

BIBLIOMETRIC ANALYSIS OF RESEARCH OUTPUT IN QUALITY MANAGEMENT AT AFRICAN CONTINENT FROM 1990-2016

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Abstract—The study was done in Quality Management records produced by top ten African countries to examine their record production contribution in the field. During the period of 1990-2016, total of 2312 records have been collected from Web of Science Database. The highest annual record productivity is scored in the year 2015 (280) followed by 2014 (244). Similarly, in 2015 more records were referred (13,778), which are 1604 records over the second year 2013. Countries H-index and number of records contribution, as well as individual authors' production performance rate is reserved by South Africa (35, 3189, 752) and Kenya (29, 1195, 190) respectively. Besides, University of Cape Town has produced 117 records to be at the top of all the other institutions. Later, in addition to the progress in record production (from 1 in 1990 to 280 in 2015), side by side increment to number of reference records (from 20 in 1990 to 13778 in 2015) is distinguished; however, almost all records (97.5%) were presented in English Language.

Keywords—Bibliometric, Citation Analysis, Database, H-Index, Quality Management.

INTRODUCTION

Bibliometrics as a tool to Information Science is defined as an application of mathematics and statistical methods to books and other media of communication (Powell and Silipigni, 2010). Again, according to John and Paul (2003), Bibliometrics is the use of mathematical and statistical methods to study documents and patterns of publication. Likewise, based on their definition Bibliometrics can simply be explained as application of Mathematics or Statistics to Information science, as Mathematics and Statistics can be applied to any other subject.

Bibliometrics as a field has half a century history, because numerous scientists have investigated countless results in description, evaluation and analysis of publications and their authorship. As a result of the studies citation reference, impact-factor and H-index of authors, journals, institutions, countries, field of studies, form and language of presentations have been scrutinized and anticipated for their future progress against the number of records produced each year. Further, the authorship pattern frequency and the level of collaboration in publication also are the major areas of study of Bibliometrics.

QUALITY MANAGEMENT

Quality management as a phrase can be viewed from the two distinct key words namely, management and quality. Management as a field is broad. According to Stueart and Moran, 2007 citation; *Mary Follett* defined it as “the art of getting things done through people”, where quality emphasizes the efficiency of the managerial science for an optimal achievement.

LITERATURE REVIEW

For purpose of the study, the following few literatures have been collected, evaluated, interpreted, and their review yield the following. In all of the five reviewed literatures Bibliometrics was the selected method of study except in that of Amesaveni and Vasanthi (2013) specifically limited to authorship pattern and collaboration, excluding the language,

format, institution or country wise analysis which is fully covered by the others. Their objective was to examine articles in a given topic and particular period of time. The subject of the five selected articles is varied and covers - Biotechnology, Network Security, Nanotechnology, Leishmaniasis, and Journal of Electronic Library. Leishmaniasis records in Medline journal researched by Ramos and et al, (2013) has covered long range from 1945 to 2010 but the other four papers were of about a decade period of time.

Scope of their study is much more diversified. Sevukan and Sharma, (2008) for their Biotechnology have limited to central Library of India, Thirumagal's (2012), Nanotechnology is also of India as a limited geographical area, where Akhtar & et al, (2011) and Ramos & et al, (2013) are broader to cover all the "Electronic Library" (LIS records) and PubMed Journal (Leishmaniasis) publications, respectively. The only tremendous study done by Amesaveni and Vasanthi, (2013) covers Network Security records published in three journals by scientists all over the world. The data were collected from the Science Citation Index (SCI), Social Science Citation Index (SSCI) and Arts & Humanities Citation Index (ACHI) where collectively accessed from web of science database.

In their conclusion, regardless of the steady speed almost all studies have explored increment in record production through the specified period time frame. A study done in Biotechnology by Sevukan and Sharma noted that, the 15 publications produced in Central University of India in the year 1997 has grown to 43 in 2004. Again, in Nanotechnology India limited research grown from 10 to 93 in the range of 2004 – 2010. Except in the Akhtar & et al, (2011) the Electronic Library Journal single authorship ranked top; all studies identified collaboration between authors for publication was dominant in the latest years of the specified study period. The study by Sevukan and Sharma scored predominance of multi-authored papers (95.86%) over single-authored papers.

Therefore, having the discussed literatures as a base, the study will process Bibliometrics of Quality Management records published by top ten Africa countries within 1990 to 2016.

