

EXPLORING RESEARCH PERFORMANCE OF LIBRARY AND INFORMATION SCIENCE FACULTIES IN GOOGLE SCHOLAR: A SCIENTOMETRIC ASSESSMENT

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The purpose of this paper is to explore the research performance of LIS faculties based on Google Scholar. The study is exploratory in nature by identifying the performance level using different scientometric indices. The study shows variations in publications and citations with growth in publications and fluctuations in citations. Further, document types in GS are quite unclear and considered as its' limitations. Top productive authors, top cited authors, and top cited journal articles have been found. Moreover, preferred research areas have been proposed based on co-occurrence of keywords, and inter- and intra-departmental collaboration is weak among LIS faculties. The study provides sufficient insight for the individual researcher, LIS departments, institutes / universities to improve upon their research performance and collaboration with others by framing new research guidelines.

Keywords – Research Performance, LIS Faculty, Library & Information Science, Google Scholar, Keyword Co-occurrence, Keyword Clustering, Co-authorship Network

INTRODUCTION

Google Scholar (GS) is a discovery tool for finding scholarly communication available over WWW in different formats, freely accessible within the campus or off the campus without putting any financial burden on individual or institutions. It provides more effective user performance and user satisfaction than the journal portal or the link resolver form of library systems and services (Dixon et al., 2010). Citation feature of GS allows one to increase their online visibility and recognition by creating an author profile which simultaneously influences the impact of publications. The major force behind the success of GS is its' relevancy ranking and wide coverage over the universe of subjects. The GS features include both simple and advanced search facility through the single user interface for exploring the scholarly communications by an author, publisher, citations and other similar works. The GS provides an opportunity for every faculty

to create their own publication profile and if the GS profile is created by every faculty then it would be easy for faculties and researchers to conduct citation measurement related studies very easily (Vucetic et al., 2017). Apart from measuring scholarly work of an individual, GS also provides an opportunity to add researchers & inform their scholarly work to other researchers interested in the similar research area, improving future research, expanding scholarly networking for collaborations, and marketing of their research (Zientek et al., 2018). The GS has become a useful complementary tool for bibliometric research concerned with the identification of the most influential scientific works (Martin-Martin et al., 2017). Despite the advantageous features of GS, it has been widely criticized due to its' lack of transparency in selecting items, poor standardization, duplication, lack of control over self-citation, and the high chance of gaming the system (Martínez & Anderson, 2015). This study is an attempt to identify the performance of Library and Information Science (LIS) faculties indexed in GS with the help of software tools used in scientometric studies.

LITERATURE REVIEW

The GS is open and freely accessible bibliometric tool widely used all over the world for citation metrics like Web of Science (WoS) and Scopus (Meho & Yang, 2007). The GS serves not only for information search mechanism but also for research evaluation process. Its' dynamic, broad coverage and uncontrolled indexing features allow its' comparison with other traditional bibliometric databases (Delgado López-Cózar et al., 2017). Its' citation metrics help for promoting early career researcher and preserving scholarly

publications particularly for those researchers / authors having few or no indexed articles or poorly visible on Scopus and WoS (Gasparyan et al., 2017). It has good coverage for Social Sciences and Humanities subjects rather than WoS and Scopus but GS has less reliable data and less data tool for bibliometric analysis (Delgado-López-Cózar & Cabezas-Clavijo, 2012; Mingers & Meyer, 2017). The GS crawlers scan repository's Web address particularly the local documents published on the Web in different language formats and simultaneously increases its coverage in terms of publications and citations but bibliometric evaluation should be done carefully due to duplication of data (Aguillo, 2012).

The publications which are not well covered in WoS, as well as citations data related to those publications, are easily accessible through GS without putting any financial burden on their parent institutions (Harzing & van der Wal, 2008). Repanovici (2011) suggested that GS citations and h-index obtained from Publish or Perish (PoP) has been utilized as an important tool for assessing scientific research in university and evaluating Professors also. The GS has better indexing for conference proceedings and non-English language publications. Diem & Wolter (2013) found that in GS, Professor is more visible than their lower ranking colleagues and also found that female Professors achieve fewer cites per publication than their male colleagues.

SCOPE & LIMITATIONS OF THE STUDY

For the study, LIS faculties working in the Central Universities of India have been considered as population. A total of 18 Central Universities are offering LIS courses but no permanent

faculties were found for Hemvati Nandan Bahuguna Garhwal University. So, this study included 79 LIS faculties from 17 Central Universities and out of which only regular (permanent) LIS faculties were considered for the study. The LIS faculties working on temporary or ad-hoc basis were excluded from the study. The LIS faculty's information was retrieved through the concerned university website. In GS, no publication data were retrieved for 4 LIS faculties. Thus, the study is limited to 75 LIS faculties.

METHODOLOGY

The authors performed GS search queries for each LIS faculty by their names and subject of specialization. Searching publications by faculty's name were difficult due to having similar names from other disciplines as retrieved by the GS. In such a difficult situation, the authors added the term "LIS" or "Library and Information Science" separated by a comma after the name of the faculty. Some faculty members have publications other than LIS field, so the authors filtered the publications belongs to LIS field only by matching the publication titles from the concerned faculty's bio-data or CV, if available or from journal websites itself. Further, the authors checked duplication of publications retrieved from GS and excluded them out. It is noticeable that GS profile ID has not been used for any faculty in the study for retrieving required data as it creates differences in determining the coverage of GS for the LIS faculties having no profile ID. The raw data were collected in October 2018 and the extracted data were analyzed and presented with the help of suitable software like Publish or Perish, VOSviewer and MS-Excel.

