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AUTHORSHIP PRODUCTIVITY AND COLLABORATIVE PATTERNS ON ANNALS OF LIBRARY AND INFORMATION STUDIES.

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Authorship Productivity and Collaborative Patterns on Annals of Library and Information Studies

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Abstract.

Annals of Library and Information Studies (ALIS) is a quarterly journal, published by National Institute of Science Communication and Information Resource (NISCAIR**)**. This study aimed at analyzing the authorship trends and collaborative pattern of the 312 publications published by ALIS during the period of eleven years (2011-2020). The average publication of the journal is 31 articles per year. Further, Collaborative co-efficient was applied to find out the different levels of multi-authored collaboration and finally conclusion was presented with scope and directions for further research.

Keywords: Collaboration Coefficient, Authorship pattern, Degree of Collaboration, ALIS, Scientometrics, Lotka Law.

1. INTRODUCTION

Library and Information Science (LIS) is an interdisciplinary area which is obtained by the merging of two separate fields: Library science and Information Science. The former deals with the administration and care of the library (Merriam-Webster, 2018) and the latter with the process of collecting, analyzing, classifying, storing, retrieving, disseminating and protecting information (Stock & Stock, 2013). The field of LIS is not only restrained to physical walls of classification and cataloguing but has been expanded to welcome new areas like digitization, blogging, wikis, metadata, podcasts and other web technologies. As a result of this interdisciplinary approach, new facets are being incorporated into LIS, which in turn enhances its scholarly literature (Wani, 2008). Moreover, the research carried out in LIS are scattered over a large number of journals and conferences and it is difficult to keep track with the new trends. Journals are the major source for communicating recent research trends, up to date information and publishing scientific research articles owing to latest development in any field (Chandran Velmurugan & Radhakrishnan, 2015). These scientific journals, which produce new and authentic information are not available for free, though there are some good open access journals, most of them are subscription-based and the

costs are very high which makes it difficult for the libraries to subscribe all the journals in a particular field. As a result, libraries have to undergo a meticulous process for selecting appropriate journals (C Velmurugan, 2013). This is where scientometrics studies play a vital role in providing

insights about a discipline (Hood & Wilson, 2001) by analyzing their research trends based on subject, journals, author productivity and authorship pattern in order to create subscription policy for selecting journals (Chandran Velmurugan & Radhakrishnan, 2015).

Scientometrics deals with quantitative studies by measuring scientific activities to present an outline of the growth and nature of a discipline (Shrivastava & Mahajan, 2016). A scientometric study presents the directions of research activities in a particular field along with an indication for improvement with respect to knowledge sharing, quality of research, authors, affiliations and development of key research topics (Hood & Wilson, 2001). This study aims at analyzing a well-reputed journal related to Library and Information science using scientometric techniques in order to aid library and information science professionals in their selection policy for journals.

2. SOURCE JOURNAL

Annals of Library and Information Studies (ALIS) is one of the topmost quarterly journals which publishes original papers, reports of survey, short communications, reviews and letters related to library science, information science and computer applications in both (CSIR-NISCAIR, 2018) . The broad subject areas include Information technology, Computer applications, user studies, bibliometrics and scientometrics, digital library and management (C Velmurugan, 2013). It was launched in the year 1954 by Indian National Scientific Documentation Centre (INSDOC) as Annals of Library Science. The journal's title was broadened to Annals of Library Science and Documentation in 1964 and it got its present name as Annals of Library and Information Studies in 2001 (Board, 2005). At present, it is one of the oldest journals in India and has successfully published its 65^{th} volume (Jan-Mar 2018). The publications of ALIS are freely available to the readers online (Paliwal, 2015) and also doesn't collect Article Processing Charges (APCs) from the authors.

