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Changing Scholarly Trends of LIS Research in Asia: A Scientometric Study based on Scopus

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INTRODUCTION

Noruzi and Abdekhoda (2013) stated that academic and industrial interests are increasing in the impartial evaluation of scholarly research and global ranking of universities. Publication and citation counts have been used to assess the scientific production of countries and regions. While publication data have always formed a key component of research evaluation, they do not give any indication as to the quality of scientific research. On the other hand, although citation data have some inherent biases, especially towards publishing in English, it is often stated that a well-cited paper is used more by researchers, and it is probably considered more relevant to their scholarly work. During the last few decades, extensive studies have been conducted to analyze the research publications in terms of number of authors, gender of authors, length of articles, affiliations, citations, co-citations, word frequencies, co-occurrence of words and trends in research areas by considering one or more academic venues. These types of analyses are usually done by the bibliometric and scientometric methods.

REVIEW OF LITERATURE

Scientometrics or different metrics based studies are the powerful tools to analyse the behavior of various disciplines in a given time period. They reveal the collaboration by authors, different institution as well as nations. Some important laws such as Lotka's Law of Frequency Distribution or Bradford's Law of Scattering or Zipff's Law of Word Frequency, all are used to analyze the literature. This measurement can also be done using parameters like collaboration study, citation study or productiveness study. Scientometric analysis of Dentistry research by Sadik Batcha M in 2018 vol. of Informetrics study, where collaborative study was done using collaborative co-efficient, Collaborative Index, Modified collaborative co-efficient, Co-authorship Index and Degree of Collaboration etc. Internet Use in ERIC: A Scientometric Study was published in International Journal of Library & Information Science in 2016. Authors, L R Girdhari and Dr. V. Khaparde reviewed 775 articles for various aspects of the characteristics and patterns of contributions of the study, using length of the title, numbers of pages, type of document, chronological distribution of article, no. of references print as well as web references, authorship pattern, author productivity. () Social Media Research Publications in Asian Countries - A Scientometric Study by Dr L. N. Uma Devi & K. Thirumal, where authors tried to analyze the growing tendency of researchers to study the social media for research and publication. The parameter used was, source wise research output, year wise publications, authorship pattern, and country wise research on Social Media. The scope of the study was Asian countries. This was published in International Journal of Innovative Science and Research Technology. Scientometric analysis of Indian Journal of Biochemistry and Bio-Physics, a peer reviewed, open access bio-monthly Journal published by NISCAIR, was carried out by Madhu Bala and Dr. M P Singh. The analysis was based on number of articles, form of document cited, most cited Journals etc. Study revealed that single author contributed 5.7% while the rest 51.3% articles were by Multi authors. The Indian contributions in this Journal are higher than the other countries. The objectives of study

being to assist the collection development to satisfy the needs of scientists and researchers in the field of science and technology. All these studies are based on Scientometrics and scope of the study are different. The present study is also a scientometric analysis of the research trend in LIS in the Asia.

OBJECTIVES OF THE STUDY

The following objectives have been framed for the study:

- ➢ To analyze top most prolific institutes of Asia and ;
- ➢ To depict the growth of LIS research in Asia during the period 2002-2016 ;
- ➢ To examine the authorship pattern and nature of collaborative research ;
- ➢ To identify the authors productivity and their impact on scholarly world ;
- ➢ To examine Region-wise productivity of LIS publications ;
- ➢ To find out the most preferred journals.

SOURCE DATABASE & METHODOLOGY

In advance search, subject code for Library and Information Science was used to find out the literature on 20th Sept. 2017. Total 547403 LIS literature from abroad were shown in display for the time span of 18:58 – 20th September 2017. Then data were refined by Asian countries (Country/Territory option) for the time span of 2002-2016. After that a total of 21526 bibliographic records pertaining to Asian Library and Information Science literature was obtained from the Scopus database and subjected to further analysis. The following methods and indicators have been used to analyze the publications.

Collaborative Index (CI)

Collaborative index (CI) presents the mean number of authors per joint paper. Lawani introduced collaborative index in 1980. In this index, single-authored papers are omitted which is equal to one always. The mean number of authors per joint authored paper CI value Zero weight to single-authored paper. Which is calculated using following formula,

$$CI = \frac{\sum_{j=1}^{A} jf_j}{N}$$

Where, fj is the number of J authored papers published in a discipline during a certain period, N is the total number of research papers published in a discipline during a certain period of time.

Collaborative Coefficient (CC)

Ajiferuke(1988) suggested the notion of Collaborative coefficient (CC) and was used by Karki and Garg(1997) to measure the extent and strength of collaboration among the researchers in India in the Bibliometric discipline. It can be expressed mathematically as:

$$CC = 1 - \frac{\sum_{j=1}^{k} \left(\frac{1}{j}\right) f_j}{N}$$

Where, fj is the number of J authored papers published in a discipline during a certain period of time N is the total number of research papers published in a discipline during a certain period of time and k is the greatest number of authors per paper in a discipline.

According to Ajiferuke, CC tends to zero as single authored papers dominate and to 1-1/j as j-authored papers dominate. This implies that higher the value of CC, higher the probability of multi or mega authored papers.

Relative Citation Index

RCI is used to measure the influence and visibility of a nation's research on the global perspective. Relative citation impact can be defined as the average citations of a country's papers in the field divided by the world average in the corresponding field during the same period. The formula to calculate RCI suggested by Yi, Qi and Wu is:

$RCI = (c_{ij}/p_{ij})/(w_{cj}/w_{pj})$

RCI =1denotes that any country's citation rate is equal to world citation rate; RCI<1indicates that a country's citation rate is less than the world citation rate and also implies that the research efforts are higher than its impact; and RCI>1indicates that the rate of citation of a country is higher than the world's citation rate and also implies high-impact research of that country.

ANALYSIS AND INTERPRETATION

Distribution of LIS Publications into five regions of Asia Continent
The number and growth of Library and Information Science (LIS) publications in Asia continent during 2002–2016 is illustrated in Table 1and Fig. 1.

