

Semantic Web Research Output in Global Level: A Scientometric Study

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Abstract - This study tries to investigate about the Semantic Web research publication output to observe the performance of Semantic Web research in Global level. We have taken data from the Web of science database 4627 records were downloaded from the database during 2000 to 2011(12 years) of Semantic Web research area. It analysis the exponential growth rate, share of collaborative authors, most productive journals and citations were also analysed.

Keywords: Semantic Web, Scientometrics, Citations, Growth Rate, Author Productivity.

I.INTRODUCTION

The Semantic Web is a vision the idea of having data on the web defined and linked in a way that it can be used by machines not just for display purposes, but for automation, integration and reuse of data across various applications. With this opportunity there is lot work going on to invent new strategies in Semantic Web. With this background we have taken this study to analyse the research performance of Semantic Web, as reflected in the publications output in Web of Science database during 2000-2011.

II.OBJECTIVES

This study to analyse the research output in the field of Semantic Web during the period 2000-2011. The analyses included year wise growth, Exponential growth rate, author wise contribution, share of top scholarly Journals and major collaborative partner countries. It also analyses the characteristics of most productive institutions, authors and Citations.

III.METHODOLOGY

Data was collected from the Web of Science Database (WoS). The WoS is the search platform provided by Thomson Reuters (the former Thomson Scientific emerged from the Institute for Scientific Information (ISI) in Philadelphia) SCI database is one of the very comprehensive databases covering all aspects of science. The study period 2000-2011 is selected. The search string “semantic web” in the basic research field of for the years 2000-2011 to download the records on the subjects “Semantic web”. A total of 4627 records published in global level were downloaded and analysed by using the web of Science website application as per the objectives of the study.

IV.ANALYSIS AND DISCUSSION

TABLE I YEARLY OUTPUT OF GLOBAL AND NATIONAL RESEARCH OUTPUT IN SEMANTIC WEB

Comprehensive Level					National Level				
S.No	Year	Records	TLCS	TGCS	S.No	Year	Records	TLCS	TGCS
1	2000	23	111	479	1	2000	0	0	0
2	2001	68	623	4422	2	2001	1	0	0
3	2002	185	556	2462	3	2002	1	0	18
4	2003	314	657	3791	4	2003	1	0	0
5	2004	502	651	4217	5	2004	3	0	24
6	2005	639	762	4952	6	2005	12	1	48
7	2006	617	680	4526	7	2006	3	0	64
8	2007	321	475	3347	8	2007	2	0	37
9	2008	449	519	3801	9	2008	7	0	17
10	2009	499	316	2500	10	2009	5	0	5
11	2010	483	86	1256	11	2010	5	0	12
12	2011	527	18	632	12	2011	5	0	1
	Total	4627	5454	36385		Total	45	1	226