TOOLS AND TECHNIQUES

The paper analyses 2312 articles published in Quality Management in Africa countries for a period of 27 years ranging from 1990 to 2016. The bibliographic references affixed at the end of each article that appeared in web of science (ISI) were downloaded from the database and stored in a separate notepad folder. The particulars with regard to each published article such as type of papers, number of single authorship and collaboration authorship in each year and specific country and their forms in each article and the name of journals highest impact fact were recorded and analyzed. Keeping the objectives of the study in mind, the collected records were fed into HistCite software for useful examination.

RESULT AND DISCUSSION

After analysing the collected records, the authors have tried to present the opinion under altered heads. The detailed result of the analysis of the Quality Management records from 1990 to 2016 is shown in the succeeding sections:

Below, table one explicitly shows the dominance of publications in late-years of the twenty-seven years subjected to study. Within only three years (2013-15) out of total 2312 published 751 (32.5%) records came to publication, with yearly average of 250. Besides, the highest H-index score recorded is in the medium years of the specified range of years. Years in the first (1990 -2002) and last (2013-2016) decades have scored lower H-index (below 20) than of the medium decade years (20-28). Moreover, parallel to the increment in publication clearly observed from 1990 to 2015, dominance of citation reference by the authors for other articles is still persisted in years from 2011 to 2016 (all scored above 2000) which is 45.1%, excluding 2012. This data identifies in the current three to four years, there has been a great number of records publication and these publications have dominantly referred and cited more records of other scholars.

Table 1: Year wise Quality Management Records H-index and Cited Records Distribution

<i>S.No.</i>	<i>Publication Year</i>	<i>Records</i>	<i>% of 2312</i>	<i>H-Index</i>	<i>CR</i>
1	2015	280	12.11	7	13778
2	2013	227	9.82	17	12174
3	2014	244	10.55	12	11888
4	2011	193	8.35	23	10091
5	2016	149	6.44	2	8337

6	2012	189	8.17	19	8137
7	2010	138	5.97	20	6151
8	2009	122	5.28	25	5478
9	2008	113	4.89	28	5032
10	2007	108	4.67	25	4899
11	2006	69	2.98	24	3085
12	2004	70	3.03	22	2889
13	2005	72	3.11	24	2589
14	2003	60	2.60	20	2574
15	2002	49	2.12	19	1710
16	2001	43	1.86	19	1537
17	1999	39	1.69	14	1317
18	2000	27	1.17	12	1211
19	1998	26	1.12	12	688
20	1996	17	0.74	9	658
21	1995	25	1.08	7	556
22	1997	17	0.74	8	537
23	1994	14	0.60	7	471
24	1992	8	0.35	5	223
25	1993	7	0.30	4	153
26	1991	5	0.22	4	68
27	1990	1	0.04	1	20
Total		2312	100.00		

CR – Cited References

Table-2: The Country's Records Production Performance - the result investigated within the proximate three decades time, South Africa contributed 752 (53.3%) the highest number of "Quality Management" publications of the total 1410 published in ten best African countries. Kenya takes the second place however is far from that of South Africa. It covers 190 articles or 13.5 percent comparatively more against Cameroon 33 (2.3%) with a least contribution record from top ten African countries. Further, H-index is also thoroughly dominated by these two country's authors (35 and 29 respectively) both covering 36.4%. All the rest countries scored 10 to 18 each, which is 63.6%. Surprisingly, the study revealed that publication has long history in South Africa. In the early eight years (1991 to 1998) South Africa produced 45(84.9%) publications where only 8 (15.1%) records were produced by the rest nine African countries.

Akin to the record production result found in table 2, again table 3 reveals individual author's involvement in record production is highly dominated by South Africa. South African authors are leading by 3189(42%), and Kenyan 1195(15.7%), while all other eight African countries authors contributed 3209 or 42.3% records similar to what has been scored by South African authors.

Table 2: Top ten African Countries Quality management research Performance in 1991-2016

<i>Year</i>	<i>SA</i>	<i>Kenya</i>	<i>Uganda</i>	<i>Tanzania</i>	<i>Nigeria</i>	<i>Ghana</i>	<i>Zimbabwe</i>	<i>Ethiopia</i>	<i>Malawi</i>	<i>Cameroon</i>	<i>Total Articles</i>
1991	2	-	-	-	-	-	-	-	-	-	2
1992	4	-	-	-	-	-	-	-	-	-	4
1993	3	-	-	-	-	-	-	-	-	-	3

Bibliometric Analysis of Research Output in Quality Management at African Continent From 1990-2016