With view to assess the research output and growth in the field of LIS at Asia level, the tabulation has been worked out to reflect the LIS research distribution across different countries of Asia. It is observed that total 44 countries from different regions of Asia is involved in LIS research during the study period. A total of 21526 research publications were published in the field of LIS during the period of study, where Eastern Asia remained the largest Asian region with contribution of 13788 (64.05%) of total Asian publications, followed by South-Central Asia with 3818(17.74%) and Western-Middle Asia 2495 (11.59%), respectively. Northern Asia remained at the bottom of the table among all the regions with 429 publication.

Table 1 Region wise distribution of LIS publications

Rank	Continent	No. of country	No. of pub.	% of total pub	Pub. Per country
1	Eastern Asia	8	13788	64.05%	1724
2	South-Central Asia	11	3818	17.74%	347
3	Western-middle Asia	15	2495	11.59%	166
4	South-East Asia	9	2145	9.96%	238
5	Northern Asia	1	429	1.99%	429
	Total	**44**	**21526**	**100.00%**	**489**

Table 1 presents that 8 countries of eastern Asia contributed highest 1724 publications per country followed by Northern Asia with 1 country contributing 429 publications, South-Central Asia with 11 countries produced 347 publications per country, South-East Asia with 9 countries contributed 238 publications per country and Western Middle Asia with 15 countries contributed least number i.e. 166 publications per country.

Figure 1. Region-wise share of Asia (%)
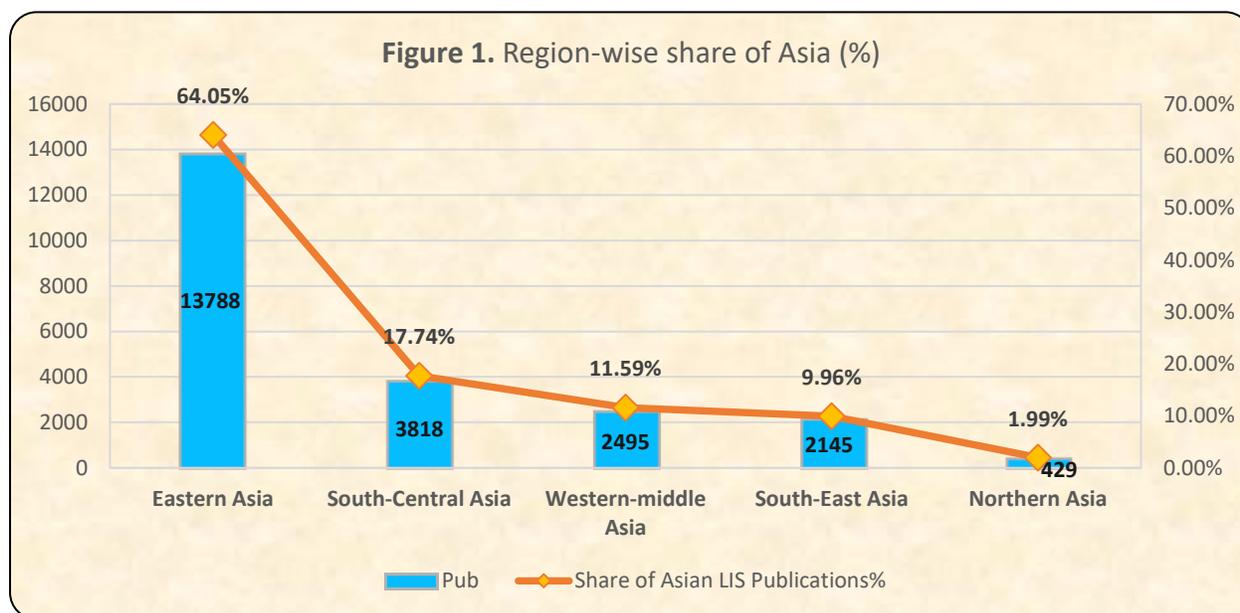
Geographical distribution of Asian publications and its impact
The number and growth of LIS publications in five sub-regions of the Asia during 2002-2016 is illustrated in Table 2. It was observed that Eastern Asia is the most productive region which has an impressive 13788(64.05%) publications and 99607(60.78%) citations of total Asian pub./citations followed by South-Central Asia with 3818(17.74%) publications and 20025(12.22%) citations, Western-middle Asia with 2495(11.59%) publications and 31978(19.51%) citations, South-East Asia with 2145(9.96%) publications and

20675(12.62%) citations and Northern Asia with 429(1.99%) publications and 3458(2.11%) citations. Publications from Western-middle Asia received the highest average number of citations (12.83) per publication followed by South-East Asia with 9.64 ACP, Northern Asia with 8.06 ACP, Eastern Asia with 7.22 and South-Central Asia with 5.24 ACP.

Table 2-Sub-region wise distribution of Asian publication						
Asian sub-region	**TNP**	**TNP %**	**TNC**	**TNC %**	**ACP**	**PEI**
Eastern Asia	13788	64.05	99607	60.78	7.22	0.95
South-Central Asia	3818	17.74	20025	12.22	5.24	0.69
Western-middle Asia	2495	11.59	31978	19.51	12.82	1.68
South-East Asia	2145	9.96	20675	12.62	9.64	1.27
Northern Asia	429	1.99	3458	2.11	8.06	1.06

The Citation impact which is represented as Publication Efficiency Index (PEI) Western-middle Asia impressed 19.51% of total Asian citation having highest PEI (1.68), South-east Asia gained 12.62% citation having PEI 1.27 value. Table 6 presents that Eastern Asia and South-central Asia had less than average Publication Efficiency Index value.

Figure 2 represents that Western-middle Asia, South-east Asia and Northern Asia have PEI greater than 1 which indicates that impact of publications is more than the research effort.

