Dominance Factor Analysis for Collaboration and Productivity of Authors

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ABSTRACT: *Discuss author's newly developed formula of Dominance Factor (DF).It is proportion of number of multi authored papers as first author to his/her total number of multi- authored papers. Test formula on Ph.D. Dissertation. First one analyses 3875 Indian Contributions out of 13394 from world on groundnut. Find values of Degree of Collaborations (DC) and Collaboration Index (CI) 0.93 and 3.55. Calculate Dominance Factor values of 9 prolific authors. Also analyses 3588 Indian contributions out of 35075 from world on mustered and rapeseeds research. Find DC & CI values are 0.92 and 3.89. Calculate DF values of 22 prolific authors. Third study is on Soyabean which analyses 4067. Indian contributions out of 34032 from world publications. Find values of DC and CI values 0.917 and 3.16. Calculate DF values of 19 prolific authors. Result shows 76% prolific authors have low dominance values.*

Keywords: Dominance Factor, Bibliometrics Study, Groundnut, Mustard, Research

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1. Introduction

Dominance factor analysis is a new concept in scientrometric studies developed by Prof. Sudhir Kumar (Also write S. Kumar, the fist author in this article) to find out dominance of one author over other co-authors by placing himself as first author in most co-authored papers. In a way it shows brand value of that author. His name may appear in most indexes. The meaning of Dominance is power and influence over others. The synonyms for the word are control, influence, power, rule, sway, preponderance, paramounting, authority, command, upper hand, sovereignty, prepotency, etc. though their meaning may differ to little extent. The antonyms for dominance are submission surrender, modesty, subordination, etc. There are 744 synonyms and 19 antonyms for the word as found on goggle. Dominance, in genetics, is the phenomenon of one variant of a gene on a chromosome making or overriding the effect of a different variant of the same gene on the copy of the chromosome.[1] The first variant is termed dominant and the second recessive. The principle of dominance in Game Theory (also known as dominant strategy or dominance method) states that if one strategy of a player dominates over the other strategy in all conditions then the later strategy can be ignored. A strategy dominates over the other only if it is preferable over other in all conditions.

Dominance analysis of an approximation algorithm by Glower and Punnan (1997)[2] and Kwoaka's[3] Dominance index can also be referred for some works on the word.

In research many interdisciplinary areas have emerged in modern time. Researchers have used their co-ordination skills to develop new research outcome. To fulfill research desires organizations and scientists, individually and collectively ,work together with common objectives. Because of this factor, there has been an increasing trend in the growth of collaborative publications in all disciplines. With the growth of collaboration work, it has been a general thinking that some prolific authors dominate over their co-authors in the most of their research publications by placing themselves as first author. Ideally first author should be one who has contributed most in the research. Practically it may not be true for various reasons.

In research publications "Dominance" means a author who dominates co-authors in most of coauthored publications. Authors collaborate with many other authors at time during their active productivity period. It is possible that in most of the cases one of the authors who have contributed most number of articles. prolific author appear as first author (Dominant author) . This has been studied in this paper by data analysis collected by many research scholars in bibliometrics under the supervision of first authors for a research degree.

Dominance factor formula in bibliometrics has been developed by Sudhir Kumar (2008). Dominance factor is proportion of number of multi-authored papers of an author as first author (Nmf) to total number of multi-authored papers of the author (Nmf). Single authored papers have been omitted due to its constant value one of single authored papers.

Mathematically it is represented as

$$DF = \frac{Nmf}{Nmt}$$

High DF value shows more dominance of author as first author while low DF value shows low dominance of author as first author. If all the multi-authored papers of an author are as first author as the value of dominance factor become 1.00 and it is known as complete dominance. The dominance factor has been categorized in five.