1994	5	-	-	-	-	-	-	-	-	-	5
1995	10	-	-	-	-	-	-	-	-	-	10
1996	8	3	-	-	2	-	-	-	-	-	13
1997	4	-	-	-	2	-	-	1	-	-	7
1998	9	-	-	-	-	-	-	-	-	-	9
1999	11	-	1	1	1	-	-	-	-	-	14
2000	6	1	1	1	1	-	1	1	-	-	12
2001	11	2	1	1	2	3	-	-	-	1	21
2002	11	-	-	1	1	1	-	1	-	-	15
2003	15	2	1	1	2	-	-	-	-	-	21
2004	25	2	1	-	2	1	-	-	-	2	33
2005	28	6	1	-	-	-	1	-	-	-	36
2006	17	7	5	2	1	1	3	-	-	1	37
2007	38	8	2	3		1	3	-	1	-	56
2008	33	12	2	5	5	2	5	1	5	1	71
2009	36	18	5	5	1	3	3	4	2	2	79
2010	49	12	9	3	8	7	2	4	-	3	97
2011	56	19	11	7	5	6	1	5	5	2	117
2012	67	14	8	10	6	4	3	6	4	6	128
2013	77	19	7	7	4	8	9	6	9	5	151
2014	81	22	10	14	9	5	6	5	3	3	158
2015	93	26	14	14	20	12	8	5	8	2	202
2016	53	17	5	5	4	7	6	5	2	5	109
Total	752	190	84	80	76	61	51	44	39	33	1410
H-Index	35	29	18	16	13	13	14	12	16	10	

As it is concisely presented in table 4, virtually all publications in Quality Management research are presented in the form of Articles. Articles cover 82.7% over the other forms where all are denoted by 17.3%. Another prevalent result is majority of the records got higher global citation score – TGCS. These references cover 96.3%, while references score for own previously published articles are only 3.7%. Interestingly, articles are the most referred or cited records (72.53%) though one fourth (25.74%) of the articles record was held by reviews and proceeding papers published in conferences, where all other form of presentations only cover (1.73%).

Table 3: Top 10 African Countries authors research contribution from 1991 to 2016

<i>Year</i>	<i>SA</i>	<i>Kenya</i>	<i>Uganda</i>	<i>Tanzania</i>	<i>Nigeria</i>	<i>Ghana</i>	<i>Zimbabwe</i>	<i>Ethiopia</i>	<i>Malawi</i>	<i>Cameroon</i>	<i>Total Authors</i>
1991	7	-	-	-	-	-	-	-	-	-	7
1992	6	-	-	-	-	-	-	-	-	-	6
1993	13	-	-	-	-	-	-	-	-	-	13
1994	9	-	-	-	-	-	-	-	-	-	9
1995	31	-	-	-	-	-	-	-	-	-	31
1996	22	8	-	-	3	-	-	-	-	-	33

1997	12	-	-	-	12	-	-	1	-	-	25
1998	51	-	-	-	-	-	-	-	-	-	51
1999	45	-	1	6	4	-	-	-	-	-	56
2000	30	2	6	1	3	-	7	3	-	-	52
2001	44	12	5	10	12	16	-	-	-	10	109
2002	45	-	-	5	1	2	-	1	-	-	54
2003	45	17	10	10	9	-	-	-	-	-	91
2004	94	10	4	-	16	5	-	-	-	5	134
2005	105	30	6	-	-	-	4	-	-	-	145
2006	56	43	26	14	3	13	9	-	-	2	166
2007	148	38	10	8	-	5	15	-	6	-	230
2008	164	66	14	35	25	9	17	2	30	5	367
2009	287	103	35	37	8	18	16	29	21	6	560
2010	157	60	44	15	19	42	16	25	-	23	401
2011	229	132	82	54	111	53	4	38	31	17	751
2012	302	84	68	51	35	22	10	37	18	36	663
2013	348	114	41	59	12	65	43	34	45	34	795
2014	315	152	97	69	51	23	25	44	34	23	833
2015	377	203	123	159	168	78	40	35	77	18	1278
2016	247	121	53	65	49	74	25	37	18	44	733
Total	3189	1195	625	598	541	425	231	286	280	223	7593

Table 4: Source Wise Distribution of Quality Management Research Publications

Document Type	Records	%	TLCS	TGCS
Article	1913	82.74	903	21003
Review	226	9.78	102	4948
Article; Proceedings Paper	140	6.06	80	2644
Editorial Material	20	0.87	14	77
Review; Book Chapter	11	0.48	10	418
Article; Book Chapter	1	0.04	0	3
Reprint	1	0.04	0	1
	2312	100.00		