Figure 2. PEI of sub-region of Asia
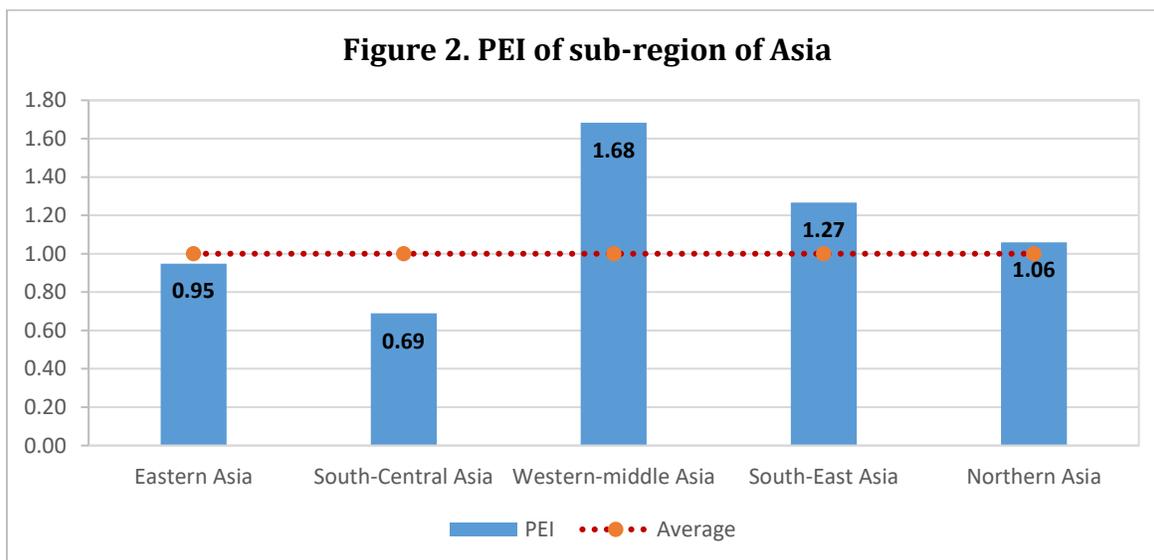
Year-wise growth of publication
Figure 3 provides the AGR of the number of documents for period 2002–2016.

$$AGR = \frac{end\ value - first\ value}{first\ value} x100$$

Figure 3 presents the annual distribution and average growth pattern of LIS publications. Fluctuation is seen throughout the study period. The compound annual growth rate (CAGR) (calculated using the formula available at www.investopedia.com/calculator/cagr.aspx) was found to be 13.25% during the period

2002–2016. The AGR for publications have shown decreasing trend from 19.10 in 2002 to 4.61 in 2015. AGR of publications was negative in 2007 (-15.89) and 2016 (-28.62) while highest growth rate were seen in 2006 (83.76) and 2008 (49.11). However major fluctuation has been seen since 2003-2008, a continuous decreasing trend existed during this period. The reason for the fluctuation is that there was no constant growth of publication.

The study analysis for the period 2002 – 2016 indicates that year in which less than 100 papers were published, were first five years i.e. 2002 (335), 2003(399), 2004 (417), 2005(548), 2007 (847) except 2006(1007) from which increased. In beginning the quantity of scientific publications were less but it increased gradually even though there were ups and downs, year 2006 and 2014 possess more number of articles.

Figure 3. Year-wise growth

Relative Growth Rate (RGR) and Doubling Time (Dt.) Vs. Year

Relative Growth Rate (RGR) and Doubling Time (Dt.) has been administrated to LIS publications. RGR is a measure to study the increase in number of articles over the period (Mahapatra 1985) and Doubling time is the time required for a quantity to double in size or value.

Table 3. Year-wise RGR & Doubling Time of Asian Publication						
Year	Publications	Cumulative	W1	W2	RGR	Dt.
2002	335	335	0	5.81	----	----
2003	399	734	5.81	6.60	0.78	0.88
2004	417	1151	6.60	7.05	0.45	1.54
2005	548	1699	7.05	7.44	0.39	1.78
2006	1007	2706	7.44	7.90	0.47	1.49
2007	847	3553	7.90	8.18	0.27	2.54
2008	1263	4816	8.18	8.48	0.30	2.28
2009	1470	6286	8.48	8.75	0.27	2.60
2010	1681	7967	8.75	8.98	0.24	2.92
2011	1903	9870	8.98	9.20	0.21	3.24

2012	2139	12009	9.20	9.39	0.20	3.53
2013	2362	14371	9.39	9.57	0.18	3.86
2014	2562	16933	9.57	9.74	0.16	4.22
2015	2680	19613	9.74	9.88	0.15	4.72
2016	1913	21526	9.88	9.98	0.09	7.45
Total	**21526**					

The chronological distribution, RGR, and DT, publications in the field of Library and Information Science during the period 2002–2016 has been shown in Table 3. It can be seen that the DT is doubled just after 2 years. When the RGR is constant, the quantity undergoes exponential growth and has a constant DT or period which can be calculated directly from the growth rate.

Figure 4. RGR vs. Dt.
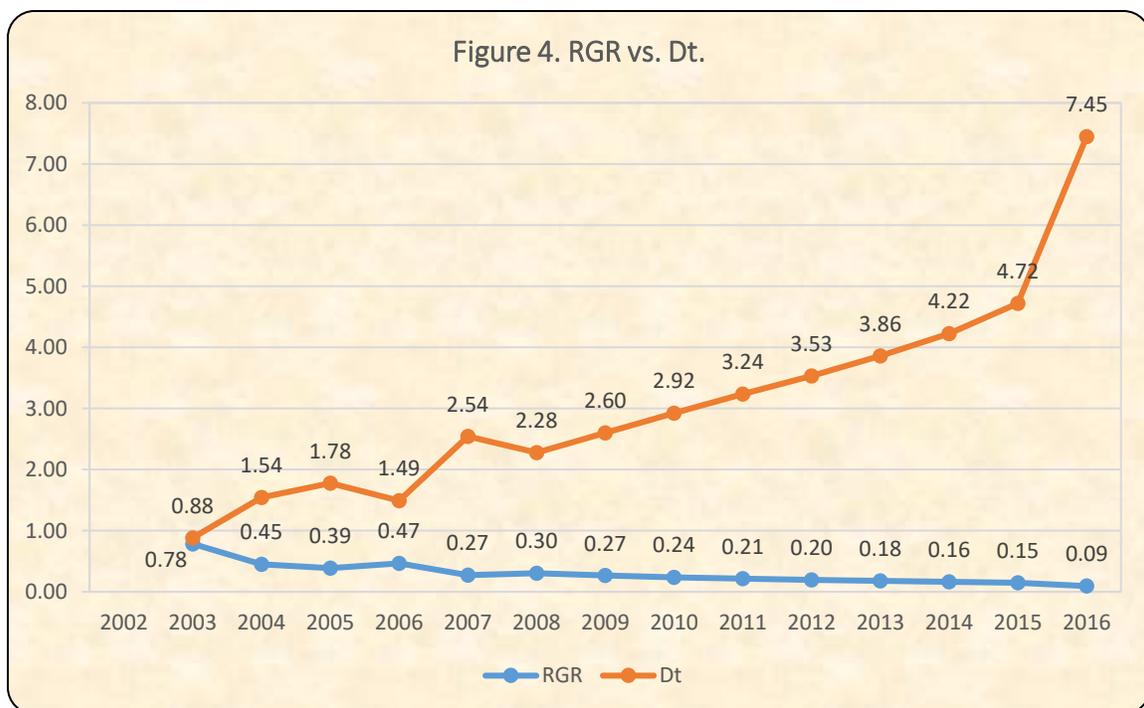
Citation distribution of Asian publications