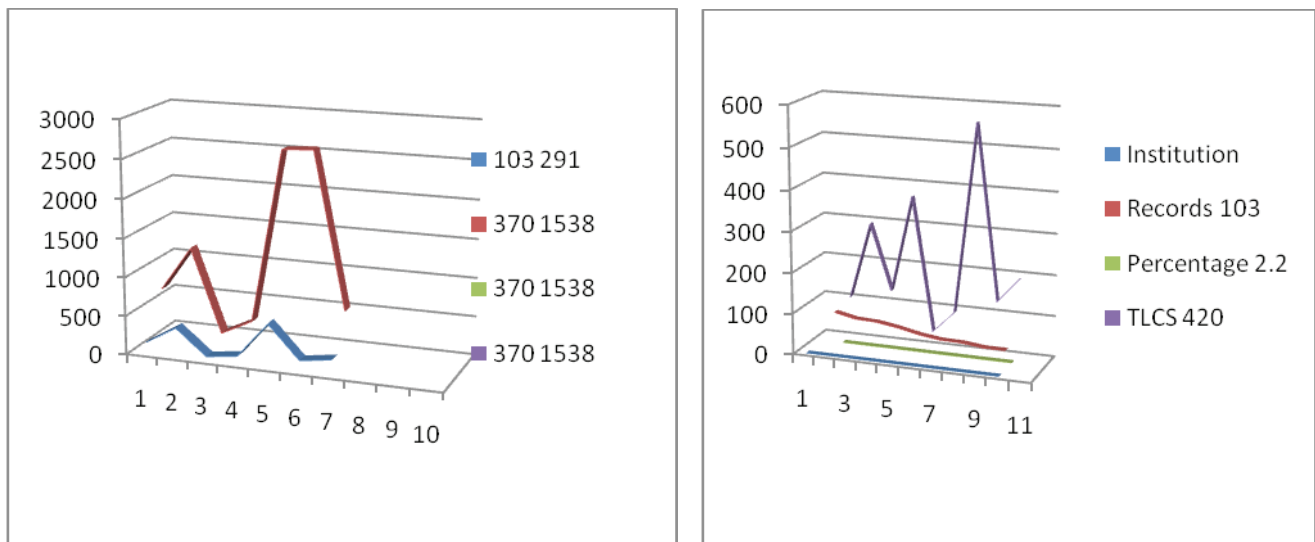


Fig. 1 Yearly Output Of Global And National Research Output

Table 1 reveals the year wise output of the Semantic Web research there is a linear growth in year wise output and it reached 4627 records in 2011 from only 23 records in the year 2000 which is an indication of increasing importance of Semantic web. In case of comprehensive level 2005 stands ahead in TLCS as well as TGCS with 762 and 4952 Citations respectively. In national level yearly output of Semantic Web research started for in 2001 with 1 record and it was reached to highest 12 records in the year 2005. As compare to comprehensive level there is no linear growth at national level. In case of TLCS as well as TGCS also there are fluctuations. Only One citation in national level that too only in the year 2005 in case of TGCS there are 64 citations in the year 2006.

TABLE 2 EXPONENTIAL GROWTH RATES OF SEMANTIC WEB RESEARCH PERFORMANCE

Comprehensive Level				National Level			
S.No	Year	Records	Growth Rate	S.No	Year	Records	Growth Rate
1	2000	23	-	1	2000	0	-
2	2001	68	2.96	2	2001	1	0
3	2002	185	2.72	3	2002	1	1
4	2003	314	1.70	4	2003	1	1
5	2004	502	1.60	5	2004	3	3
6	2005	639	1.27	6	2005	12	4
7	2006	617	0.97	7	2006	3	0.25
8	2007	321	0.52	8	2007	2	0.67
9	2008	449	1.40	9	2008	7	3.5
10	2009	499	1.11	10	2009	5	0.71
11	2010	483	0.97	11	2010	5	1
12	2011	527	1.09	12	2011	5	1
	Total	4627	16.31 (1.36)		Total	45	16.13 (1.34)

Table 2 reveals that the Exponential Growth rate of publications in Semantic Web research output at comprehensive level and national level. An exponential growth in number of publications was observed during from 2000 to 2011, average growth at comprehensive level is 1.36 and 1.34 at national level. The highest growth rate at comprehensive level is 2.96 during 2001.

The total exponential growth rate value is 16.31 at comprehensive level and 16.13 at national level. With this data we can say observe the linear growth at comprehensive level except the year 2007 everywhere the contribution is less than 2006. In case of national level growth there are fluctuations with average contribution to global output.

TABLE 3 TOP 10 AUTHORS PRODUCTIVITY OF SEMANTIC WEB RESEARCH

S.No	Author	Records	TLCS	TGCS
1	Goble C	35	145	552
2	Motta E	34	88	333
3	Horrocks I	32	254	823
4	Wu ZH	32	18	115
5	Chen HJ	31	19	99
6	Antoniou G	30	81	244
7	Staab S	29	180	587
8	Hendler J	27	243	2287
9	Fensel D	26	206	640
10	Jung JJ	24	51	248

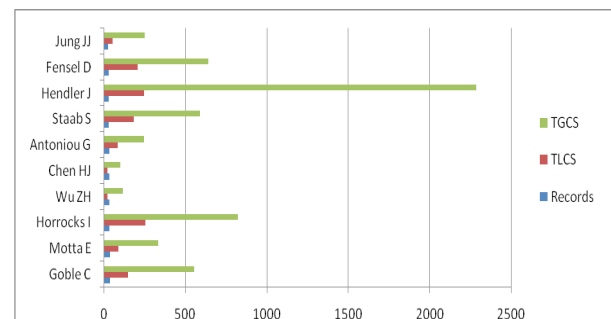


Fig. 2 top 10 Authors Productivity

Table 3 divulge the contribution of top 10 most productive authors in Semantic Web Research articles. Goble C top the list with the contribution of 35 records, but in case of total global citation and local citation of Globe C ahead the Hender J contribution of 27 records in top most productive contribution list in global level of 2287 documents . Remaining authors in the list have contributed for with less difference but with greater difference in total global citation and total local citation.