3. LITERATURE REVIEW

Chandran Velmurugan and Radhakrishnan (2015) carried out scientometric observations focusing on authorship trends and collaborative pattern in DESIDOC Journal of Library and Information Technology (DJLIT). They found that majority of the publications were multi-authored and their average degree of collaboration is 0.59 (Chandran Velmurugan & Radhakrishnan, 2015). Paremeshwar and Reddy Kolle (2016) conducted a bibliometric analysis on the publication trends in Annals of Library and Information Studies (ALIS) for the period of ten years (2006-2015). Their analyses comprised of year wise distribution of publication, the contribution of institutions, authorship pattern, state wise, city wise and country wise distribution of publications. It was found that 335 articles were published during the aforesaid period with an average of 33.5 articles per year. Majority of these articles are multi-authored and they received 575 citations with an average of 1.72 citations per article (Parameshwar & Reddy Kolle, 2016). Gupta et.al (2017) performed a

scientometrics analysis on Annals of Library and Information Studies (ALIS) for a period of sevenyears (2010-2016). The findings revealed that there were 248 research publications which were contributed by 469 authors. Most of the publications were multi-authored with a degree of collaboration and collaborative index of 0.63 and 2.42 respectively (Gupta, Bajpai, Shukla, & Bajpai, 2017). Paliwal (2015) undertook a scientometric analysis on Annals of Library and Information Studies (ALIS) from 2009-2013. It was found that 177 research papers were published during the period of five years in most of them were multi-authored and their collaborative trends were increasing. The study also identified few prominent journals for libraries, which are cited by most researchers (Paliwal, 2015). Deshmukh P (2011) examined the citations in ALIS for from the period 1997-2010. It was identified that 4141 citations were there during the aforesaid period and most of them have cited the source journal. Further, the half-life of LIS works is estimated at 9 and 14 years for periodicals and books respectively (Deshmukh Prashant P, 2011). Garg K C and Bebi (2014) carried out a comparative analysis of ALIS and DJLIT for a period of four years (2010-2013) regarding the number of publications and citations received by both the journals based on Google. The study found out that DJLIT has published maximum publications and also received more citations as compared to ALIS. The citation per paper (CPP) was same in both but DJLIT had better immediacy index(Garg & Bebi, 2014)(Garg & Bebi, 2014)(Garg & Bebi, 2014).

The aforementioned studies were measuring the impact of ALIS journals based on various indicators such as the growth of publication, authorship trends, research trends, citation analysis and collaborative patterns. It was observed from that only few studies were focusing on authorship pattern and collaborative research of ALIS and that too in a superficial manner. Hence, in order to address the gap, this study was initiated, with the main focus on authorship trends and collaborative clusters of ALIS journal, based on scientometric laws and techniques to get a clear picture of the same.

4. OBJECTIVES

The study has been carried out to achieve the following objectives:

1. To study the collaborative pattern of authorship in ALIS.
2. To analyze the year wise publication of Annals of Library and Information Studies (ALIS) during the period of 2011--2020.
3. **To test the applicability of Lotka Law of scientific productivity of authors.**
4. To analyze the degree of collaboration (DC). of the publications
5. To determine the levels of collaboration using collaborative coefficient (CC)

5. METHODOLOGY

The data for the study were extracted from the Annals of Library and Information Studies (ALIS) which is in open access mode in NISCAIR Online Periodical Repository (NOPR). The data was

collected for the period of eleven years (2011 to 2020) to study the authorship pattern and collaborative trends of publications. The details regarding the number of authors, number of publications, authorship pattern were gathered and tabulated for further analysis**.**

6. ANALYSIS

A total of 312 articles were published by ALIS journal from the year 2011 to 2020. Several indicators such as authorship pattern, the degree of collaboration, collaborative co-efficient and Lotka's law were used to analyze the research performance of the ALIS journal.

Yearwise distribution of pattern

The journal, averagely published 34 articles per year. The table indicates that the maximum number of publications (43) comes in the year 2014 followed by the year 2015 and 2013 with 38 and 37 publications respectively. The publication pattern of ALIS journal during the period of the study indicated a fluctuation trend with ups and down each year.

Table 1. Year wise distribution of pattern

Year	No. of Publications	Percentage
2011	36	11.53
2012	27	8.65
2013	37	11.85
2014	35	11.21
2015	38	12.17
2016	32	10.25
2017	32	10.25
2018	28	8.97
2019	20	6.41
2020	27	8.65
Total	312	100

Yearwise authorship pattern

Table 2 presents the year-wise distribution of authorship pattern for the period of eleven years. The authors are classified into four clusters namely, single author, two authors, three authors and more than three authors. It is observed from the table that out of 312 publications, 172 (45.62%)

of them were multi-authored followed by single authored (131) and three authored publications (60). Further, it was noticed that only 14 (3.71%) publications were authored by more than three researchers. The details concerning the volume-wise distribution of authorship pattern were presented in Table 3.