Table 4 presents that 38.42% (8269) of total Asian publications were never cited, 14.39% (3098) were cited one time, 8.50% (1830) cited two times, 5.90% (1269) cited three times, 4.20% (904) cited four times, 3.20% (689) cited five times, 2.48% (534) cited six times, 2.17% (467) cited seven times, 1.80% (388) cited eight times, 1.65% (355) cited nine times, 1.30% (279) cited ten times and 16% (3444) were cited more than ten times. It has been seen in table that 38.69% (8329) of total publications were cited more than 2 times which has been counted as high quality papers and 61.31% (13197) counted as low quality papers.

Table 4. Distribution of citation	Time cited	TNP	TNP%	TNC
	0	8269	38.41	0
	1	3098	14.39	3098

|	2	1830	8.50	3660
	3	1269	5.90	3807
	4	904	4.20	3616
	5	689	3.20	3445
	6	534	2.48	3204
	7	467	2.17	3269
	8	388	1.80	3104
	9	355	1.65	3195
	10	279	1.30	2790
	11-20	1692	7.86	24781
	21-30	669	3.11	16649
	31-40	340	1.58	11861
	41-50	193	0.90	8633
	51-60	127	0.59	7020
	61-70	87	0.40	5626
	71-80	67	0.31	5049
	81-90	45	0.21	3828
	91-100	42	0.20	4003
	101-200	120	0.56	15975
	201-300	38	0.18	9425
	301-400	7	0.03	2334
	401-500	6	0.03	2660
	501-1000	7	0.03	4598
	>1000	4	0.02	8259
	Total	**21526**	**100.00**	**163889**

Year-wise citation impact of Asian publications

A value of RQI >1 indicates higher than average quality, whereas a value of RQI<1 indicates lower than average quality. Table 5 indicates year wise total number of publications, total citations, citation per paper, number of high quality and relative quality index. Figure 5 presents that RQI is lower than average during the year 2013, 2014, 2015 and 2016. RQI is maximum in the year 2004 and it was 1.59 during the year 2002 and 2012.

Table 5- Year-wise Relative Quality Index (RQI)						
Year	**TNP**	**TNC**	**TNC %**	**ACP**	**NHQ**	**RQI**
2002	335	6325	3.86	18.88	191	1.47
2003	399	8476	5.17	21.24	224	1.45
2004	417	12026	7.34	28.84	256	1.59
2005	548	10840	6.61	19.78	366	1.73
2006	1007	14817	9.04	14.71	482	1.24
2007	847	14319	8.74	16.91	505	1.54
2008	1263	16685	10.18	13.21	672	1.38
2009	1470	15779	9.63	10.73	744	1.31
2010	1681	13927	8.50	8.28	799	1.23
2011	1903	15677	9.57	8.24	959	1.30
2012	2139	11527	7.03	5.39	877	1.06

2013	2362	10913	6.66	4.62	907	0.99
2014	2562	7616	4.65	2.97	776	0.78
2015	2680	3866	2.36	1.44	462	0.45
2016	1913	1096	0.67	0.57	109	0.15
Total	**21526**	**163889**	**100**	**7.61**	**8329**	**1**

It is observed from above table 5 that average citation per paper of total Asian publications was 7.61. Highest ACP 28.84 was in 2004 and lowest 0.57 in 2016.


Figure 5. Year wise RQI
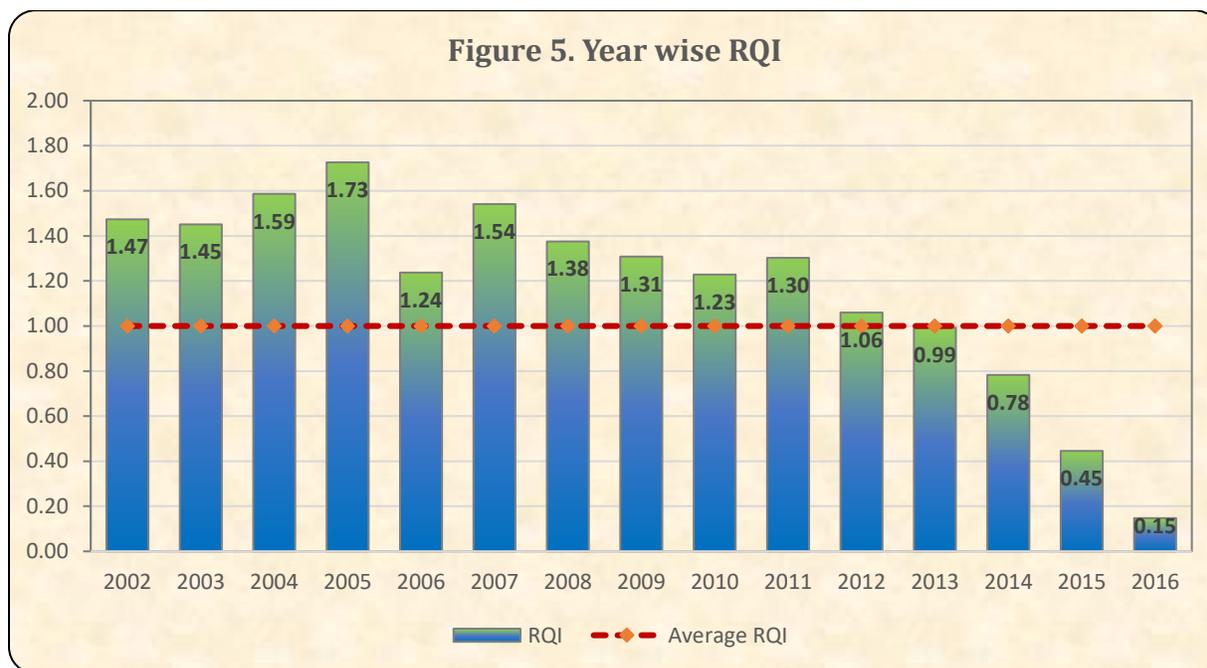
Form-wise growth of publications