TABLE 4 COLLABORATION PATTERN OF AUTHORSHIP IN SEMANTIC WEB RESEARCH

No of Authors	No of Articles	Percentage
1	632	13.66
2	1185	25.61
3	1183	25.53
4	795	17.18
5	427	9.25
6	176	3.80
7	91	1.97
8	48	1.04
9	22	0.48
10	15	0.33
Above 10	53	1.15
Total	4627	100

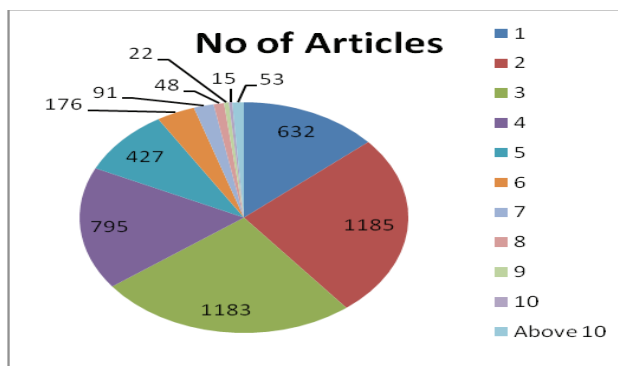


Fig. 3 Collaboration Pattern Of Authorship

The table 4 reflects the collaboration pattern of authorship. Out of 4627 records 632 are contributed by single authors which are 13.66 percentage of total output. 1185 records are contributed by double authors which are 25.61 percentage of total and which top percentage wise contribution. Contribution by single authors and double authors together stands around 50 percent and remaining 50 percent contribution came from three and more than three authors with the major contribution of three authors. Analysis of this collaborative pattern in though quite good in collaboration but as compare to other areas of research it demands still more collaboration.

TABLE 5 MOST PRODUCTIVE JOURNALS

S.No	Journal	Records	Percentage	TLCS	TGCS
1	Journal of Web Semantics	138	3.0	386	1538
2	Expert Systems with Applications	111	2.4	101	802
3	IEEE Intelligent Systems	75	1.6	309	1274
4	BMC Bioinformatics	63	1.4	0	590
5	Journal of Universal Computer Science	61	1.3	42	241
6	IEEE Transactions on Knowledge and Data Engineering	60	1.3	144	920
7	Semantic Web: Research and Applications, Proceedings	60	1.3	81	460
8	International Journal on Semantic Web and Information Systems	56	1.2	70	375
9	Data & Knowledge Engineering	54	1.2	91	497
10	Semantic Web - ISWC 2005, Proceedings	47	1.0	40	276

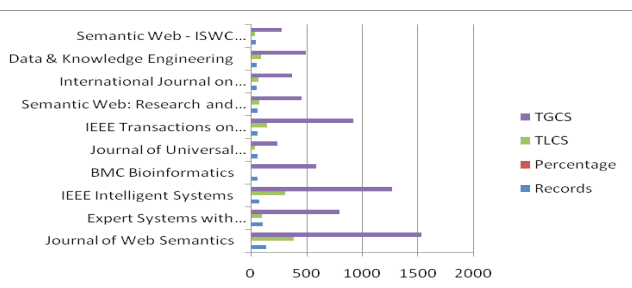


Fig. 4 Most Productive Journals

Table 5 these top 10 most productive journals have contributed 725 papers, with an average contribution of 72.5 papers per journal publications output of 2000-2011 among the top 10 most productive journals, only two journals have higher number of papers than the group’s average. These are Journals of Web Semantics (138), Expert systems with applications (111). In case of total local citation and total global citation Journal of web Semantics dominates the list by having 22.05 percent of citation which indicates the dominated usage of journal of Semantic Web followed by the IEEE intelligent systems.