RESULTS

University-wise Performance

Publication performance of faculties depends on their research interest, dedication towards reaching the milestone in exploring new research areas results to build a strong research career, impact of research work, and addition of new ideas in existing knowledge domain. Further, in India, the University Grants Commission, New Delhi (UGC) has also provided an opportunity to faculties by setting standards in the form of Academic Performance Indicators (API) to perform the best at their level for further promotion and simultaneously upgrade the quality of research. Scientometric indicators help to analyze the scholarly publications and its impact (in the form of citations) which is applicable for institutions as well as for individual level too. University-wise performance has been retrieved for 17 central universities of India and a total of 1186 LIS publications were found with 4684 citations to them. The data were analyzed at three levels of performance which is based on average publication, average citation, and citations per publication for all the central universities. In terms of publication productivity, MZU has the highest share of publications (13.82%, 164), followed by AMU (12.39%, 147), BHU (12.14%, 144), DU (11.72%, 139) and PU (9.02%, 107). The highest citations share have been found for AMU (24.33%, 1140), followed by DU (21.13%, 990), BHU (14.38%, 674), PU (10.46%, 490) and MZU (5.97%, 280). Citations per Publication (CPP) is calculated the highest for AMU (7.75) followed by DU (7.12), HSGU (5.64), BHU (4.68), and PU (4.57). The performance level is found unsatisfactory for three central universities viz. TU, GGU and CUH respectively. Less number of

faculties and newly established LIS departments may also be the one reason for poor performance

by some central universities which further needs to be scrutinized after a reasonable time lag.



Fig. 1: University-wise publications and citations

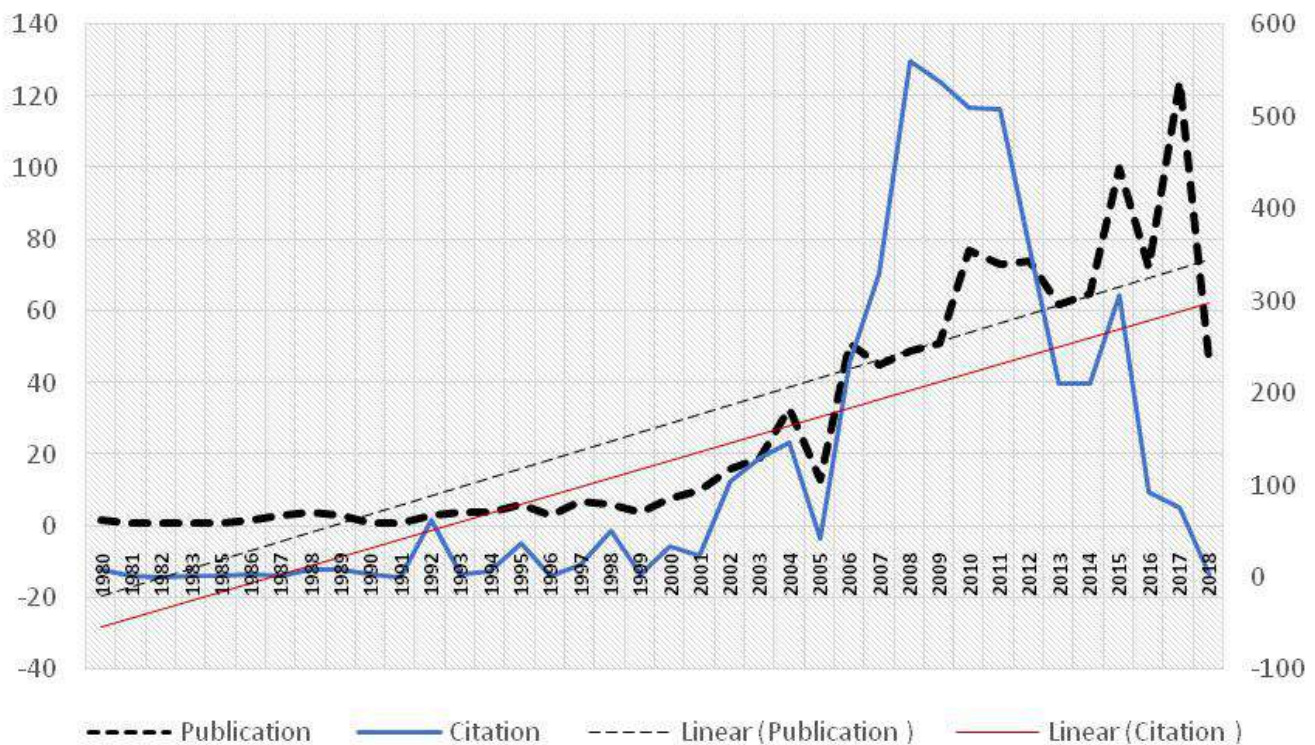


Fig. 2: Year-wise growth of publications and citations

Year-wise Performance

The GS has some advantages over other citation databases as it offers extensive search facility and potential to provide access to grey literature and to find citations for old as well as outdated items of publications (Shultz, 2007). The coverage of GS in terms of year of publications, number of results, keyword searching, and time of searching is comparatively better than other commercial bibliographic databases (Stirbu et al., 2015). The year-wise growth of publications and citations of LIS faculties are represented in Figure 2 which illustrates the remarkable growth in publications and citation patterns over the years. In Figure 2, the y-axis represents the number of publications while z-axis represents the number of citations over the period. In this study, publication coverage year of GS is found to 38 years which ranges from 1980 to the present date i.e. 2018. More than 50% publications and 37% citations were observed after 2011 onward. Increasing trend of publications has been observed from 2006 onwards which reached the maximum 124 publications in the year 2017 and simultaneously increasing trend has been observed for citations from 2006 to 2008 and after that decreasing trend of citations has been observed from the highest 561 citations in 2008 to 75 citations in 2017 which denotes decreasing quality of research performance of faculties. The publication performance of LIS faculties increased during 2006 – 2017 but the quality of research is not at par. As per Figure 2, the linear (citation) and linear (publication) show steady growth in the number of publications as well as citations over the period.