In Table 6, it could be clearly seen that research articles appearing in Asian literatures, have shown a predominant contribution (85.68%) and it occupies the first position with respect to total number of publications reported during the study period. The conference paper as LIS publication from Asia comes next in order (8.95%). The review form of publication comes third in the order (3.15%), note slips down to fourth in order (0.59%) and editorial form at fifth position (0.54%). And remaining document form comes in order- letter (0.38%), article in press (0.27%), erratum (0.21%), book chapter (0.14%), and short survey (0.08%).

Table 6-Form of publication				
Publication Form	**TNP**	**TNP %**	**Cumulative**	**Cumulative%**
Article	18444	85.68	18444	85.68
Conference Paper	1926	8.95	20370	94.63
Review	679	3.15	21049	97.78
Note	127	0.59	21176	98.37
Editorial	116	0.54	21292	98.91
Letter	81	0.38	21373	99.29
Article in Press	59	0.27	21432	99.56

Erratum	46	0.21	21478	99.78
Book Chapter	30	0.14	21508	99.92
Short Survey	18	0.08	21526	100.00
Total Asian Pub.	**21526**	**100.00**	----	----

It could be deduced from the above discussion that journal articles predominate over other form of publications. It is more due to the vital place of journals as a medium of scientific communication than any other form of publication. Majority of the LIS scientists publish their research papers in the journals.

Figure 6. Publication form
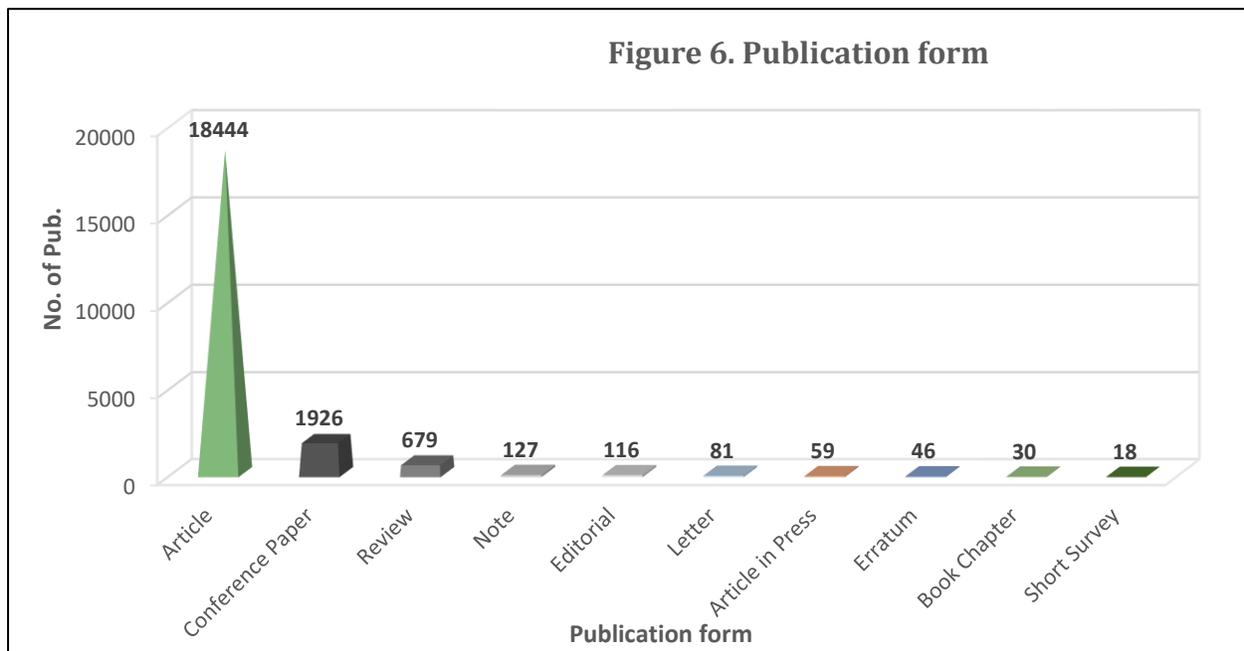
Changing trends of authorship of LIS publications

Table 7 presents that out of 21526 publications, 3698(17%) were single authored papers, 6568(31%) two authored papers, 8883(41%) multi-authored papers and 2377(11%) mega-authored papers. The authorship pattern clearly shows that more than 50% publications were contributed by Multi-authors and mega-authors while less than 50% of total publications published by single and double authors. It means multi and mega collaborative publications were dominated over single and double-authorship.

In the present study, it is found that CI is increasing continuously at mean rate of 2.68. It was observed that year 2002- 2009 have the less than average CI value while remaining years have more than average CI value.

It is found, that DC was lowest at 0.63 in 2003 and highest at 0.88 in 2015. It indicates that DC is continuously increasing at the mean rate of 0.79. It has been seen that the trend of multi-authored publications were increasing during study period.

Ajiferuke, Burell, and Tague gave a new measure known as CC, which removed the shortcomings related to CI and DC. In this study, the mean CC was 0.49. It is indicated that CC is increasing continuously from 0.37 (2002) to 0.53 (2016) with some minor fluctuations.

