globally during 2004-2013. The USA was a prolific producer of LIS research. The authors from North America received the highest citations, followed by authors from Europe and Asia. The tendency towards self-citation is widely prevalent among the authors of LIS publications.

Objectives of the study

The following objectives are set as guidelines to accomplish the study.

1. To find out the authorship pattern in LIS literature
2. To study the degree of collaboration among the authors contributing to the LIS domain.
3. To find out the most prominent authors
4. To test the applicability of the Inverse Square Law of Scientific Productivity

Methodology

The data was downloaded on 13th June, 2023, from Web of Science during 1989-2023. Initially, a topic-wise search was made with the formation of the following query.

TS = ("library and information science")

Further, the search was customized to the Web of Science subject category "Information Science Library Science." The customization of the result brought forth 2216 records. These records were downloaded in packets of 500 records as plain text files and excel files. The Excel program was used to reveal authorship patterns. The five plain text files containing 2216 records were merged using Bibexcel to provide input for the Biblioshiny web app[20]. The app assisted in getting prominent authors' results on the total number of publications, h-index, and g-index. The number of citations to the publication was confirmed through the WoS interface on the same date the data was downloaded.

The nature of collaboration among the authors in Library and Information Science is also studied here. The following measures have been used to achieve this objective.

Annual Growth Rate

The annual growth rate is calculated by the equation given by Santha Kumar and Kaliyaperumal[21] to determine the fluctuation in the productivity of publications.

$$AGR = \frac{end\ value - first\ value}{first\ value} \times 100 \quad \ldots (1)$$

Collaborative Indicator

Degree of Collaboration

The Degree of Collaboration assesses the extent of collaboration in the field, and Subramanyam's[22] (1983) formula is used to gauge the collaboration ratio in LIS literature.

$$C = \frac{Nm}{Nm + Ns} \quad \ldots(2)$$

C = degree of collaboration

Nm = a number of multi-authored papers in the discipline published during a year.

Ns = a number of single-authored research papers in the discipline published during the same year.

Collaborative Coefficient

Collaborative Coefficient proposed by Ajiferuke et al.[23] is a modification over Collaborative Index by Lawani and Degree of Collaboration by Subramanyam.

$$= 1 - \frac{j=1 \sum_{j=1}^{k} \left(\frac{1}{j}\right) fj}{N} \quad \ldots(3)$$

Where

f_j = the number of j-authored research papers published in a discipline during a discipline during a certain period of time;

N = the total number of research paper published in a discipline during a certain period of time; and

k = the greatest number of authors per paper in a discipline

Modified Collaborative Coefficient

Savanur and Srikanth[24] developed the Modified Collaborative Coefficient, a slight modification of the Collaborative Coefficient.

$$K = \frac{A}{A-1}\left[1 - \frac{\sum_{j=1}\left(\frac{1}{j}\right)f_j}{N}\right] \quad \ldots(4)$$

f_j = the number of papers having j authors research papers published in a discipline during a certain period of time

N = the total number of research papers published in a discipline during a certain period of time; and

k = the greatest number of authors per paper in a discipline.

Analysis and Interpretation of Data

Year-wise research output along with average growth rate

Table 1 indicates that all 2216 documents were published during the study period. These documents were cited 27678 times with 12.49 ACPP. The overall h-index is calculated as 68. Most of the documents appeared in 2023, i.e., 115. However, 72 documents published in 2007 received the highest 1861 citations. The ACPP seemed higher in 2006 for 49 documents.

The AGR in Table 1 shows the year wise annual growth rate of Library and Information Science Literature publications. AGR is not consistent as for few years it is positive, while for some years it is negative. The highest AGR, i.e., 74.29, was higher in 1992, while the most negative AGR, -56.52 and -48, were found in 2023 and 2002, respectively. The reason behind the lowest AGR in 2023 is that publications only up to 13th June have been