Forms of Document

Mayr and Walter (2007) studied that GS hits were categorized into link, citation, pdf and other formats (like PS, DOC, RTF etc.) and the high ratio of journals found were reflected as Citations (28%) document types, followed by full-text in PDF (19%) while other forms of documents were negligible in ratios. In this study, mainly five categories of documents were observed in GS that covers 56.66% of total documents and rests (43.33%) were blank i.e. without any forms. The highest number of publications found in PDF (33%), while 1% DOC file and 1% HTML files were observed. There have been 1% book forms of documents observed while 21% observed as citations. The GS failed to categorize the forms of documents appeared in its' database. Significantly more than 43% publications do not have any forms of documents and represent 'blank'.

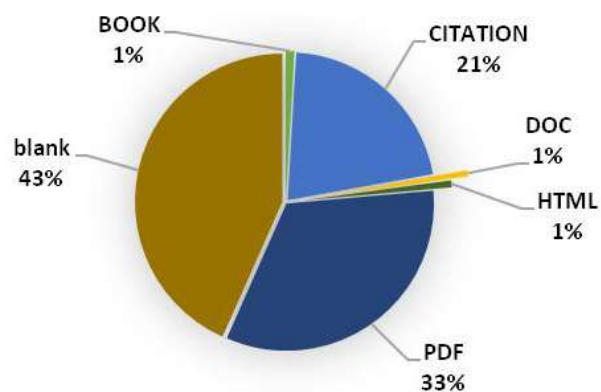


Fig. 3: Forms of document coverage in GS

Highly Productive Author, Cited Author and Cited Publications in LIS Research

The representation of most influential authors, adopted research methods, most used

titles & frequently used sources of publications are some of the important aspects of bibliometric research (Martin-Martin et al., 2017). Citation count act as an indicator to measure the impact of paper and its author as citation attracts researchers having similar research interest and influences one's effort in the development of science (Bauer, Leydesdorff, & Bornmann, 2016). Counting citation is not a perfect method of measuring author's impact on the field though it is far better evaluation indicator than counting

numbers of papers a person has authored (Stern & Arndt, 1999). The authors analyzed individual contributions of LIS faculties and it has been observed that the number of publications is highly skewed. Out of total 1186 publications by 75 LIS faculties, 18.66% faculties altogether contributed more than 50.75% publications. Moreover, more than 50% faculties have 10 or less than 10 publications and out of which 24% faculties have contributed 3.87% of total publications.

Table 1: Top Ten Highly Productive LIS Authors (Faculty)

Sl. No.	Author & Affiliation	Publications	Citations	CPP	CPY
1	MK Verma, MZU	76	96	1.26	5.65
2	MK Sinha, AU	68	229	3.37	8.18
3	U Kanjilal, IGNOU	62	84	1.35	3.5
4	CK Ramaiah, PU	47	284	6.04	11.36
5	A Shukla, MZU	44	46	1.05	4.6
6	B Mukherjee, BHU	43	364	8.47	20.22
7	KP Singh, DU	43	192	4.47	12
8	M Madhusudhan, DU	40	621	15.53	56.45
9	HN Prasad, BHU	32	152	4.75	4.11
10	R Sevukan, PU	31	157	5.06	13.08

The table 1 depicts the top ten most productive LIS faculties account for more than 40% of total publications which received more than 47% of total citations. Among the top ten most productive LIS faculties, MK Verma has contributed the highest share (6.4%) of total publications, followed by MK Sinha (5.7%) and U Kanjilal (5.2%). In terms of total citations, M Madhusudhan has the highest share (13.25%) of citations, followed by B Mukherjee (7.77%) and CK Ramaiah (6.06%). Cites per Publication (CPP) and Cites per Year (CPY) is found the highest for M Madhusudhan (15.53 & 56.45

respectively), followed by B Mukherjee (8.47 & 20.22) and CK Ramaiah (6.04 CPP), while Cites per Year is the third highest for R Sevukan (13.08) rather than CK Ramaiah. The table 1 reveals the impact of research by using CPP and CPY and found that the quality of research publications among the top productive authors varies. The faculties having more number of research publications have less research impact and vice-versa. The research impact of individual faculty members also affects the research quality of their parent department as well as the university.

To increase the impact of scholarly communications, scholars (Ali & Richardson, 2017; Jan & Anwar, 2013) have suggested that the faculties who are getting fewer citations and having low indices should publish their work in reputed journals having good impact factor, create academic networking site for collaboration and sharing of information among peers to increase their online visibility. To measure the impact of faculties, the most common method adopted is counting the total number of citations against each publication; which gains the momentum over the period of time and nowadays acts as an indicator to rank the faculties and measuring the quality of research (Adkins & Budd, 2006; Dev et al., 2015).