S.N.	Symbols	Dominance Factor Values	Dominance Level
1	A	0.81-1.00	Very high/ Complete Dominance
2	B	0.61-0.80	High Dominance
3	C	0.41-0.60	Moderate Dominance
4	D	0.21-0.40	Low Dominance
5	E	0.00-0.20	No Dominance

Table 1.1. Categorization of Dominance Factors

2. Review of Literature

Most of the papers on Dominance Factor have been written by the first author himself in collaboration with his research scholars on scientometric study to test the invented formula. Kumar and Kumar (2008)[4] have studied performance of DRMR scientists. Collaboration coefficient, collaboration index and dominance factors have been calculated. Chauhan contributed highest 130 articles with 0.192 dominance factor. 39 authors have published more than 10 articles each. Paper mainly discussed the authorship pattern, collaboration pattern of top ten contributors from each institutions with their dominance factors. The mean collaboration coefficient was found 0.781. Jain and Kumar (2011)[5] have analyzed Indian contributions to world soybean research. The data from International Crop CD database has been collected for 20 years (1989-2008). Various Bibliometric methods such as activity index, growth rate and doubling time, prolific authors and their dominance factor etc. have been applied. Meena, Kumar and Jain (2014)[6] have applied degree of collaboration, RGR & DT and dominance factor in their study on pigeon pea for the duration of 9 years (2000-2008). Kumar and Kumar (2014)[7] have reviewed performance of scientists of NRCS on the basis of subjects, language, contributions, collaboration, communication channels and dominance factor, etc. Joint-authorship was preferred by the researchers with average collaboration coefficient was found 0.80. Kumar and Kumar have studied performance of Director of Rapeseed Mustard Research. Scientists and calculated DF of 39 authors.

Jain and Kumar have researched on Indian contributions to Soybean Research from Crop CD database for 20 years (1989-2008). In collaboration study Dominance Factors of prolific authors were calculated. Meena, Kumar and Jain have calculated DF on Peogion pea for 2000-2008. Kumar and Kumar study on NRCS scientists performance also calculated Dominance Factor and found most of prolific authors did not dominates other co-authors. The Ph. D. thesis of Shilpa, Dhoble[8] on Indian contributions to Groundnut and Mustard research has calculated DF of authors. Dhoble has published many papers based on her thesis work. Dhoble and Kumar and Shah (2015)[9] have studied collaboration patterns of Indian scientists in groundnut research and found prolific authors are not dominant over co-authors.

Roberto, R[10] has analysed 724 articles published between 1992-2017. Calculates articles per authors per articles, co authors per articles and Collaboration index. Analyses most productive countries. Also calculate most productive authors. Calculates Dominanace Factors of 9 authors using formula given by Sudhir Kumar Aria and Cuccurfulla[11] have calculated documents per author (0.544), author per document (1.44) coauthors per document (2.22) and Collaboration Index (2.82) for 160 articles published during 1985- 2015. Give a list of most productive authors. Calculate Dominance Factors of most productive authors using formula given by Sudhir Kumar.

3. Analysis

This study has been made by Mrs.Shilpa Dhoble for her research work for Ph.D. degree.

3.1. Groundnut Research

Dhoble (Shilpa) has analysed 13394 articles published during 2000-13 on ground nut research internationally out of which 3875 (29%) have been contributed from India. The study recorded 93% coauthored papers. The overall value of Degree of collaboration 0.93 and Collaboration Index is 4.27 for world. The study shows high level of collaboration hence very suitable to study Dominance Factor. Degree of collaboration and Collaboration Index values for 3875 contributions from India are 0.93 and 3.55 respectively which are also high. The Dominance Factor study is based Indian authors. Table 2 presents the ranking list of top 9 prolific authors who made 20 or more contributions each. The table calculates DF values for each author as shown in the table. Nigam tops the list with 40 contributions, followed by Gowda with 37 contributions, Vasanthi with 28 contributions, Reddy with 26 contributions, and John with 22 contributions each respectively. Other authors contributed less than 20 publications and not listed in the table. DF values have been calculated and found that John, K. is very dominant author with DF 0.85, Naidu with DF 0.53 and Nandgopal with DF 0.47 are moderately dominant. Other have less DF values, hence in spite of being prolific authors, they are not dominant over their co- authors.