Table 1 — Year wise productivity in LIS field

Year	TP	TC	ACPP	H-index	AGR
1989	22	61	2.77	5	-
1990	29	215	7.41	6	31.82
1991	35	169	4.83	6	20.69
1992	61	553	9.07	11	74.29
1993	48	452	9.42	10	-21.31
1994	52	502	9.65	9	8.33
1995	37	430	11.62	10	-28.85
1996	45	374	8.31	11	21.62
1997	36	360	10	11	-20.00
1998	48	418	8.71	12	33.33
1999	50	725	14.50	16	4.17
2000	26	376	14.46	10	-48.00
2001	31	293	9.45	10	19.23
2002	33	495	15	11	6.45
2003	45	892	19.82	15	36.36
2004	40	734	18.35	12	-11.11
2005	37	687	18.57	15	-7.50
2006	49	1587	32.39	19	32.43
2007	72	1861	25.85	20	46.94
2008	78	1134	14.58	18	8.33
2009	65	1208	18.58	18	-16.67
2010	87	1461	16.79	21	33.85
2011	79	1811	22.92	25	-9.20
2012	70	1214	17.34	19	-11.39
2013	99	1484	14.99	20	41.43
2014	73	896	12.27	17	-26.26
2015	113	1362	12.05	20	54.79
2016	107	1247	11.65	18	-5.31
2017	98	1471	15.01	17	-8.41
2018	85	1180	13.88	18	13.27
2019	89	785	8.82	15	4.71
2020	114	832	7.30	15	28.09
2021	98	313	3.19	7	-14.04
2022	115	92	0.80	4	17.35
2023	50	4	0.08	1	-56.52
	2216	27678	12.49	68	

considered. By the time 2023 is completed, the AGR could be positive. However, the growth of LIS literature is not consistent.

Authorship pattern in library & information science

Table 2 showcases the authorship pattern observed in Library and Information Science. There is a dominance of single-authored papers followed by two authored papers, three authored papers, four authored papers, and five or more than five authored papers. The papers produced through single authorship are the highest, i.e., 1104. There is less inclination to write highly collaborative articles as five authors and more than five authors have written only 90 papers in the entire research output. However, when the output from all the authorship patterns except a single authorship pattern is combined; the total collaborative output goes to 1112, slightly higher than a single-authored paper.

Collaboration Ratio

Year-wise degree of collaboration, collaborative coefficients, and modified collaborative coefficients

Table 3 denotes The value of degree of collaboration ranges from 0.32 in 1989 to 0.66 in 2023. The average DC is register as 0.50. The value of CC ranges from 0.18 in 1989 to 0.42 in 2023. The average CC is 0.68. The value of MCC ranges from 0.19 to 0.30. The avegare MCC is 0.27. The value 0 indicates the dominance of single authored papers. The increasing value above it shows a treand towards collaboration. As such DC and MCC shows dominance of single authored paper while CC shows a trend toward collaborative co-authorship. Figure 1 provdes line graph of DC, CC, and MCC.

Prominent authors in LIS discipline

Table 4 reflects the 14 most prominent Library and Information Science authors. Hjorland B, with 23

Table 2 — Authorship pattern in Library and Information Science

Year	Single	Two	Three	Four	≥Five	Total
1989	15	4	3	0	0	22
1990	19	9	0	1	0	29
1991	28	6	0	0	1	35
1992	51	9	1	0	0	61
1993	35	11	2	0	0	48
1994	35	13	3	1	0	52
1995	24	9	3	0	1	37
1996	30	12	2	0	1	45
1997	24	10	0	1	1	36
1998	33	11	1	2	1	48
1999	39	9	2	0	0	50
2000	24	1	1	0	0	26
2001	22	6	2	0	1	31
2002	22	8	2	0	1	33
2003	32	8	3	0	2	45
2004	28	11	1	0	0	40
2005	24	12	1	0	0	37
2006	28	11	7	1	2	49
2007	41	21	7	0	3	72
2008	35	25	11	5	2	78
2009	27	19	9	7	3	65
2010	46	21	11	5	4	87
2011	36	20	11	7	5	79
2012	32	18	13	4	3	70
2013	44	29	19	4	3	99
2014	30	24	13	3	3	73
2015	47	34	21	6	5	113
2016	43	41	18	3	2	107
2017	38	30	18	7	5	98
2018	29	26	16	6	8	85
2019	36	24	16	7	6	89
2020	29	44	19	13	9	114
2021	30	31	21	13	3	98
2022	31	33	31	11	9	115
2023	17	12	11	4	6	50
	1104	**612**	**299**	**111**	**90**	**2216**

Table 3 — Yearwise degree of collaboration, collaborative coefficients, and modified collaborative coefficients