From the table 2, out of total 4684 citations received for 1186 publications by 75 LIS faculties, the authors found that the top ten faculties (13.33% of total faculty) altogether received more than 57% citations. The table 2 depicts that the top ten most cited LIS authors

have contributed more than 32% publications and received more than 57% citations. Among all LIS faculties, M Madhusudhan has received the highest share (13.25%) of total citations in 3.37% publications, followed by B Mukherjee (7.77% & 3.62%) and CK Ramaiah (6% & 3.96%). Among all LIS faculties, CPP is calculated maximum for SN Singh (20) followed by M Madhusudhan (15.53) and N Fatima (10.83). Moreover, CPY is found the maximum for M Madhusudhan (56.45) followed by N Fatima (26) and B Mukherjee (20.22). The total number of citations, CPP and CPY are one of the indices to evaluate the quality of research produced by the researcher. In terms of citation study of LIS faculties, it has been observed that research efforts (publications) are more than research impact (Citations, CPP & CPY). Overall, the authors say that the research impact of the maximum LIS faculties is less effective. The attention should be paid towards qualitative research work rather than quantitative.

Table 2: Top Ten Highly Cited LIS Authors (Faculty)

Sl. No.	Author & Affiliation	Citations	Citation %	Publications	Pub. %
1	M Madhusudhan, DU	621	13.25	40	3.37
2	B Mukherjee, BHU	364	7.77	43	3.62
3	CK Ramaiah, PU	284	6.06	47	3.96
4	M Nazim, AMU	281	5.99	29	2.44
5	N Fatima, AMU	260	5.55	24	2.02
6	MK Sinha, AU	229	4.88	68	5.73
7	KP Singh, DU	192	4.09	43	3.62
8	MA Ansari, AMU	160	3.41	25	2.11
9	R Sevukan, PU	157	3.35	31	2.61
10	HN Prasad, BHU	152	3.24	32	2.69

Analysis of highly cited publications will provide valuable information about the high impact research topics in the LIS literature for a particular period of time and simultaneously it also provides the information about high impact journals in the field (Blessinger & Hrycaj, 2010). From the LIS researcher's point of view, the highly cited publications display the top trending research areas of the field. In general, highly cited papers have been known by its excellence in scientific

research of any discipline. In general, articles published in high impact factor journals obtain more citation in comparison to less impact factor journals. Moreover, multi-authored and international collaborative publications were often more cited because of increase in the scientific mind, economic and technical resource accessibility (Aksnes, 2003). The authors analyzed the top ten highly cited journal publications by LIS faculties and found only 2

Table 3: Top Ten Highly Cited Publications by LIS Faculties

Journal Publication	Citations	CPY	Publishing Journal	CiteScore as per Scopus
Use of UGC-Infonet e-journals by research scholars and students of the University of Delhi, Delhi: A study by <i>M Madhusudhan</i>	118	11.8	Library Hi Tech	0.9
Use of social networking sites by research scholars of the University of Delhi: A study by <i>M Madhusudhan</i>	103	17.17	International Information & Library Review	0.24
Use of electronic resources by research scholars of Kurukshetra University by <i>M Madhusudhan</i>	95	11.88	Electronic Library	0.99
Impact and use of e-resources by social scientists in National Social Science Documentation Centre (NASSDOC), India by <i>S Haridasan, M Khan</i>	95	10.56	Electronic Library	0.99
Usage of e-journals by researchers in Aligarh Muslim University: a study by <i>M M Raza, A K Upadhyay</i>	84	7	International Information & Library Review	0.24
Internet use by research scholars in University of Delhi, India by <i>M Madhusudhan</i>	81	7.36	Library Hi Tech News	0.33
Information seeking behaviour of the students at Ajmal Khan Tibbiya College, Aligarh Muslim University: a survey by <i>N Fatima, N Ahmad</i>	62	6.2	Annals of Library and Information Studies	0.39
Use of e-journals among research scholars at Central Science Library, University of Delhi by <i>PM Naushad Ali, Faizul Nisha</i>	60	8.57	Collection Building	0.6
Mapping the intellectual structure of scientometrics: A co-word analysis of the journal Scientometrics (2005–2010) by <i>S Ravikumar, A Agrahari, SN Singh</i>	58	19.33	Scientometrics	2.72
Use of electronic journals by doctoral research scholars of Goa University, India by <i>R Chirra, M Madhusudhan</i>	54	6	Library Hi Tech News	0.33

publications (0.16%) out of 1186 publications which have received more than 100 citations and altogether the top ten publications have received more than 17% citations. Among the top ten highly cited publications, 3 single-authored publications have the highest number of citations than multi-authored papers which partially fails the concept of Aksnes (2003). The table 3 displays top cited papers with their CPY and Scopus CiteScore as per 2017. It has been observed that journals having high CiteScore received more CPY as compared to low CiteScore journals.

Co-occurrence of Keywords

The co-occurrence in scientometric studies represents ‘keywords based on common presence, the frequency of occurrence, the close proximity which may be similar to each other but are not exactly same and generally based on same topic’ (Co-citation and Co-occurrence, 2014). The similar studies have been found (Bornmann et al., 2018; Sedighi, 2016; Sharma et al., 2018, p. 1990; Xing et al., 2018) in which co-occurrence of keywords was analyzed based on different research areas. A keyword co-occurrence network helps in understanding the meaningful knowledge components, knowledge structure and insight of scientific field which based upon the strength of links between keywords used in a literature (Radhakrishnan et al., 2017). A co-occurrence link is a connection or relation between two items and there is no more than one link between any pair of items. Further, link strength represents the number of times the paired keyword occurs together. The value of link strength is always in positive and more the value, stronger the link strength.