S.N.	Name of author	Total	First author	Single author	Multiple authors	FMA	Dominance Factor
1	Nigam, S. N.	40	3	-	40	3	0.08
2	Gowda, M. V. C.	37	2	-	37	2	0.05
3	Vasanthi, R. P.	28	7	1	27	6	0.22
4	Reddy, T. Y.	26	3	-	26	3	0.12
5	John, K.	22	19	2	20	17	0.85
6	Gedia, M. V.	20	3	-	20	3	0.15
7	Naidu, P. H.	20	12	3	17	9	0.53
8	Nandagopal, V.	20	10	1	19	9	0.47
9	Wani, S. P.	20	3	-	20	3	0.15
	Total	233	62	7	226	55	
	Others	3642	3813	279	3363	3534	
	G. Total	**3875**	**3875**	**286**	**3589**	**3589**	

FMA= First author in multiple authorship

Table 3.1. Dominance factors of authors in groundnut research in India

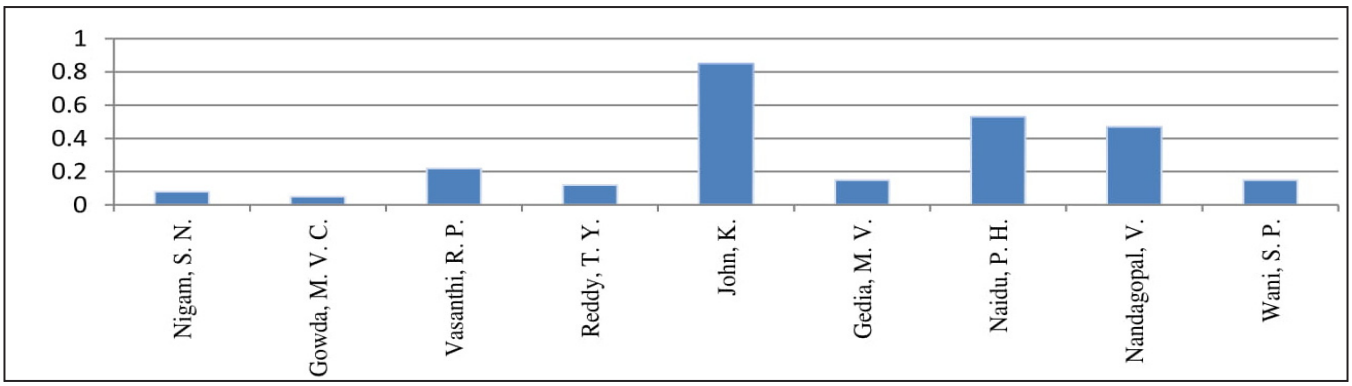

Figure 3.1. Dominance factors of authors in groundnut research in India

3.2. Mustard Research

Dhoble has also studies mustered research. She analyses 9574 articles contributed internationally by 35075 authors. Out of these 3588 (37%) articles have been contributed by 11249 authors from India for the period 2000-2013. For world contributions the values of Degree of collaboration and collaboration Index are 0.92 and 3.89 respectively. The value of degree of collaboration is 0.93 and Collaboration Index is 3.30 for Indian contributions which is also high and good to test Dominance Factor study. There are 11249 Indian authors out of which 22 are prolific authors who have contributed 20 or more articles in the study. 6

Table 3 presents the ranking list of top 22 prolific authors who made 20 or more contributions each. The table calculates DF values for those authors as shown in the table. Chauhan tops the list with 50 contributions, followed by Anil Kumar with 43 contributions, Singh and Singh have jointly ranked third position with 41 contributions each and Kumar with 38 contributions is on fourth. R.K. Singh with DF 0.78 and Mahak Singh with DF 0.62 are moderately dominant. DF values for other, is around 0.35 or less, hence they are not dominant authors. Thus we see that there is no" very dominant author" in this study.