Figure 1: Language Wise Distribution of Quality management research Output

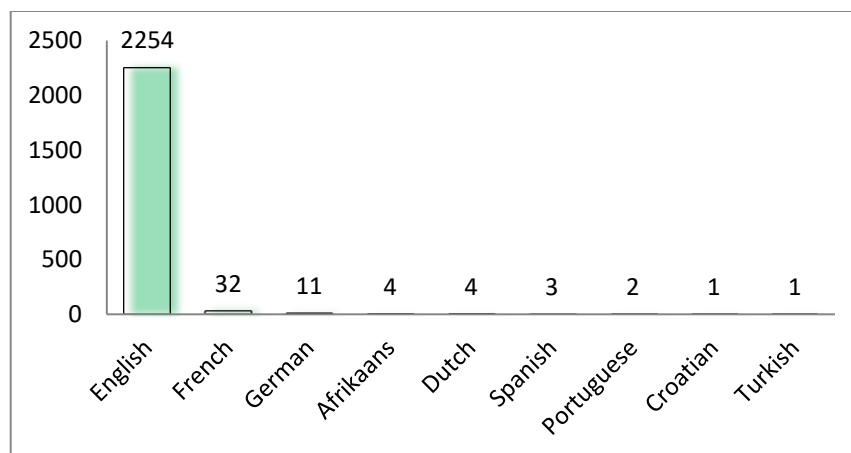


Figure-1 indicated that English language form of presentation is leading in African countries publications even though African continent has great language diversity. The published 2254 (97.5%) records of total 2312 are in English language. Surprisingly, all the languages used except Afrikaans are languages of countries out of the Africa, though some of them are still spoken by citizens of some countries. Authors of the above-mentioned English records have also consulted 1107 (99.82%) local and 28975 (99.68%) global English records as a reference to get their records published. Particularly, 104 (0.34%) Quality Management research publications referred for records presented in French and German Languages, while 17 (0.06%) records referred for records presented by the rest six languages.

Table 6 shows that most of the records produced by top ten African institutions are five from South Africa, each published more than 80 of total 736 records, where the top two covered 217 (29.5%) of all top ten institutions records. Contrarily, number of records produced by the least four institutions is similar to that of top two institutions - which is 24.3%. Another interesting result is, 2143 and 1811 records have cited as a reference by University London School Hyg & Trop Med, and University Cape Town, respectively, covering 43.2% of the total 9150 referred records by top ten institutions. Not only limited to global records reference, but also to local records reference too (records cited by their authors), because, both have scored 133 records or 32.8% of the total 402 locally referred records.

Table 6. Institution Wise Research Output on Quality management

<i>S.No.</i>	<i>Institution</i>	<i>Recs</i>	<i>%</i>	<i>TLCS</i>	<i>TGCS</i>
1	University Cape Town	117	5.06	61	1811
2	University Witwatersrand	100	4.33	35	976
3	University Pretoria	89	3.85	24	526
4	University Stellenbosch	86	3.72	32	540
5	University KwaZulu Natal	84	3.63	50	518
6	University London School Hyg& Trop Med	81	3.50	72	2143
7	Wageningen University	48	2.08	59	871
8	Makerere University	46	1.99	19	567
9	MinistryHealth	44	1.90	37	427
10	Harvard University	41	1.77	13	771

Table-7 specifies that the records production score by two leading authors is 41 (30.83%) out of total 133 records produced by top ten authors. Nevertheless, the remaining eight authors have produced 9 to 14 records each which are 92 or 69.17% of the general produced records. Another perspective of the authors published records is their H-index score. Parallel to the way they referred a number of records for producing their publications; their publications have also been referred by other authors. Consequently, first three authors have got 38 H-index score. Importantly, records of all authors have been used as a reference to others, though the least H-index score is 3.