In VOSviewer, the group of items is represented in the form of cluster based on similarity of items in weight and score attributes. Clusters are generally non-overlapping in nature and may not include all available items. Different clusters appear in VOSviewer map represented by the different color for clear visualization (Van Eck & Waltman, 2011). In this study, keyword co-occurrence is analyzed only from the title of total 1186 publications of which a total of 2211 keywords extracted out. To generate co-occurrence of keywords in VOSviewer, the authors choose only binary counting method and selected keyword occurrence 5 or more times which gives a total 186 keywords and 60% (111 keywords) of selected keywords were used for visualization which results in 10 clusters to create the map (Figure 4). Total links and link strength for all 111 keywords were found as 494 & 731 respectively. The table 4 represents top frequently occurred keywords (10-time occurrence as minimum frequency) with the frequency of occurrence and total link strength among them. From the table 4, the authors see that the keywords like Development, Journal, Information Science, Education, Knowledge Management etc. are the most frequently occurred keywords with higher link strength. In Figure 4, keywords of different clusters have been displayed by different colors and each similar color represents more or less identical selected topics of LIS research by authors (faculty members).

Table 4: Top Keywords with Frequency of Occurrence

Keywords	No. of Occurrence	Total Links	Total Link Strength	Keywords	No. of Occurrence	Total Links	Total Link Strength
Development	45	30	58	Automation	14	19	29
Journal	44	21	41	Information Science Education	14	10	12
Information Science	29	19	36	Digital Literacy	13	7	13
Education	28	23	27	Scientometric Analysis	12	6	8
Knowledge Management	28	16	27	Information Technology	12	8	14
Scientist	26	10	16	Digital Environment	12	12	16
Academic Library	25	15	24	Social Science	11	10	16
Bibliometric Study	23	6	16	Citation Analysis	11	5	7
Website	20	5	8	Information service	11	11	12
Librarian	17	16	17	Contribution	10	6	7
University Libraries	17	12	15	Information Retrieval	10	3	4
Bibliometric Analysis	16	9	18	Collection Development	10	6	7
Communication	16	17	22	Information Literacy	10	7	7
Information Communication	15	10	19	Behaviour	10	12	15
Internet	15	8	11	LIS Professional	10	10	12

Table 5: 10 Clusters of Keywords

Cluster	Number of Keywords	Selected Keyword	Proposed Research Area
1	18	Digital Library, Distance mode, education, Information Literacy, information retrieval, Internet, Knowledge Management, Marketing, Teaching, Training	ICT, Digital Information Management, Marketing of Digital Information, Knowledge Management
2	13	Challenges, Issues, Collection development, Digital environment, digital era, Higher education, Information science education, Opportunity, Librarian, reference	LIS Education, Collection Development
3	12	Digital preservation, Digitization, Preservation, Knowledge, information service, Online exhibition	Digital Preservation, Knowledge Dissemination
4	12	Bibliometric analysis, Bibliometric study, Citation analysis, Scientometric analysis, research performance, research output, Information management	Metric Studies, Information Management
5	11	Automation, ICT, Networking, Internet, Information centre, university libraries, Awareness	Library Automation & Networking
6	11	Usage, Behaviour, Assam University, Mizoram University, Physical Science, Social science, Aizawl, Silchar	Field and Institutions based Study
7	10	Library consortia, Resource sharing, LIS education, Distance education, academic library	Library Consortia, LIS Education
8	10	Communication, Contribution, Growth, Open access, Open access journal, Shodhganga, Scientometric study	Open Access Information Management, Metrics Study
9	7	Faculty Members, PG students, Information need, Library collection, engineering	Information Collection, Population Study
10	7	Website, Webometric analysis, Content analysis, Technical library, Library profession	Metrics Study, Librarianship

Co-authorship Network among LIS Faculties

Research publication with more than one author is likely to be more influential than single-authored publication (Aksnes, 2003) when counts in terms of citations and high level of author collaboration as well as can be an indicator of more inter-disciplinary research (Singh et al.,

2015). Co-authorship network represents a group of authors with the most relationship in and the greatest productivity in the center, the less connected authors in the relationship are situated on the periphery (Muñoz-Muñoz & Mirón-Valdivieso, 2017). The figure 5 represents the co-