S.No.	Name of author	Total publications	First author	Single author	Multiple authors	FMA	D.F.
1	Chauhan, J. S.	50		50	17	17	0.34
2	Kumar, Anil	43	1	42	17	16	0.38
3	Singh, S. P.	41		41	16	16	0.39
4	Singh, A. K.	41		41	13	13	0.32
5	Kumar, Arvind	38		38	2	2	0.05
6	Singh, S. K.	34		34	12	12	0.35
7	Chakravarty, N. V.K.	34		34	3	3	0.09
8	Singh, R. P.	31	1	30	4	3	0.10
9	Singh, Mahak	29	3	26	19	16	0.62
10	Mehta, Naresh	27		27	5	5	0.19
11	Kolte, S. J.	26	1	25	1	0	0.00

12	Singh, Y. P.	25	1	24	10	9	0.38
13	Misra, A. K.	24		24	6	6	0.25
14	Sangwan, M. S.	24		24	1	1	0.04
15	Tripathi, A. K.	24	2	22	8	6	0.27
16	Singh, R. K.	23		23	18	18	0.78
17	Sharma, S. K.	22		22	7	7	0.32
18	Wu , XiaoMing	22		22	2	2	0.09
19	Singh, Diwan	20		20	4	4	0.20
20	Kumar, Manoj	20		20	7	7	0.35
21	Singh, D.	20		20	3	3	0.15
22	Singh, K. H.	20		20	7	7	0.35
	Total	638	9	629	182	173	
	Others	10611	247	10364	3366	3119	
	G. Total	11249	256	10993	3548	3292	

Table 3.2. Dominance factors of authors in mustard research in India

FMA= First author in multiple authorship

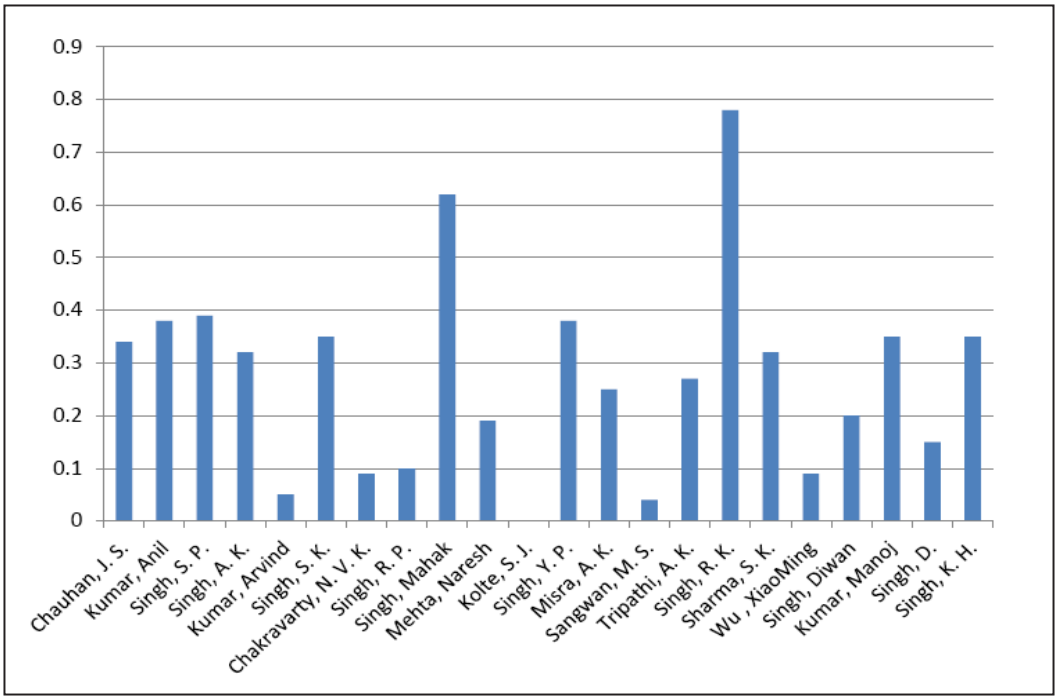

Figure 3.2. Dominance factors in mustard research in india

3.3. Soybean Research

The study has been made by Miss Krti Bala Jain for her Ph. D. on Indian contributions to Soyabean Research. Her study is based on data collected from 1973 to 2008. She has analysed 34032 articles. Out of these contributions 4067 articles (1.95%) are from India. The value of Degree of Collaboration is 0.9162 and Collaboration index is 3.163 which is also high and good to study Dominance Factor. Her study on DF is limited to authors contributing 30 articles or more.