Table 7. Authorship pattern of Asian pub.									
Year	Single-authored (CAI)	Double-authored (CAI)	Multi-authored (CAI)	Mega-authored (CAI)	TNP	No. of author	CI	DC	CC
2002	122 (212)	120 (117)	80 (58)	13 (35)	335	698	2.08	0.64	0.37
2003	149 (217)	119 (98)	120 (73)	11 (25)	399	831	2.08	0.63	0.37
2004	124 (173)	145 (114)	133 (77)	15 (33)	417	937	2.25	0.70	0.42
2005	155 (165)	191 (114)	167 (74)	35 (58)	548	1310	2.39	0.72	0.43
2006	215 (124)	296 (96)	411 (99)	85 (76)	1007	2659	2.64	0.79	0.49
2007	193 (133)	240 (93)	341 (98)	73 (78)	847	2242	2.65	0.77	0.48
2008	241 (111)	429 (111)	498 (96)	95 (68)	1263	3343	2.65	0.81	0.49
2009	293 (116)	468 (104)	575 (95)	134 (83)	1470	3907	2.66	0.80	0.49
2010	280 (97)	544 (106)	714 (103)	143 (77)	1681	4609	2.74	0.83	0.51
2011	329 (101)	580 (100)	798 (102)	196 (93)	1903	5349	2.81	0.83	0.51
2012	313 (85)	608 (93)	960 (109)	258 (109)	2139	6282	2.94	0.85	0.54
2013	317 (78)	723 (100)	1019 (105)	303 (116)	2362	6995	2.96	0.87	0.54
2014	349 (79)	718 (92)	1143 (108)	352 (124)	2562	7910	3.09	0.86	0.55
2015	331 (72)	773 (95)	1176 (106)	400 (135)	2680	8383	3.13	0.88	0.56
2016	287 (87)	614 (105)	748 (95)	264 (125)	1913	6139	3.21	0.85	0.53
Total	**3698**	**6568**	**8883**	**2377**	**21526**	**61594**	**2.68***	**0.79***	**0.49***

Figure 7 shows that CAI for single authored publications was more than average value from 2002-2009 and in 2011 shows that Asian scientists preferred to work in without collaboration while in 2010 and from 2012-2016 was less than average CAI value. In 2002, 2004, 2005, 2008 and 2009 CAI value of single and double authored paper were more than average value that shows works is preferred in without collaboration or with one person. In 2003, 2006 and 2007, CAI value of only single authored is higher than average that indicates

that in these periods without collaborated work were preferred. In 2011 single, double and multi-authored work was preferred. Since 2012 to 2016 multi and mega-authored papers had more than average CAI value that showed collaborative work trend.


Figure 7. Year-wise CAI
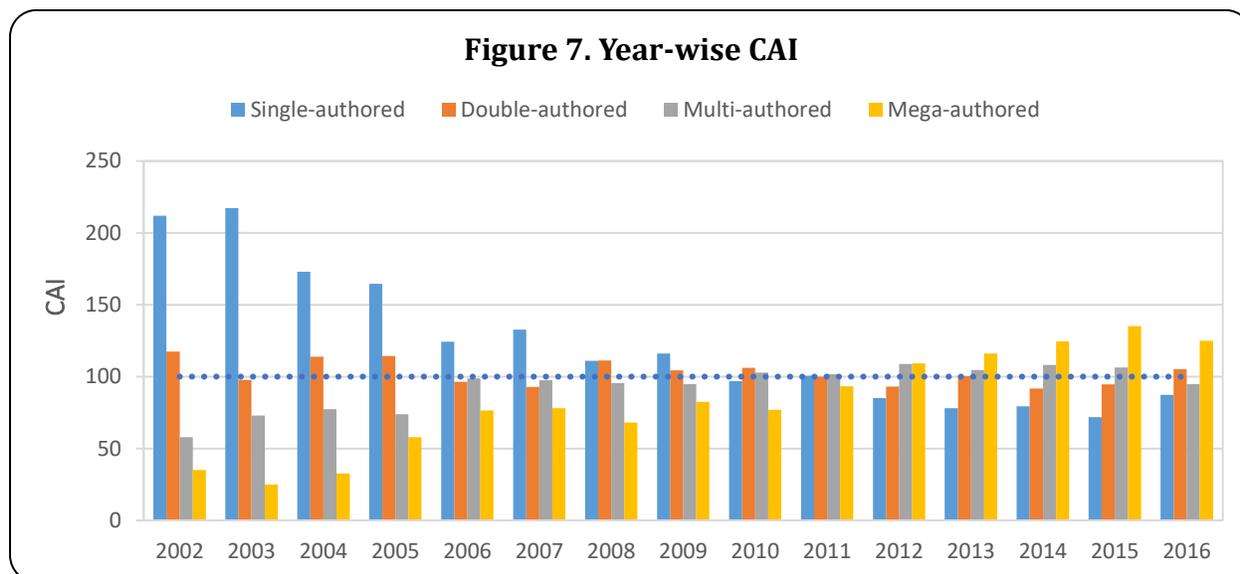
Authorship-wise citation distribution and its impact

It is observable from table 8 that 58.06%(2147) of single-authored publications were cited while 41.94% (1551) not cited, 63.38% (4163) of double-authored were cited and 36.62% (2405) not cited, 61.36% (5451) of multi-authored were cited and 38.64% (3432) not cited and 62.98% (1497) of mega-authored were cited while 37.02% (880) not cited. Therefore it has been seen that 61.59% (13258) of total (21526) publication were cited while 38.41 (8268) not cited.

The four levels of authorship pattern, their volume & percentage, number of publication cited (TPC), number of citations and their percentage of citation, citation per paper (CPP), and relative citation index (RCI) are calculated and shown in table 8.

Table 8. CITATION IMPACT OF AUTHORSHIP PATTERN								
Type of authorship	**TNP**	**TNP %**	**TNC**	**TNC %**	**TPC**	**Citedness %**	**ACP**	**RCI**
Single-authored	3698	17.18	22911	13.98	2147	58.06	6.20	0.81
Double-authored	6568	30.51	49611	30.27	4163	63.38	7.55	0.99
Multi-authored	8883	41.27	73494	44.84	5451	61.36	8.27	1.09
Mega-authored	2377	11.04	17873	10.91	1497	62.98	7.52	0.99
Total	**21526**	**100.00**	**163889**	**100.00**	**13258**	**61.60**	**7.61**	**1.00**

Note: TNP=Total no. of publications, TNC=Total no. of citations, TPC=Total paper cited, ACP=Average Citation per paper, RCI=Relative citation impact.