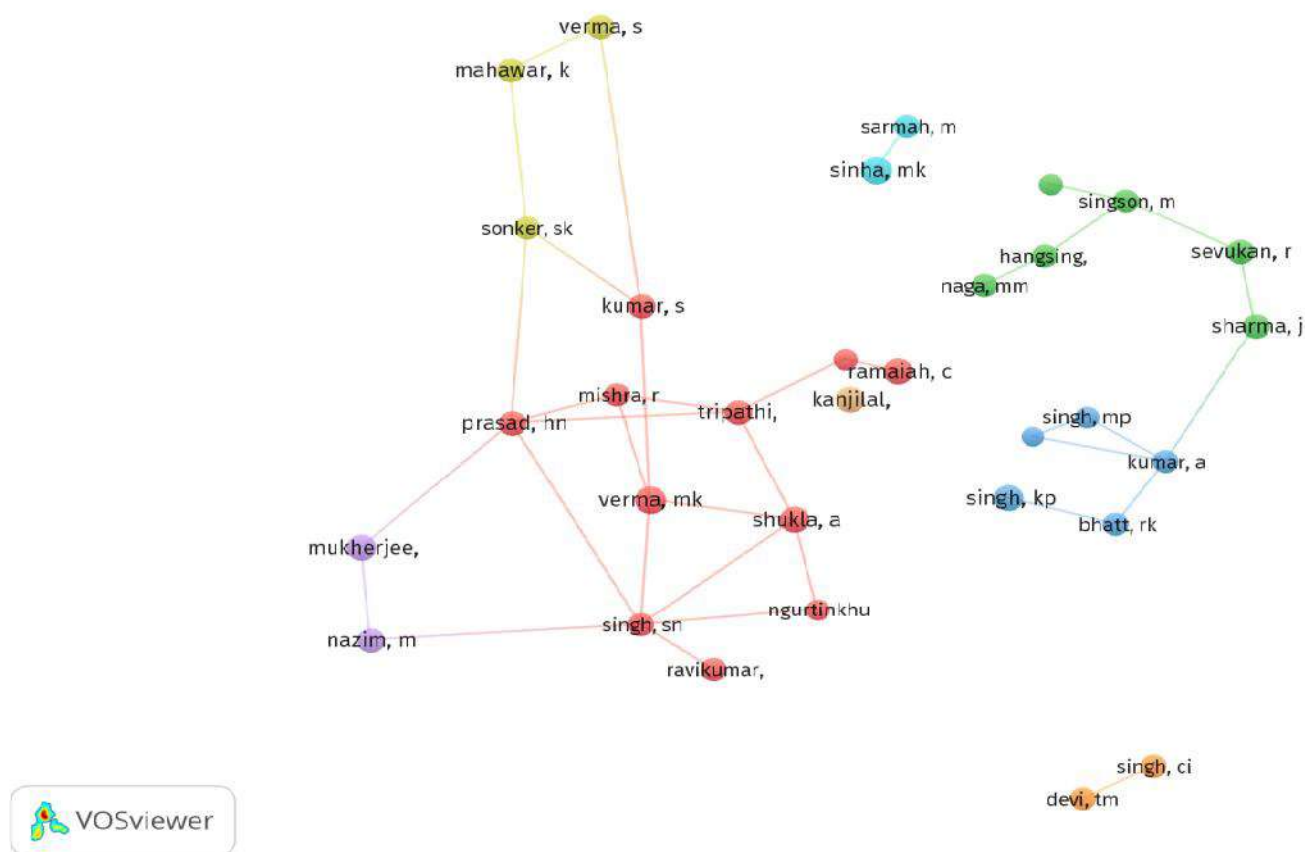


Fig. 5: Co-authorship network among LIS faculties

authorship network of LIS faculties created by using VOSviewer. The authors found a total of 663 authors for 1186 publications having at least 1 publication. By considering 4 publications by an author as a minimum threshold, a total of 118 authors met the threshold. Again from 118 authors, we chose 63 authors (only LIS faculties) and excluded the remaining authors (research scholars and non-teaching staffs) which do not falls under our scope. Due to error in parsing of names in VOSviewer, some faculties name

appears twice like 'Ali, pm naushad' and 'Ali, pmn', 'Koganuramath, mm' and 'Koganuramath, m', 'Laloo, bt' and 'Tariang, bl', 'Kumbar, r' and 'Kumbar, rt' etc. For such cases, the authors considered the only prevalent name of an author like 'Laloo, bt' which have comparatively more links than other variant names. The major disadvantages of the co-authorship network through link analysis are seen in the case of publications having more than two authors. The link strength between two LIS faculties, in terms

of shared publications, is represented in the table 6 which depicts that some LIS faculties like KL Mahawar, B Mukherjee, A Tripathi, A Shukla, HN Prasad, and R Mishra have co-authored publications with more LIS faculties whereas LIS faculties TM Devi, R Sevukan, RK Bhatt, P Hangsing etc. have more co-authored publications with single LIS faculty collaboration. Among the top co-authored publications, 2/3rd collaboration

found between the faculties belongs to same LIS department and remaining 1/3rd collaboration found between faculties belong to inter-university LIS departments (Table 6). Link strength between KL Mahawar – S Verma is found the highest followed by B Mukherjee – M Nazim, and TM Devi – CI Singh. More the link strength tends to more collaborative publications between authors and vice-versa.

Table 6: Top Co-authored LIS Faculties

1 st Author & Affiliation	2 nd Author & Affiliation	Total Link Strength
KL Mahawar, BBAU	S Verma, BBAU	16
B Mukherjee, BHU	M Nazim, AMU	14
TM Devi, MU	CI Singh, MU	10
A Shukla, MZU	A Tripathi, BHU	8
R Sevukan, PU	J Sharma, IGNOU	6
HN Prasad, BHU	A Tripathi, BHU	5
RK Bhatt, DU	A Kumar, MZU	5
B Mukherjee, BHU	HN Prasad, BHU	4
P Hangsing, NEHU	MM Naga, NEHU	4
R Mishra, BHU	HN Prasad, BHU	3
R Mishra, BHU	A Tripathi, BHU	3
A Shukla, MZU	MK Verma, MZU	3
RK Ngurtinkhuma, MZU	A Shukla, MZU	3
S Ravikumar, NEHU	SN Singh, MZU	3
KL Mahawar, BBAU	SK Sonker, BBAU	3