TABLE 6 TOP 10 INSTITUTIONS CONTRIBUTED SEMANTIC WEB RESEARCH

S.No	Institution	Records	Percentage	TLCS	TGCS
1	University of Manchester	103	2.2	420	1699
2	Unknown	93	2.0	103	370
3	University of Southampton	82	1.8	291	1538
4	Chinese Academy of Sciences	80	1.7	130	700
5	University of Karlsruhe	72	1.6	366	1271
6	Zhejiang University	61	1.3	38	192
7	Open University	54	1.2	91	392
8	Stanford University	53	1.1	555	2629
9	MIT	47	1.0	130	2653
10	Vrije University of Amsterdam	47	1.0	189	658

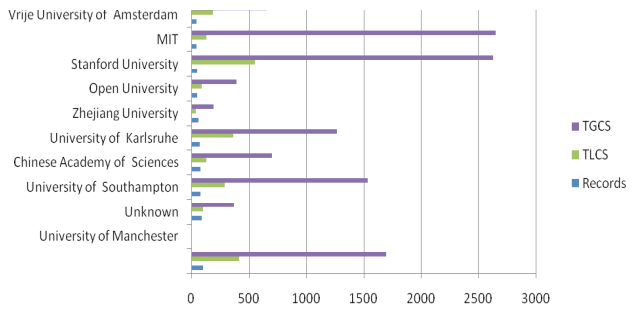


Fig. 5. Top 10 Institutions Contributed Semantic Web Research

Table 6 reflects the research profile of the most productive institutions in semantic web research output. The 10 most productive institutions involved in research in semantic web are identified out of these two universities in case of records and citation are Stanford University and MIT which are from MIT which shows the importance of semantic web research output. Here the focusing point is semantic web research output is concentrated in universities and it demands specific research centres for semantic research which can further boost the semantic research.

TABLE 7 TOP 10 COUNTRIES CONTRIBUTION OF SEMANTIC WEB RESEARCH

S.No	Country	Records	Percentage	TLCS	TGCS
1	USA	864	18.7	1488	12668
2	UK	584	12.6	1087	5929
3	Peoples R China	519	11.2	285	1925
4	Unknown	444	9.6	697	3654
5	Germany	356	7.7	531	2719
6	Spain	305	6.6	166	1683
7	Italy	297	6.4	341	2123
8	South Korea	201	4.3	101	674
9	Canada	190	4.1	224	1628
10	Greece	176	3.8	171	966

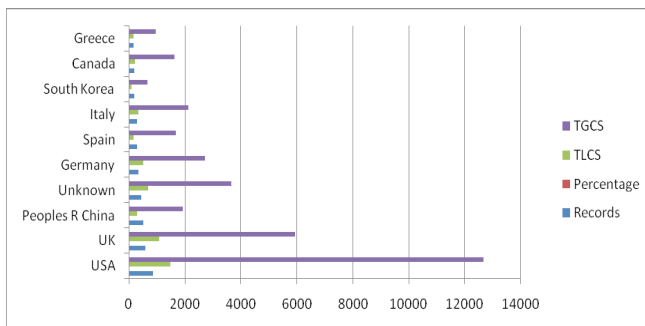


Fig. 6 Top 10 Countries Contribution Of Semantic Web Research

Table 7 the global publications shares of the top 10 most productive countries in semantic web research during from 2000 to 2011 varied between 176 and 864 records. United States of America (USA) topped the list with global publications (4627) share of 864 records during 2000-2011. United Kingdom (UK) ranked 2nd with the contribution of 584 records, followed by, Peoples R China, Unknown, Germany, Spain, Italy, South Korea and Canada. In case of TGCS and TLS there is a little variation USA topped the TGCS followed by UK and Unknown. USA topped the TLCS list followed by UK and Unknown. The citation analysis shows that UK and USA though with fewer record that UK managed to get more citation which is a healthy sign quality research in USA and UK. Here the concern is that the research is concentrated in developed world and it need to promote in developing world including India and developed world.

V.CONCLUSION

In this world semantic web research for learning, from 2000s to till date there is curious development in the area of semantic web research which is realized by this study. This study reflects the linear growth in the research as well as usage of the output. Collaboration pattern found in the semantic web research is really interesting and optimistic that we can understand by authorship pattern and histogram as there is huge network between researchers. Main portion of the research output communicated in journal papers followed by proceedings here there is a need of communicating research output in letters, news and other medias which can easily accessible. In case of national output it is somewhat disappointing as it is concentrated in developed world and there is a need of huge initiation in developing and underdeveloped world. In Case of India, south Korea and Greece it is really unsatisfactory because being a information technology hub of the world failed to place at least in the top ten position in Semantic web research so there is a need of greater initiation to make use of Indian Expertise to improve the performance of in Semantic web research.

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