Table 2. Year wise authorship pattern

Authors	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total	%
Single Author	14	11	12	12	18	8	9	11	05	05	105	33.65
Two Authors	14	10	18	18	14	18	17	14	7	11	141	45.19
Three Authors	7	6	4	3	4	3	6	7	3	5	48	15.38
More than three Authors	0	3	2	2	3	0	0	5	2	1	18	5.76
Total	35	30	36	35	39	29	32	37	19	26	312	100

Volume wise authorship pattern

Table 3. Volume wise authorship pattern

Volume	Author 1	%	Author 2	%2	Author 3	%3	Author>3	%4
58	14	13.33	14	9.92	7	14.58	0	0
59	11	10.47	10	7.09	6	12.05	3	16.66
60	12	11.42	18	12.76	4	8.33	2	11.11
61	12	11.42	18	12.76	3	6.25	2	11.11
62	18	17.14	14	9.92	4	8.33	3	16.66
63	08	7.61	18	12.76	3	6.25	0	0
64	09	8.57	17	12.05	6	12.5	0	0
65	11	10.47	14	9.92	7	14.58	5	27.77
66	05	4.76	07	4.96	3	6.25	2	11.11
67	05	4.76	11	7.80	5	10.41	1	5.55
Total	105	100	141	100	48	100	18	100

Authorship pattern with cumulative distribution

Table 4. Authorship pattern with cumulative distribution

Pattern	No. of Publications	Cumulative Publications	%
Single Author	105	105	33.65
Two Authors	141	282	45.19
Three Authors	48	144	15.38
More than 3 Authors	18	72	5.76
Total	312	603	100

The cumulative distribution of authorship pattern is presented in Table 4. It is seen from the table that among 312 publications, 282 of them has been published by single and two authors, which indicates that the researchers either prefer to work in single or in small teams as opposed to large groups.

Single and Co-Authorship distribution

Table 5. Single and Co-Authorship distribution

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	No. of Articles	%
Single Author	14	11	12	12	18	8	9	11	5	5	105	33.65
Multi Author	21	19	24	23	21	21	23	26	12	17	207	66.34
Total	28	35	36	42	35	30	36	35	39	29	312	100

We can understand from Table 5 that majority of the publications of ALIS during the period of study are collaborative research (207) as compared to single-authored publications (105). It also shows that the researchers are more interested in doing collaborative research.

Degree of Collaboration

To find out the degree of collaboration (ratio of number of collaborative papers to the total numbers of paper in a specific period), formula suggested by Subramanyam (1982) is used, (Subramanyam, 1982)

C= Nm/ Nm+Ns

Where,

C= Degree of Collaboration

Nm= Number of multi-authored research paper

Ns= Number of single-authored research papers

C= 207/207+105

= 0.66

Therefore, it proves that 0.66 is the overall DC for the period of eleven years and Table reveals that the value of DC was maximum in the year 2020 with 0.77 and minimum in the year 2015 with 0.53.

Table 6: Degree of Collaboration

Year	Single Authored Paper (Ns)	Multi-Author Papers (Nm)	Total (Ns+Nm)	Degree of Collaboration
2011	14	21	35	0.6
2012	11	19	30	0.63
2013	12	24	36	0.67
2014	12	23	35	0.65
2015	18	21	39	0.53
2016	8	21	29	0.72
2017	9	23	32	0.72
2018	11	26	37	0.70
2019	5	12	17	0.70
2020	5	17	22	0.77
Total	105	207	312	0.66

Collaborative Coefficient

The degree of Collaboration presents the value of collaboration as a degree in order to give a clear idea about the extent of collaboration in a particular field. The main drawback of DC is it doesn't differentiate amongst levels of multiple authorship (Ajiferuke, Burell, & Tague, 1988) . Hence, as a result to overcome this limitation Collaborative Coefficient (CC) was introduced by Isola Ajiferuke in the year 1988.

CC is a method to determine the level of collaboration in research as it presents both the average number of authors per paper and also the amount of multi-authored papers. The value of CC is highest in 2016 (0.4156) and lowest in the year 2015 (0.2591) as contrary to the results of DC. This is because the consequence of the different levels of multiple authorship is not taken into account by DC.