Figure 8. Volume of collaboration
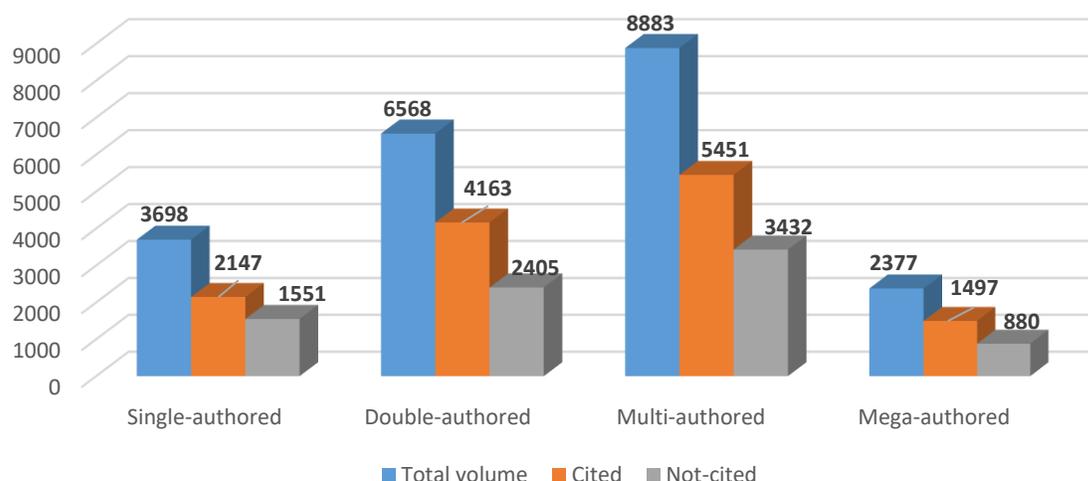
The qualitative scene of authorship pattern reveals that out of the 8883 (41.27%) multi-authored publications, 5451 publications have received a total of 73494 citations, which is 44.84% of the total citations and out of 6568 (30.51%) double-authored publications, 4163 publications have received 49611 citations which 30.27% of total citation. It has been seen from the graph that 71.78% of total citations received is by double and multi-authored papers and remaining 28.22% citation received by single and mega-authored publications. The volume of the different levels of authorship pattern, and the publications with and without citations has been visualized in table 8. The citedness, CPP, and RCI of single-authored publications stand at 58.06, 6.20, and 0.81 respectively. Out of the 515 intra collaborative publications, 291 have been cited. The number of citations received by these publications is 2077, which is 26.28% of the total citations. The citedness, CPP, and RCI values of this category are 56.50, 4.03, and 1.75, respectively. So it can be assumed that scholarly impact of double and multi-authored publications is more effective than others.

Top 10 prolific authors of Asia

Table 9 lists the top 10 authors in which Shamai, S produced the highest 76 (0.35%) of total output and received 6602 citations followed by Mahmood, K. with 70 (0.33%) and 388 citations, Merhav, N. 67 (0.31%) and 1014 citations, Bar-Ilan, J. 66 (0.31) and 1397 citations, Zainab, A.N. 52 (0.24) and 305 citations, Park, H.W. 48 (0.221) and 631 citations, Ameen, K. and Huang, M.H. 43 papers, Abrizah, A. 42 papers, and Ho, Y.S. 40 papers. Out of the top 10 authors listed below 5 authors had higher than average RCI. Among these authors, highest CPP and RCI were for Shamai, S. (11.42) of Technion - Israel Institute of Technology, Haifa, Israel, Ho, Y. S. (5.98) of Asia University Taiwan, Trend Research Centre.

S.N.	Authors	Affiliation	TNP(%)	TNC	CPP	RCI
	Table 9. Top 10 authors & their impact					
1.	Shamai, S.	Technion Israel Institute of Technology, Israel	76 (0.35)	6602	86.87	11.42
2.	Mahmood, K.	University of the Punjab, Pakistan	70	388	5.54	0.73

			(0.33)			
3.	Merhav, N.	Technion-Israel Institute of Technology, Haifa , Israel	67 (0.31)	1014	15.13	1.99
4.	Bar-Ilan, J.	The Hebrew University of Jerusalem, Jerusalem , Israel	66 (0.31)	1397	21.17	2.78
5.	Zainab, A.N.	University of Malaya, Kuala Lumpur, Malaysia	52 (0.24)	305	5.87	0.77
6.	Park, H.W.	YeungNam University, South Korea	48 (0.22)	631	13.15	1.73
7.	Ameen, K.	Punjab University, Lahore, Pakistan	43 (0.20)	191	4.44	0.58
8.	Huang, M.H.	National Taiwan University, Taiwan	43 (0.20)	353	8.21	1.08
9.	Abrizah, A.	University of Malaya, Kuala Lumpur, Malaysia	42 (0.20)	274	6.52	0.86
10.	Ho, Y.S.	Asia University Taiwan, Wufong, Taiwan	40 (0.19)	1819	45.48	5.98

Highly prolific country of Asia

In the study to find out highly publishing countries of Asia, all the five regions with the top 5 countries have been ranked according to their publication output. (Table-10) It is clear from the table that in the Eastern Asia, China has been ranked at the top with 7822 publications which have begged 33032 citations and Hong-Kong has begged least TNP (892) but quite a large TNC (13344). In south-Central Asia, which has countries like India, Iran, Pakistan Bangladesh and Sri Lanka. India is at the top with TNP 2360 followed by Iran, Pakistan, Bangladesh and Sri Lanka. In the Western-Middle Asia, Israel tops the list with TNP of 1049 (TNC= 21504) and UAE has the least TNP (152) but least TNC is of Kuwait (932). In the South-East Asia, Singapore has highest TNP (1062) and TNC (13783) and Viet-Nam has lowest TNP & TNC. Whereas in the Northern Asia region, Russian Federation have 429 TNP and 3458 TNC.