Table 4 presents the list of top 19 prolific authors with their dominance factor (DF) who made 30 or more contributions each. O. P. Singh tops the list with 77 contributions, followed by S. D. Billore with 55 contributions, O. P. Joshi and V. M. Raut with 53 contributions each respectively. On the other hand S. K. Dubey ranked first with highest DF 0.786, followed by O. P. Singh with DF 0.541 and S. K. Sharma with DF 0.484. The table clearly indicated that among the top 19 prolific authors, only two authors have DF value more than 0.500 which revealed that most of the prolific authors have very low dominance over their co-authors. The correlation coefficient between the number of contributions and contributions as first author for these 19

S.N.	Name of author	Total publications	First author	Single author	Multiple authors	FMA	D.F.
1	Singh-OP	77	40	3	74	37	0.541
2	Billore-SD	55	25	0	55	25	0.455
3	Joshi-OP	53	8	1	52	7	0.154
4	Raut-VM	53	17	0	53	17	0.321
5	Halvankar-GB	46	19	0	46	19	0.413
6	Singh-KJ	45	15	0	45	15	0.333
7	Bhatnagar-PS	44	16	3	41	13	0.390
8	Singh-M	43	1	0	43	1	0.023
9	Chauhan-GS	37	2	0	37	2	0.054
10	Chandel-AS	36	9	0	36	9	0.250
11	Taware-SP	35	11	0	35	11	0.314
12	Tiwari-SP	35	11	1	34	10	0.324
13	Ram-HH	34	5	0	34	5	0.147
14	Patil-VP	33	2	0	33	2	0.061
15	Sharma-SK	33	15	2	31	13	0.484
16	Singh-BB	33	13	2	31	11	0.419
17	Dubey-SK	31	28	17	14	11	0.786
18	Singh-R	31	5	2	29	3	0.172
19	Kundu-S	30	10	0	30	10	0.333
	Total	784					
	Others	4365					
	Grand Total	5149					

Table 3.3. Dominance factors of authors of soybean research in India

prolific authors has been calculated using pearson's formula and obtained the value 0.772. This value revealed positive correlation between both the facts. It has seen as a good sign for collaboration in research work and publication.