Year	DC	CC	MCC
1989	0.32	0.18	0.19
1990	0.34	0.18	0.11
1991	0.20	0.11	0.09
1992	0.16	0.08	0.15
1993	0.27	0.14	0.18
1994	0.33	0.18	0.20
1995	0.35	0.20	0.18
1996	0.33	0.18	0.19
1997	0.33	0.18	0.18
1998	0.31	0.18	0.12
1999	0.22	0.12	0.05
2000	0.08	0.04	0.17
2001	0.29	0.17	0.19
2002	0.33	0.19	0.17
2003	0.29	0.17	0.16
2004	0.30	015	0.19
2005	0.35	0.18	0.26
2006	0.43	0.26	0.25
2007	0.43	0.24	0.33
2008	0.55	0.32	0.36
2009	0.58	0.36	0.29
2010	0.47	0.28	0.34
2011	0.54	0.34	0.33
2012	0.54	0.33	0.33
2013	0.56	0.33	0.35
2014	0.59	0.35	0.35
2015	0.58	0.35	0.34
2016	0.60	0.34	0.37
2017	0.61	0.37	0.41
2018	0.66	0.41	0.37
2019	0.60	0.37	0.46
2020	0.75	0.45	0.43
2021	0.69	0.43	0.46
2022	0.73	0.46	0.43
2023	0.66	0.42	0.30
	0.50	**0.68**	**0.27**

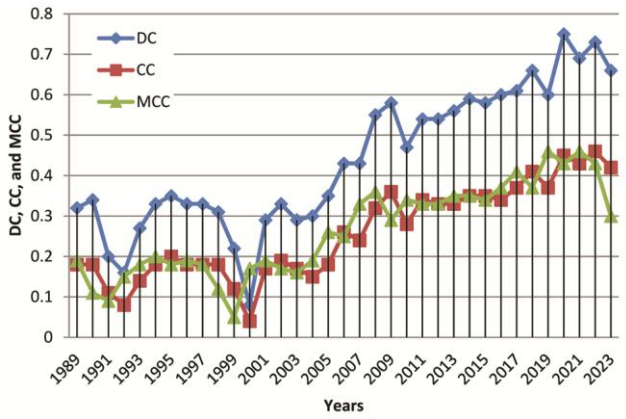

Fig. 1 — Yearwise DC, CC, and MCC

documents, is the most prolific author. Budd, J. M., and Chang, Y. W. are in second and third positions. Fourie I, Thelwal M, Hernon P, Sugimoto C R, Mahmood K, Yan E J, Buschman J, Cronin B, Aharony N, Lo P, and Oppenheim C follow them.

The Bibliometrics R tool provides results for fractional authorship, which considers individual contributions to the published output. The following equation is used to get the result of fractionalized authorship in the bibliophily app.

$$Frac\ Freq = \frac{no.of\ co-authored\ documents}{no\ of\ co-authors}$$

The result is the same for the first three authors, i.e., Hjorland B, Budd, J M, and Chang Y W. The fourth position is occupied by Buschman J, who is in the fifth position of prominent authors. Fourie I, securing the fourth position as a prominent author, came down to the fifth. The result of fractionalized authorship shows further a variation in the position of prominent authors.

Prominent authorship through the h index

Figure no. 2 shows the prominent authorship based on the h-index. Hjorland B has maintained his first

Table 4 — Prominent authors

Sr. No.	Authors	Articles	Authors	Articles Fractionalized
1.	Hjorland B	23	Hjorland B	22.50
2.	Budd J M	21	Budd J M	15.67
3.	Chang Y W	19	Chang Y W	14.83
4.	Fourie I	17	Buschman J	11.50
5.	Thelwall M	16	Fourie I	10.58
6.	Hernon P	15	Aharony N	9.20
7.	Sugimoto C R	14	Tsay M Y	9.00
8.	Mammood K	13	Hrnon P	8.94
9.	Yan E J	13	Thelwall M	8.83
10.	Buschman J	12	Anonymous	8.00
11.	Cronin B	12	Oppenheim C	7.53
12.	Aharony N	11	Bawden D	7.00
13.	Lo P	11	Cronin B	7.00
14.	Oppenheim C	11	Wojcik M	7.00