Table-10; Top 5 country of each region of Asia							
Region	Rank	Country	TNP	TNP%	TNC	ACP	RCI
Eastern Asia	1	China	7822	36.34	33032	4.22	0.55
	2	Taiwan	2217	10.30	23930	10.79	1.42
	3	South Korea	1477	6.86	19376	13.12	1.72
	4	Japan	1353	6.29	9611	7.10	0.93
	5	Hong Kong	892	4.14	13344	14.96	1.97
South-Central Asia	1	India	2360	10.96	12999	5.51	0.72
	2	Iran	828	3.85	4602	5.56	0.73
	3	Pakistan	397	1.84	1496	3.77	0.50
	4	Bangladesh	136	0.63	599	4.40	0.58
	5	Sri Lanka	60	0.28	215	3.58	0.47
Western-middle Asia	1	Israel	1049	4.87	21504	20.50	2.69
	2	Turkey	554	2.57	5941	10.72	1.41
	3	Saudi Arabia	234	1.09	1016	4.34	0.57
	4	Kuwait	159	0.74	932	5.86	0.77

	5	UAE	152	0.71	938	6.17	0.81
South-East Asia	1	Singapore	1062	4.93	13783	12.98	1.71
	2	Malaysia	686	3.19	4003	5.84	0.77
	3	Thailand	235	1.09	2330	9.91	1.30
	4	Indonesia	63	0.29	280	4.44	0.58
	5	Viet Nam	51	0.24	179	3.51	0.46
Northern Asia	1	Russian Federation	429	1.99	3458	8.06	1.06

Country-wise distribution of publications

It has been seen in Table 11, 91.73% of total Asian LIS publication published by following 10 countries. Table 11 presents that Peoples Republic of China was the highly productive country in Asia with 7822 (36.34%) publications, 33032 citations, 4.22 ACP and 0.55 RCI followed by. India 2360(10.96%), Taiwan 2217(10.30%), South Korea 1477(6.86%) and Japan, Singapore, Hong Kong, Iran and Malaysia distributed less than 5 of total Asian papers. Taiwan, South Korea, Singapore, Israel, and Hong Kong have more than average ACP and RCI while remaining countries have less than average value.

Table 11- Top 10 prolific countries					
S.N.	Country	TNP (%)	TNC (%)	ACP	RCI
1.	China	7822(36.34)	33032(20.16)	4.22	0.55
2.	India	2360(10.96)	12999(7.93)	5.51	0.72
3.	Taiwan	2217(10.30)	23930(14.60)	10.79	1.42
4.	South Korea	1477(6.86)	19376(11.82)	13.12	1.72
5.	Japan	1353(6.29)	9611(5.86)	7.10	0.93
6.	Singapore	1062(4.93)	13783(8.41)	12.98	1.71
7.	Israel	1049(4.87)	21504(13.12)	20.50	2.69
8.	Hong Kong	892(4.14)	13344(8.14)	14.96	1.97
9.	Iran	828(3.85)	4602(2.81)	5.56	0.73
10.	Malaysia	686(3.19)	4003(2.44)	5.84	0.77
		19746(91.73)	156184(95.30)	7.61*avrg	1.00 avrg

Most prolific institutes/colleges/universities

Table 12 reveals that top 10 productive institutes of Asia of which Nanyang Technological University, Singapore contributed highest 477(2.22%) followed by Chinese Academy of Sciences, Beijing, China 453(2.10%), National University of Singapore 405(1.88%). Seven institutes out of ten have more than average CAI and RCI values.

Table 12. top 10 prolific journals					
S.N.	Institute	TNP (%)	TNC	ACP	RCI
1.	Nanyang Technological University, Singapore	477(2.22)	5222	10.95	1.44
2.	Chinese Academy of Sciences, Beijing, China	453(2.10)	3956	8.73	1.15

3.	National University of Singapore, Singapore city, Singapore	405(1.88)	6465	15.96	2.10
4.	Wuhan University, Hubei, China	388(1.80)	2249	5.80	0.76
5.	National Taiwan University, Taiwan	356(1.65)	3367	9.46	1.24
6.	Technion - Israel Institute of Technolog, Haifa, Israel	337(1.57)	12282	36.45	4.79
7.	City University of Hong Kong, China	298(1.38)	4448	14.93	1.96
8.	University of Malaya, Kuala Lumpur, Malaysia	259(1.20)	1283	4.95	0.65
9.	National Chiao Tung University Taiwan, Taiwan	243(1.13)	2184	8.99	1.18
10.	Dalian University of Technology, Liaoning, China	234(1.09)	1232	10.95	0.69

Most prolific journals

Table 13 presents that 4181(19.42%) of total publications were published in Journal of Information and Computational Science which gained 0.94 per papers citation with 0.12 RCI. Followed by IEEE Transactions on Information Theory with 1900 publication 21.61 ACP and 2.84 RCI, Scientometrics with 1131 publication, 10.71 ACP and 1.41 RCI, Journal of Information Science and Engineering with 1054 publication and 3.68 ACP, 0.48 RCI. Remained journals produced less than 1000 papers.

Table 13-Top 10 prolific journals					
S.N.	Journal Name	TNP (%)	TNC	ACP	RCI
1.	Journal of Information and Computational Science	4181(19.42)	3939	0.94	0.12
2.	IEEE Transactions on Information Theory	1900(8.83)	41067	21.61	2.84
3.	Scientometrics	1131(5.25)	12152	10.74	1.41
4.	Journal of Information Science and Engineering	1054(4.90)	3879	3.68	0.48
5.	Lecture Notes in Control and Information Sciences	620(2.88)	1077	1.74	0.23
6.	Journal of Chemical Information and Modeling	602(2.80)	10106	16.79	2.21
7.	Electronic Library	422(1.96)	2575	6.10	0.80
8.	Information Processing and Management	410(1.90)	6857	16.72	2.20
9.	Journal of Digital Information Management	378(1.76)	395	1.04	0.14
10.	International Journal of Geographical Information Science	373(1.73)	5674	15.21	2.00

Conclusion

The annual growth rate fluctuated during the period of study , though the output as seen, in the early stages the quantity of scientific publications were less but it increased gradually even though there are ups and drop downs in some years and 2015 is the year which possess highest number of articles of the study period. Shamai, S was the most prolific

author and has got the highest CPP and RCI. More than half 91.73% of total papers were published in 10 journals. Eastern Asia is the highest productive region of Asia continent and Nanyang Technological University, Singapore was the most prolific institute of Asia. Scholarly impact of double and multi-authored publications is most effective of all.

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