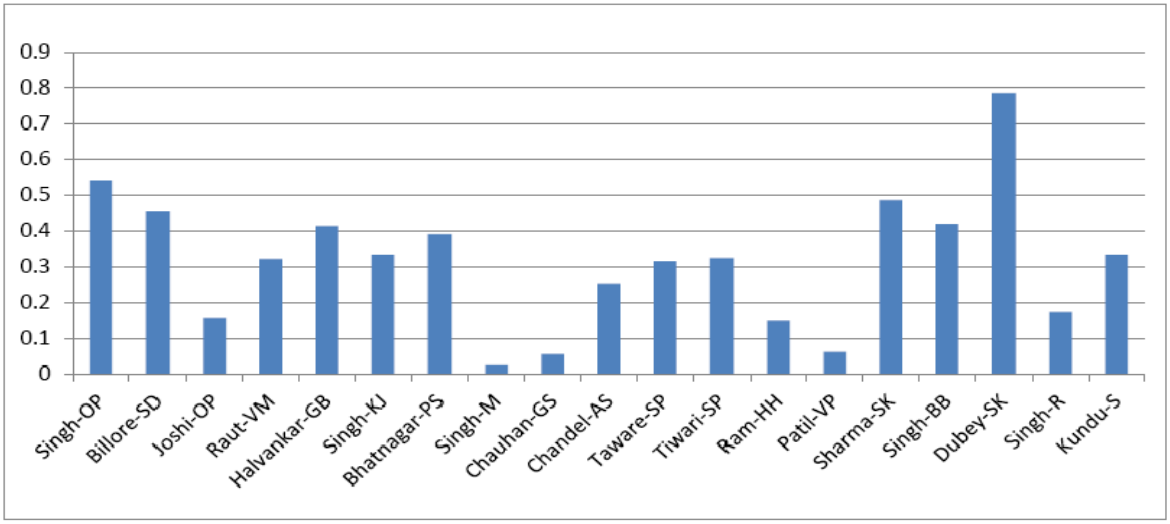

Figure 3.3. Dominance factors of authors of soybean research in India

4. Conclusion

The study finds 76% "Low" or "No Dominance " of prolific authors. Only 16% authors have medium Dominance. High and very high Dominance value is only 8%. Thus we can conclude that Dominance by prolific authors is less in this scientific study. Further studies should be taken in various fields. In social sciences the scenario may be different. In another study on Library and Information Science, the author has recorded more percentage of High Dominance which has been presented in a separate paper.

S.No	Symbol	Dominance Factor Value	Dominance Level	Ground Nut @	Musterd #	Soyabean *	Total
1	A	0.81-1.00	Very High Dominance	1	0	0	1 (2%)
2	B	0.61-0.80	High Dominance	0	2	1	3 (6%)
3	C	0.41-0.60	Medium Dominance	3	0	5	8 (16%)
4	D	0.21-0.40	Low Dominance	1	11	7	19 (38%)
5	E	0.00-0.20	No Dominance	4	9	6	19 (38%)
			Total	9	22	19	50 (100%)

@ 20 + contrinbutions, # 20 + contrinbutions , * 30 +,ntrinbutions,

Table 4. Categorizations of Dominance Factor

References

[1] http://en.wikipedia.org/wiki/Dominance access on 22.09.2019 (Cenetics)

[2] Glover, F., Punnen, A. P. (1997). The travelling salesmen problem, new solvable cases and linkages with the development of approximation algorithms. *Journal of the Operational Research Society*. 48, 1997, 502-510. doi.10.1057/palgrave.jors.2600392.

[3] Kwoka, J. E. (1977). Large firm dominance and price-cost margins in manufacturing industries. *Southern Economic Journal*, 44, 183-9.

[4] Kumar, S., Kumar, S. (2008). Trends of collaborative research in journals of oilseeds research (India), 1993-2004. *Indian Journal of Agricultural Library and Information Services, 24, 80-90.*

[5] Kumar, S., Kumar, S. (2008). Trends of collaborative research in journals of oilseeds research (India), 1993-2004. *Indian Journal of Agricultural Library and Information Services*, 24, 80-90.

[6] Jain, K. B., Kumar, S. (2011). Indian contributions to world soybean research: Measurement of research productivity of soybean scientists. *In*: Proceedings 8th International CALIBER-2011, Goa: Goa University, 627-640. Retrieved from ir.inflibnet.ac.in/handle/1944/1652

[7] Meena, D., Kumar, S., Jain, A. K. (2014). Indian contributions to international pigeon pea research, a bibliometric study. *Indian Journal of Agricultural Library and Information Services*, 31(1), 33-41.

[8] Kumar, S., Kumar, S. (2014). Publication productivity of scientists of National Research Centre of Soybean, a scientometric study. *SALIS Journal of Library and Information Science*, 6 (1), 35-54.

[9] Dhoble, S., Kumar, S., Shah, L. (2015). Collaboration pattern in groundnut (oilseeds) research in India in 21st century; a bibliometric study. *In*: Jain, P.K and Others, (Ed.), Emerging trends and issues in scientormetrics, informetrics and webometrics. Paper presented at the 11th International Conference on Webometrics, Informetrics and Scientometrics (WIS) and 16th COLLNET Meeting (India), Delhi (p. 303-313), Delhi: Bookwell, V 1. (ISBN: 978-93-8546-293-1)

[10] Roberto Campos Leoni. R Bibliomerics: A brief introduction to bibliometrix http://rstudio- pubs-static. S3. Amazonaws.com/253042_5cc214c2db1845a)a45fa4b7cb.. access on 22.9.2019 p 1-26.