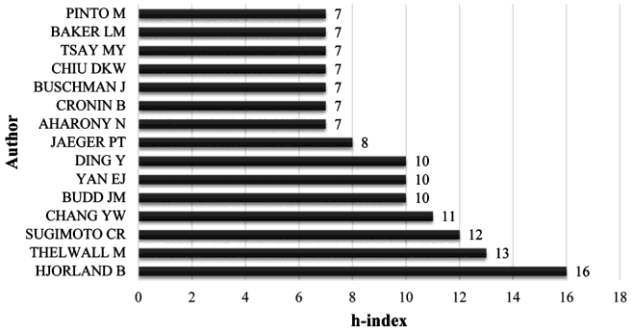

Fig. 2 — Prominent authorship through h-index

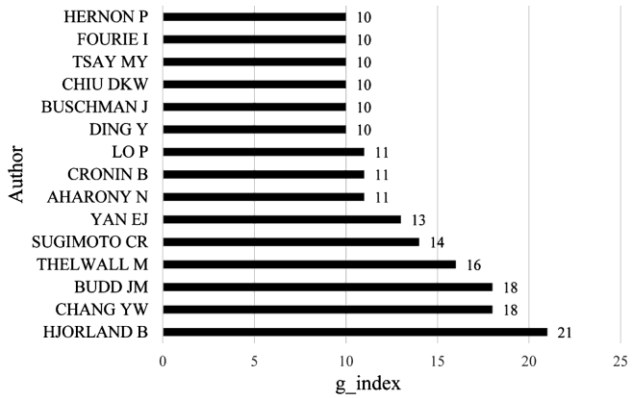

Fig. 3 — Prominent authorship through g-index

position with an h-index of 16. Thelwall M, who was in the fifth position concerning quantitative output and in the ninth position in fractionalized authorship, comers at the second position and has the second highest h-index of 13. Taking the seventh position for prominent authorship, Sugimoto C R has an h-index of 12. It is quite noteworthy that he cannot get a place on the list of fractionalized authorship. He is followed by Chang Y W (h-index 11), BUDD J M (h-index 10), Yan E J (h-index 10), and Ding Y (h-index 10). Budd J and Chang Y W form part of a group of prominent authorship and fractionalized authorship. Next in the list of prominent h-indexes are Jaeger P T, Aharony N, Cronin B., Buschman J, Chiu DKW, Tsay M Y, Baker L M, and Pinto M.

Prominent authorship through g-index

Hjorland B has also shown his supremacy in g-index (21). Chang Y W and Budd J M both have a g-index of 18. Next to follow are Thelwall M, Sugimoto C R, and Yan E J, who consecutively have the g-index of 16, 14, and 13. Aharony N, Cronin B, Lo P, each have a g-index of 11. Ding Y, Buschman J, Chiu DKW, Tsay M Y, Fourie I, and Hernon P have a g-index of 10 each (Fig. 3).

Co-authorship network

Table 5 reflects the documents in co-authorship along with the total link strength of those documents. Links denote the number of documents contributed in co-authorship with other researchers. Total link strength highlights researchers' total strength of the co-authorship links with other researchers. Figure 4 shows the co-authorship network of authors contributing to LIS literature through density visualization. To develop the co-authorship network of authors who have contributed, a minimum of five documents in co-authorship have been considered. Of 2771 authors, 91 met the threshold. For each of the 91 authors, the total link strength of the co-authorship links with other authors is calculated. The co-authorship network exhibits the authors with the greatest total link strength. The most extensive set of connected items consists of 8 items. There are 47 clusters of 91 items. The 47 clusters are divided into 2 clusters of 6 items, two clusters of 5 items, two clusters of 4 items, two clusters of three items, 10 clusters of 2 items, and all the remaining clusters consist of 1 item.