Table 7: Quality Management Research productivity of Top 10 Authors with H-index

<i>S.No.</i>	<i>Author</i>	<i>Recs</i>	<i>% of 10552</i>	<i>H-Index</i>
1	Vanlauwe B	23	0.22	15
2	Giller KE	18	0.17	12
3	Lal R	14	0.13	11
4	Thierfelder C	14	0.13	8
5	Ryan J	12	0.11	8
6	Tittonell P	12	0.11	9
7	du Preez CC	11	0.10	5
8	Mapfumo P	10	0.09	6
9	Samways MJ	10	0.09	6
10	Hirschhorn LR	9	0.09	3

Table-8 displays a very special outcome i.e. how often records published in a single journal are used as a reference by other publications. There is no direct relationship between the number of records produced by a journal and the H-index score. This strongly shows not all references came from records published in reputable journals. The evidence to this argument is, the highest 18 H-index score is recorded from a non-reputable journal which only published 29 records. Contrarily, the two-top record producing journals (72 and 61 records) H-index is 12. First three place journals indicate Agriculture Ecosystems & Environment journal came to in the first place then PLOS ONE journal came to second place and Malaria Journal came to third place.

Table 8: Quality Management Research productivity of Top 10 Journals

S.No.	Journal	Recs	%	H-Index	Impact Factor
1	AGRICULTURE PLOS ONE ECOSYSTEMS & ENVIRONMENT	29	1.25	18	3.564
2	MALARIA JOURNAL	35	1.51	15	3.030
3	NUTRIENT CYCLING IN AGROECOSYSTEMS	26	1.12	13	1.490
4	WATER SA	79	3.42	12	1.090
5	PLOS ONE	61	2.64	12	3.540
6	HEALTH POLICY AND PLANNING	27	1.17	12	1.270
7	TROPICAL MEDICINE & INTERNATIONAL HEALTH	24	1.04	10	2.519
8	BMC HEALTH SERVICES RESEARCH	30	1.30	8	1.606
9	SAMJ SOUTH AFRICAN MEDICAL JOURNAL	24	1.04	7	0.890
10	WATER SCIENCE AND TECHNOLOGY	24	1.04	6	1.340

Though citing reference in a record is obvious, here in the study as stated in table 9, there is a great difference in the number of consulted references. The higher score of records referred by an author is 32 and the least is 15. Since the data is of the top 20 authors reference record, probably there exists less number of references usage in a record. The highest five authors' average citation reference is 28.8 records. This result covers 34.1% of the best 20 authors and seems good eminence.

Table 9: Quality Management Research productivity of Top 20 Author Cited References

S.No.	Author Cited References	Recs	Percent
1	Petti CA, 2006, CLIN INFECT DIS, V42, P377, DOI 10.1086/499363	32	1.4
2	Palm CA, 2001, AGR ECOSYST ENVIRON, V83, P27, DOI 10.1016/S0167-8809(00)00267-X	29	1.3
3	Anderson J. M., 1993, TROPICAL SOIL BIOL F	28	1.2
4	Rowe AK, 2005, LANCET, V366, P1026, DOI 10.1016/S0140-6736(05)67028-6	28	1.2
5	Giller KE, 2009, FIELD CROP RES, V114, P23, DOI 10.1016/j.fcr.2009.06.017	27	1.2
6	Reyburn H, 2004, BRIT MED J, V329, P1212, DOI 10.1136/bmj.38251.658229.55	23	1.0
7	WHO, 2010, GUID TREATM MAL	23	1.0
8	Mate KS, 2009, PLOS ONE, V4, DOI 10.1371/journal.pone.0005483	22	1.0
9	Sanchez PA, 2002, SCIENCE, V295, P2019, DOI 10.1126/science.1065256	21	0.9
10	Bationo A, 2001, NUTR CYCL AGROECOSYS, V61, P131, DOI 10.1023/A:1013355822946	19	0.8
11	Feller C, 1997, GEODERMA, V79, P69, DOI 10.1016/S0016-7061(97)00039-6	18	0.8
12	Thierfelder C, 2009, SOIL TILL RES, V105, P217, DOI 10.1016/j.still.2009.07.007	18	0.8
13	Tittonell P, 2005, AGR ECOSYST ENVIRON, V110, P166, DOI 10.1016/j.agee.2005.04.003	18	0.8
14	WHO, 2006, WORLD HLTH REP 2006	18	0.8
15	Callaghan M, 2010, HUM RESOUR HEALTH, V8, DOI 10.1186/1478-4491-8-8	17	0.7
16	Haines A, 2007, LANCET, V369, P2121, DOI 10.1016/S0140-6736(07)60325-0	17	0.7
17	STOORVOGEL JJ, 1993, FERT RES, V35, P227, DOI 10.1007/BF00750641	17	0.7

18	AbouZahr C, 2005, B WORLD HEALTH ORGAN, V83, P578	16	0.7
19	Chen L, 2004, LANCET, V364, P1984, DOI 10.1016/S0140-6736(04)17482-5	16	0.7
20	Franco LM, 2002, SOC SCI MED, V54, P1255, DOI 10.1016/S0277-9536(01)00094-6	15	0.6

CONCLUSION

The top ten African countries “Quality Management” records collected from 1990 to 2016 revealed South Africa’s leading history in records publication. In the early years 1991-1998, 45 of the 53 publications were from that country. Particularly in years 2013-15 (32.5%) and from total 1410 published the 752 records which is the highest production rate was recorded by South Africa; while the least scoring country is Cameroon, 33 records. The highest score of references (H-index score) for a record is also held by South Africa which is 35, leading Kenya by 6.