[11] Aria (Massimo) and Cuccurfulla (Corrado): Brief introduction to bibliometrics. 28 p https://cran.r-project.org/web/packages/bibliometrix/vignettes/bibliometrix-vignette.bit...access on 22.9.2019

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Brief biographical information

1. Prof. Sudhir Kumar

EX Professor, Head and Chairman Board of Studies and Dean faculty, Vikram University, Ujjain (Madhya Pradesh, India) with 37 years of teaching experience to postgraduate classes and 5 years to M.Phil. above 25 years experience in guiding Ph.D. research, successfully guided many Ph.D. scholars. Life member of COLLNET, ILA, IATLIS (also Vice President and Treasurer for 6 years), Presently Vice President of ILA Central zone . Member of various Committees in Vikram University as Dean Faculty, Academic Council, Examination Committee. Also Incharge university librarian for one year. 2 books and 250 published papers in journals, conferences and seminars volumes. Presented papers in 49th FID (Jaipur) 1998 and International Congress on Digital Libraries (New Delhi) 2004.

Besides 20 papers presented in other International & National Conferences and Seminars. Won Award of Commendation for paper presentation in National Conference in ILA. Paper also published in IFLA World Library Conference at Argentina, 2004, Oslo (Norway), 2005 and Seoul (Korea), 2006. Visit and Pre-

sented paper in 4th International Conference on Web metrics… etc and COLLNET Meeting in Berlin, 2008. and IFLA (Singapore), 2013. Awarded Life Time Achievement Award at International Conference of Digital Transformation (ICDT) National Law University Delhi, 2018.

2. Mrs. Shilpa Dhoble

Presently research scholar in School of Studies in Library Information Science in Vikram University. She is working librarian for last 6 years in St. Paul Institute of Professional Studies, Indore (Madhya Pradesh , India). She has three papers published in journal and COLLNET International Conference.

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3. Dr. Leena Shah

Librarian, Govt. Kalidas Girls P. G. College .Ujjain (Madhya Pradesh, India) Qualified National Eligibility Test (NET) . Have Ph.D. in Library Classification. Life member of 7 national professional bodies like ILA, IASLIC, SIS, etc. and Vice President of Associations of Library Professionals. Also Life Member of COLLNET. Have a bilingual book published in year 2000 Have app 65 papers published in International, national conferences & Seminars and reputed journals. Presented papers in FID (Jaipur) (1998) and International Conference on Digital Libraries, New Delhi, 2004. Recipient IFLA ALP grant to attend IFLA Pre conference in Sao Paulo (Brazil) and presented paper as Speaker in IFLA World Library Conference in Buenos Aires (Argentina), Recipient IFLA Free Registration grant, Singapore (2013). Besides attended 4 International conferences 14 International Conferences held India, 5 ILA National Seminars, 9 UGC National Seminars, 11 national conferences, 5 State Seminars and 1 Divisional Seminars and presented papers. Attended 15 Various training programmes and workshops. Recipient of Award of Commendation for paper presentation in national conference of ILA. Also received Best paper award in Trends in Library and Information Science and Library Services" (2018) Worked as Reporter General, Co-chaied the session in ILA & ETLIS, ICDTetc conferences. Papers also published in IFLA World Library Conferences, OSLO, (Norway), 2005 and Seoul (Korea), 2006. Visit and Presented paper in 4th International Conference on Webometrics …etc and COLLNET Meeting in Berlin, 2008. Member International Program Committee, COLLNET, India, 2010 and Presented paper in 6th International Conference on Webometrics …etc and COLLNET Meeting in Mysore, 2010.