CONCLUSIONS

The authors have tried to draw a portrait of LIS faculty's performance based on GS which is one of the most used, popular and powerful scholarly search tool. Various studies confirmed that the number of citations in GS is found higher than WoS or Scopus as GS includes various forms of literature like journal papers, conference papers, books, book chapters, reports, theses,

patents, publications from repositories and websites etc. A total of 75 LIS faculties have produced 1186 publications and received 4684 citations. The variation in citations and publications is measured university-wise that indirectly reflects the quality of research work done at the university; and at the same time, very fewer contributions is seen for three central universities like TU, GGU and CUH. The year-

wise growth rate of publications and citations shows the continuous growth in terms of publications and fluctuations in terms of citations. Over the time, citations have shown growth but CPP reduced after 2008 (see Figure 2) due to the downfall of citations in comparison to the number of publications. There may be a number of reasons for the downfall of citations but it simply implies the possibility of low quality of research during the period, if the authors consider the CPP. This downfall of citations leaves a gap to find out all the possible reasons behind it. It is quite unclear about the types of document retrieved through GS as it categorized documents into link, citation, pdf and other formats like PS, DOC, RTF which the authors supposed to consider the limitations of GS; and has to be categorized in proper forms of document like journal article, conference proceedings, reports, book, book chapters, patents etc.

Based on the publications of top highly productive authors, top cited authors, and top cited journal articles, the authors say that faculties like M Madhusudhan, B Mukherjee, CK Ramaiah, R Sevukan and HN Prasad have performed a remarkable contribution in terms of publications and citations also. The preferred areas of research by LIS faculties are proposed through co-occurrence of keywords extracted from the title of the publications. It is found that proposed areas of research cover the core areas of LIS research. Finally, through co-authorship network, the authors identified highly linked LIS faculties in terms of sharing of publication; and reached to the conclusion that both inter- & intra-departmental collaboration is weak among LIS faculties.

REFERENCES

1. Adkins, D., & Budd, J. (2006). Scholarly productivity of US LIS faculty. *Library & Information Science Research*, 28(3), 374–389.
2. Aguillo, I. F. (2012). Is Google Scholar useful for bibliometrics? A webometric analysis. *Scientometrics*, 91(2), 343–351.
3. Aksnes, D. W. (2003). Characteristics of highly cited papers. *Research Evaluation*, 12(3), 159–170. <https://doi.org/10.3152/147154403781776645>
4. Ali, M. Y., & Richardson, J. (2017). Pakistani LIS scholars' altmetrics in ResearchGate *Program*, 51(2), 152–169.
5. Bauer, J., Leydesdorff, L., & Bornmann, L. (2016). Highly cited papers in Library and Information Science (LIS): Authors, institutions, and network structures. *Journal of the Association for Information Science and Technology*, 67(12), 3095–3100. <https://doi.org/10.1002/asi.23568>
6. Blessinger, K., & Hrycaj, P. (2010). Highly cited articles in library and information science: An analysis of content and authorship trends. *Library & Information Science Research*, 32(2), 156–162. <https://doi.org/10.1016/j.lisr.2009.12.007>
7. Bornmann, L., Haunschild, R., & Hug, S. E. (2018). Visualizing the context of citations referencing papers published by Eugene Garfield: A new type of keyword co-occurrence analysis. *Scientometrics*, 114(2), 427–437. <https://doi.org/10.1007/s11192-017-2591-8>
8. Chen, X., Chen, J., Wu, D., Xie, Y., & Li, J. (2016). Mapping the research trends by co-word analysis based on keywords from funded project. *Procedia*

- Computer Science*, 91, 547–555. <https://doi.org/10.1016/j.procs.2016.07.140>
9. Co-citation and Co-occurrence: An Overview. (2014, August 19). Retrieved October 30, 2018, from <https://seo-hacker.com/cocitation-cooccurrence-overview/>
10. Delgado-López-Cózar, E., & Cabezas-Clavijo, Á. (2012). Google Scholar metrics: An unreliable tool for assessing scientific journals. *El Profesional de La Informacion*, 21(4), 419–427. <https://doi.org/10.3145/epi.2012.jul.15>
11. Delgado López-Cózar, E., Orduna-Malea, E., Martín-Martín, A., & Ayllón, J. M. (2017). Google Scholar: the ‘big data’ bibliographic tool. In: Cantu-Ortiz, fj. (ed.). *Research analytics: boosting university productivity and competitiveness through scientometrics* (pp. 59-80). CRC Press (Taylor & Francis).
12. Dev, C. S., Parsa, H. G., Parsa, R. A., & Bujisic, M. (2015). Assessing faculty productivity by research impact: Introducing Dp2 Index. *Journal of Teaching in Travel & Tourism*, 15(2), 93–124. <https://doi.org/10.1080/15313220.2015.1026471>
13. Diem, A., & Wolter, S. C. (2013). The use of bibliometrics to measure research performance in Education sciences. *Research in Higher Education*, 54(1), 86–114. <https://doi.org/10.1007/s11162-012-9264-5>
14. Dixon, L., Duncan, C., Fagan, J. C., Mandernach, M., and Warlick, S. E. (2010). Finding articles and journals via Google Scholar, journal portals, and link resolvers: Usability study results. *American Library Association*, 50(2), 170–181.
15. Gasparyan, A. Y., Nurmashev, B., Yessirkepov, M., Endovitskiy, D. A., Voronov, A. A., & Kitas, G. D. (2017). Researcher and author profiles: Opportunities, advantages, and limitations. *Journal of Korean Medical Science*, 32(11), 1749–1756. <https://doi.org/10.3346/jkms.2017.32.11.1749>
16. Harzing, A., & van der Wal, R. (2008). Google Scholar as a new source for citation analysis. *Ethics in Science and Environmental Politics*, 8, 61–73. <https://doi.org/10.3354/esep00076>
17. Jan, S. U., & Anwar, M. A. (2013). Impact of Pakistani authors in the Google world: A study of Library and Information Science faculty. *Library Philosophy and Practice*, 1–18.
18. Martínez, R. A., & Anderson, T. (2015). Are the most highly cited articles the ones that are the most downloaded? A bibliometric study of IRRODL. *The International Review of Research in Open and Distributed Learning*, 16(3). Retrieved from <http://www.irrodl.org/index.php/irrodl/article/view/1754>
19. Martin-Martin, A., Orduna-Malea, E., Harzing, A.-W., & Delgado López-Cózar, E. (2017). Can we use Google Scholar to identify highly-cited documents? *Journal of Informetrics*, 11(1), 152–163. <https://doi.org/10.1016/j.joi.2016.11.008>
20. Mayr, P., & Walter, A. K. (2007). An exploratory study of Google Scholar. *Online Information Review*, 31(6), 814-830. DOI: <https://doi.org/10.1108/14684520710841784>
21. Meho, L. I., & Yang, K. (2007). Impact of data sources on citation counts and rankings of LIS faculty: Web of Science versus Scopus and Google Scholar. *Journal of the American Society for Information Science and Technology*, 58(13), 2105–2125.
22. Mingers, J., & Meyer, M. (2017). Normalizing Google Scholar data for use in research evaluation. *Scientometrics*, 112(2), 1111–1121. <https://doi.org/10.1007/s11192-017-2415-x>