Table 5 — Authors with highest total link strength

Sr.No.	Author	Document	Total Link Strength
1.	Marshall, J. G.	10	20
2.	Rathbun-grubb, S.	9	20
3.	Morgan, J. C.	8	15
4.	Solomon, P.	5	14
5.	Chiu, D. K. W.	10	13
6.	Lo, P.	11	13
7.	Mahmood, K.	13	11
8.	Morgan, B. B.	5	11
9.	Chang, Y. W.	19	10
10.	Ho, K. K. W.	5	10
11.	Jarvelin, K.	8	10
12.	Khan, M. A	6	10
13.	Siddique, N.	6	10
14.	Sugimoto C. R.	14	10
15.	Hernono, P.	15	9
16.	Schwartz, C.	9	9
17.	Ding, Y.	10	9
18.	Abadel, E.	9	6
19.	Ashiq, M.	8	6
20.	Cronin, B.	12	6

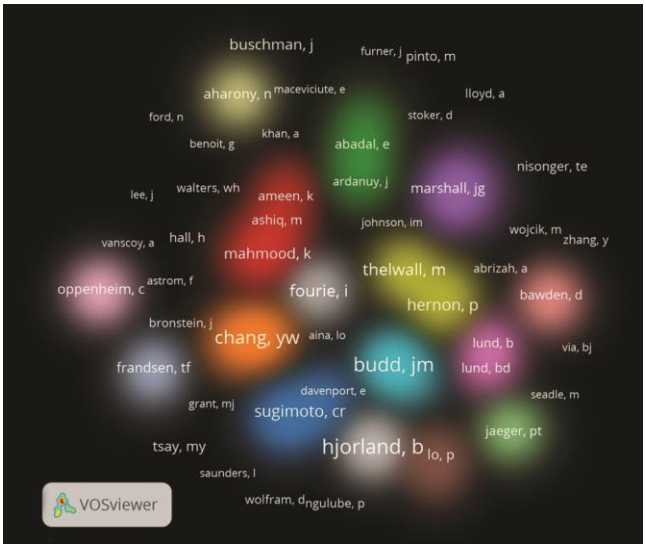

Fig. 4 — Density visualization of co-authorship network

Authors' Productivity through Lotka's Law

Lotka's law is one of the popular methods to test authorship productivity**.** According to Lotka's law, "The number of authors making 'n' contribution is about $1/n^2$ of those making one contribution, and the proportion of all contributors who make a single contribution is about 60 percent."

Mathematically, the first part of this law i.e. 'the number of authors making 'n' contributions is about $1/n^2$ of those making one contribution' can be stated as.

Table 6 — No. of observed and expected authors

Sr. no.	Document Written	No. of observed authors	Percentage	No. of expected Authors	Percentage
1	1	2106	75.97	2106	62.70
2	2	380	13.71	527	15.69
3	3	140	5.05	234	6.97
4	4	53	1.91	132	3.93
5	5	33	1.19	84	2.50
6	6	13	0.47	59	1.76
7	7	9	0.32	43	1.28
8	8	11	0.40	33	0.98
9	9	8	0.29	26	0.77
10	10	5	0.18	21	0.63
11	11	3	0.11	17	0.51
12	12	2	0.07	15	0.45
13	13	2	0.07	12	0.36
14	14	1	0.04	11	0.33
15	15	1	0.04	9	0.27
16	16	1	0.04	8	0.24
17	17	1	0.04	7	0.21
18	19	1	0.04	6	0.18
19	21	1	0.04	5	0.15
20	23	1	0.04	4	0.12
		2772	**100**	**3359**	**100**

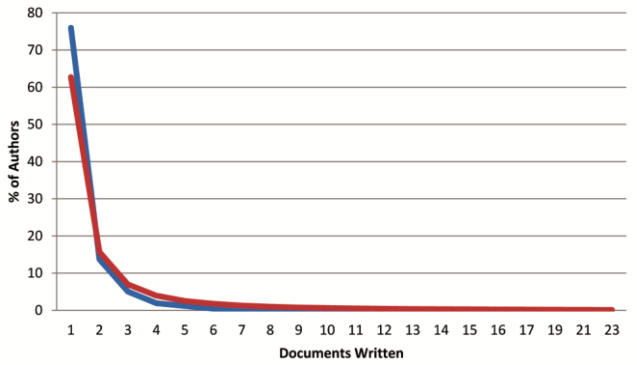

Fig. 5 — No of observed authors and expected authors

$$a(n) = a(1)/n^2$$

Where, a(1) is the number of authors contributing one article

a(n) is the number of authors contributing 'n' number of articles

'n' is number of articles

Table 6 indicates a number of observed authors and expected authors along with their percentage. The column of observed authors' points out that 2106 authors contributed 1 article, 380 authors contributed two articles, 140 authors contributed three articles, and so on. The number of observed authors and the number of expected authors show the difference in the productivity. (Fig. 5)

Table 7 highlights the proportion of observed authors and expected authors.