Table 7. Collaborative Coefficient

Number of authors	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total.
1	14	11	12	12	18	8	9	11	5	5	105
2	14	10	18	18	14	18	17	14	7	11	141
3	7	6	4	3	4	3	6	7	3	5	48
4	0	3	2	2	3	0	0	5	2	1	18
Total	35	30	36	35	39	29	32	37	17	22	312
CC	0.3429	0.375	0.375	0.3572	0.3141	0.3794	0.3906	0.4325	0.4118	0.4156	0.4355

CC is calculated by using following formula:

$$CC = 1-[1(f1) + ½(f2) + 1/3(f3) + ...+1/k\ (fk)] / N$$

Where,

- f1= paper contributed by a single author in a particular year.
- f2= paper contributed by two authors in a particular year.
- f3= paper contributed by three authors in a particular year.
- fk= paper contributed by k authors in a particular year.
- N= Total number of papers contributed by authors in a particular year.

For eg: In 2007,

CC = 1-[1*14+1/2*14+1/3*7]/35

=1-14+7+2/35

=1-23/35

=1-0.6571

=0.3429

Lotka's Law of Author Productivity

Alfred J Lotka proposed an inverse square law in 1926 related to the scientific productivity of authors with respect to their papers published. He stated that " number (of authors) making n contributions is about 1/n2 of those making one; and the proportion of all contributors, that make a single contribution, is about 60 %." (Lotka, 1926).The equation proposed by Lotka was xn.y= Constant, Where, Y= Frequency of authors making n contribution (Badan Barman, 2018).

The application of Lotka's law to examine the productivity of authors is discussed in Table 8. It is evidently noticed from the table that the observed percentage of authors has varied to a large extent with the expected percentage of authors. Further, the obtained chi-square value (523.925) was maximum than the table value (11.07) at the 0.05 level of significance, which is explicit that this data is not applicable to Lotka's law.

Table 8. Author Productivity

Number of papers	Observed number of authors(an)	Observed % of authors (100*an/a1)	Expected number of authors (p) [p=a1/n^2]	Expected % of author[100/n^2]	Chi-square Test ([an-p]^2/p)
1	105	100	105	100	0
2	141	134.28	26.25	25	502
3	48	45.71	11.17	11.11	121
4	18	17.14	6.56	6.25	20
Total	312		149		643

7. DISCUSSION

Collaboration is a penetrating form of interaction that facilitates active communication as well as the exchange of skills and resources (Melin & Persson, 1996). This study made an attempt to analyze the extent of collaborative research carried out in ALIS journal for a period of eleven years (2011-2020). To measure the robustness of collaboration DC was applied and CC was extended further to find out different levels of collaboration. The analysis revealed that 312 articles were published by ALIS journal during the period of eleven years. Among the 312 articles, 207 (66.34) of them were multi-authored and the remaining 105 (33.65) of them were single authored publications, as it conforms to the results of the previous studies. The magnitude of collaboration based on DC yielded a value of 0.66 which indicated that more than 60% of the articles were multi-authored. To identify the different levels of multi-authorship, CC was applied, which produced contrasting results to that of DC values stating that the collaboration was at a peak in 2020 (0.4355) and lowermost in the year 2011 (0.3429s). The limitations of DC was overcome by the usage of CC which indicated that the researchers of ALIS journals preferred to work in small teams as comparedto larger groups. Lotka stated that only six percent of authors in a particular field will have more than 10 publications, but the results of this study proved that lotka's law was not applicable in thiscase, as there were more than the number of authors required. The collaborative pattern of the researchers in ALIS indicated that they prefer to work in a small group of two members, mostly from the same organization (inter-institutional collaboration) or institution. This may be due to thefact that most of the authors are research scholars and they publish their article along with their supervisor.

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9. CONCLUSION

Scientometrics observations on Annals of Library and Information Science journal gave a clear picture of the authorship trends and collaborative pattern of the researchers. The previous works about ALIS primarily focused on the growth of publications, citation analysis, research areas and collaborative patterns. The findings of this study will be beneficial to the publishers of the journals, researchers and also the librarians in their selection policy regarding the choice of journal for a subscription. The study focused on collaborative patterns only for the period of eleven years and highlighted its trends and patterns of collaboration. This provides an opportunity for further research, as this pattern may change with the forthcoming issues and even possibilities of external collaboration outside the institution.

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