Year wise H-index highly was scored in 2003-2011 (24, average). Individual authors H-index was also dominated by three authors (Vanlauwe B, Giller KE, Lal R) who scored 38 of the total 83 H-index scores. Not only, have South African authors led the record production by 3189 out of 7593, but also their top five institutions produce 80 each from the general produced 736 records. The form of presentation was only limited to articles 82.7% and language of presentation was English with 97.5%. Besides, 96.3% of the referred records by the articles were presented in English language.

The last but not the least significant result from the study is the reverse relationship between number of records produced in one journal and records to be referred by authors. The mathematical result shows a journal producing 29 records, scores 18 H-index; while another journal producing 79 scores only 12 H-index. This result shows probability of records to be referred by other authors is not because of the recurring nature record production rate of a journal.

RECOMMENDATION

The study was limited to top ten African countries, but in the future, it is highly recommended to cover all countries over the world, so that a larger view of the field would be examined and show the gap between countries where eventually can lead to further research.

REFERENCE

- [1] Amsaveni, N., and R. Vasanthi. (2013) “Authorship pattern and collaborative research in the field of network security.” *Indian Journal of Applied Research* 3.1 52-54.
- [2] Arunachalam, Subbiah. (1999). “Mapping life sciences research in India: A profile based on BIOSIS 1992-1994.” *Current Science*
- [3] Ashok Kumar, P., Santosh A. Navalur, and K. Sivasekaran. “A Scientometric Study of Biodiversity Research in India: A special r.” *International Journal of Scientific Research* (2013).
- [4] R. Sevukan and Jaideep Sharma (2008) *Bibliometric Analysis of Research Output of Biotechnology Faculties in Some Indian Central Universities* *DESIDOC Journal of Library & Information Technology*, Vol. 28, No. 6, November 2008, pp. 11-20
- [5] *Bibliometric Study of Nanotechnology in India* by Thirumagal; *SRELS J/. Info. Manage.* Vol. 49, No.5, October 2012
- [6] https://en.wikipedia.org/wiki/Quality_management
- [7] Hussain, Akhtar, Fatima, Nishat, & Kumar, Devendra (2011). "Bibliometric analysis of the 'Electronic Library' journal (2000-2010)." *Webology*, 8(1), Article 87. Available at: <http://www.webology.org/2011/v8n1/a87.html>
- [8] *Indian Journal of Applied Research* by Amesaveni and Vasanthi: Authorship Pattern and Collaborative Research in the Field of Network Security Volume: 3 | Issue: 1 | January 2013 | ISSN - 2249-555X
- [9] *International Encyclopedia of Information and Library Science* Second edition John Feather and Paul Sturges 2003 by Routledge
- [10] *Library and information center management / Robert D. Stueart and Barbara B. Moran. — 7th ed. 2007* Libraries Unlimited, 88 Post Road West, Westport, CT 06881A Member of the Greenwood Publishing Group, Inc.

- [11] Ramos et al.: Bibliometric analysis of leishmaniasis research in Medline (1945-2010). *Parasites & Vectors* 2013 6:55.
- [12] Sevukan, R., and Jaideep Sharma. (2008) “Bibliometric analysis of research output of biotechnology faculties in some Indian central universities.” *DESIDOC Journal of Library & Information Technology* 28.6 11.
- [13] Sivasekaran, K., and S. Srinivasaragavan. (2014) “Mapping of research publications on Himalayas: A scientometrics exploration.” *International Journal of Scientific Research* 3 58-60.
- [14] Vinayagamorthy, P., P. Chellappandi, and J. Shanthi. (2009) “Authorship pattern and collaborative research in herbal literature.” *Pearl: A Journal of Library and Information Science* 3.4 32-38.
- [15] Vinayagamorthy, P., P. Chellappandi, and J. Shanthi. (2010). “Bibliometric Analysis of Herbal Literature and Research Output.” *Indian Journal of Library & Information Science* 4.3.