Table 7 — Proportion of observed authors and expected authors

Sr. No	No. of Observed Authors	Proportion of observed Authors	No of Expected Authors	Frequency of Expected Authors
1	2106	0.75974	2106	0.62697
2	380	0.13709	527	0.15674
3	140	0.05051	234	0.06966
4	53	0.01912	132	0.03919
5	33	0.01190	84	0.02508
6	13	0.00469	59	0.01742
7	9	0.00325	43	0.01280
8	11	0.00397	33	0.00980
9	8	0.00289	26	0.00774
10	5	0.00180	21	0.00627
11	3	0.00108	17	0.00518
12	2	0.00072	15	0.00435
13	2	0.00072	12	0.00371
14	1	0.00036	11	0.00320
15	1	0.00036	9	0.00279
16	1	0.00036	8	0.00245
17	1	0.00036	7	0.00217
19	1	0.00036	6	0.00174
21	1	0.00036	5	0.00142
23	1	0.00036	4	0.00119
	2772		**3359**	

Table 8 — Kolmogorov Smirnov Goodness of Fit Test for Authors Productivity

Sr. No.	Frequency of Observed Authors	Cumulative Proportion of Authors	Proportion of Expected Authors	Cumulative Proportion of Expected Authors	$D = \|Fo(X) - Sn(X)\|$
	0.75974	0.75974	0.62697	0.62697	**-0.13277**
	0.13709	0.89683	0.15674	0.78372	-0.11311
	0.05051	0.94733	0.06966	0.85338	-0.09395
	0.01912	0.96645	0.03919	0.89256	-0.07389
	0.01190	0.97835	0.02508	0.91764	-0.06071
	0.00469	0.98304	0.01742	0.93506	-0.04799
	0.00325	0.98629	0.01280	0.94785	-0.03844
	0.00397	0.99026	0.00980	0.95765	-0.03261
	0.00289	0.99315	0.00774	0.96539	-0.02775
	0.00180	0.99495	0.00627	0.97166	-0.02329
	0.00108	0.99603	0.00518	0.97684	-0.01919
	0.00072	0.99675	0.00435	0.98120	-0.01556
	0.00072	0.99747	0.00371	0.98491	-0.01257
	0.00036	0.99784	0.00320	0.98811	-0.00973
	0.00036	0.99820	0.00279	0.99089	-0.00730
	0.00036	0.99856	0.00245	0.99334	-0.00522
	0.00036	0.99892	0.00217	0.99551	-0.00341
	0.00036	0.99928	0.00174	0.99725	-0.00203
	0.00036	0.99964	0.00142	0.99867	-0.00097
	0.00036	1.00000	0.00119	0.99985	-0.00015

Using the K-S Statistics in table no. 8 equation i.e. $D = |Fo(X) - Sn(X)|$, D value comes at 0.13277 where the expected frequency and observed frequency proportion show a maximum deviation. At the 0.01 level significance, the critical value of D for the K-S test is calculated with the following equation.

$$K - S\ test = \frac{1.36}{\sqrt{n}}$$

$$K - S\ test = \frac{1.36}{\sqrt{2772}} = \frac{1.36}{52.64979} = 0.02583$$

The K-S Statistics reveal that the value 0.02583 is smaller than the D value i.e. 0.13277. Ultimately, it concludes that Lotka's law does not fit the authorship distribution in Library and Information Science.

Conclusion

The articles reveal that there is inconsistent growth of library science literature as AGR kept fluctuating positively and vice versa. There is a dominance of single-authored papers as compared to other authorship patterns. The average DC, CC, and MCC

count up to 0.50, 0.68, and 0.27, respectively. Hjorland B, Budd J M, and Chang Y W were the prominent authors in terms of research output as well as collaborative authorship. Although h-index and g-index showed changing of position for influential author, Hjorland B maintained his first position as the leading author in every parameter of prominent authorship. Marshall J G, Rathbun-Grubb S, and Morgon J C had the highest co-authorship links with other authors. The study also revealed that Lotka's Inverse Square Law of Scientific Productivity did not fit the authorship distribution in library and information science.

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