23. Muñoz-Muñoz, A. M., & Mirón-Valdivieso, M. D. (2017). Analysis of collaboration and co-citation networks between researchers studying “violence involving women.” *Information Research*, 22(2). Available at <http://www.informationr.net/ir/22-2/paper758.html>
24. Radhakrishnan, S., Erbis, S., Isaacs, J. A., & Kamarthi, S. (2017). Novel keyword co-occurrence network-based methods to foster systematic reviews of scientific literature. *PLOS ONE*, 12(3), e0172778. <https://doi.org/10.1371/journal.pone.0172778>
25. Repanovici, A. (2011). Measuring the visibility of the university’s scientific production through scientometric methods: An exploratory study at the Transilvania University of Brasov, Romania. *Performance Measurement and Metrics*, 12(2), 106–117. <https://doi.org/10.1108/14678041111149345>
26. Sedighi, M. (2016). Application of word co-occurrence analysis method in mapping of the scientific fields (case study: the field of Informetrics). *Library Review*, 65, 52–64. <https://doi.org/10.1108/lr-07-2015-0075>
27. Sharma, N., Bairwa, M., Gowthamghosh, B., Gupta, S. D., & Mangal, D. K. (2018). A bibliometric analysis of the published road traffic injuries research in India, post-1990. *Health Research Policy and Systems*, 16. <https://doi.org/10.1186/s12961-018-0298-9>
28. Shultz, M. (2007). Comparing test searches in PubMed and Google Scholar. *Journal of the Medical Library Association: JMLA*, 95(4), 442–445.
29. Singh, V. K., Uddin, A., & Pinto, D. (2015). Computer science research: The top 100 institutions in India and in the world. *Scientometrics*, 104(2), 529–553.
30. Stern, R. S., & Arndt, K. A. (1999). Top cited authors in dermatology: a citation study from 24 journals: 1982-1996. *Archives of Dermatology*, 135(3), 299–302.
31. Stirbu, S., Paul, T., Schmitz, S., Haesbroeck, G., & Greco, N. (2015). The utility of Google Scholar when searching geographical literature: Comparison with three commercial bibliographic databases. *Journal of Academic Librarianship*, 41(3), 322–329. Retrieved from <https://orbi.uliege.be/bitstream/2268/178974/2/Article-Stirbu&All.pdf>
32. van Eck, N. J., & Waltman, L. (2011). VOSviewer manual. Manual for VOSviewer Version, 1.4.0.
33. Vucetic, S., Chanda, A. K., Zhang, S., Bai, T., & Maiti, A. (2017). Faculty citation measures are highly correlated with peer assessment of computer science doctoral programs. Retrieved from <https://arxiv.org/abs/1708.05435>
34. Xing, D., Zhao, Y., Dong, S., & Lin, J. (2018). Global research trends in stem cells for osteoarthritis: A bibliometric and visualized study. *International Journal of Rheumatic Diseases*, 21(7), 1372–1384. <https://doi.org/10.1111/1756-185X.13327>
35. Zientek, L. R., Werner, J. M., Campuzano, M. V., & Nimon, K. (2018). The use of Google Scholar for research and research dissemination. *New Horizons in Adult Education and Human Resource Development*, 30(1), 39–46. <https://doi.org/10.1002/nha3.20209>



Appendices**List of Central Universities with No. of LIS Faculty**

Name of Central University (Abbrev.)	No. of LIS Faculty
Aligarh Muslim University (AMU)	7
Assam University (AU)	4
Babasaheb Bhimrao Ambedkar University (BBAU)	5
Banaras Hindu University (BHU)	6
Central University of Gujarat (CUG)	4
Central University of Haryana (CUH)	2
Central University of Himachal Pradesh (CUHP)	3
Dr. Hari Singh Gour University (HSGU)	3
Guru Ghasidas University (GGU)	1
Indira Gandhi National Open University (IGNOU)	5
Manipur University (MU)	5
Mizoram University (MZU)	8
North-Eastern Hill University (NEHU)	6
Tripura University (TU)	3
Pondicherry University (PU)	5
University of Delhi (DU)	7
Central University of Tamil Nadu (CUTN)	5
Total	79

