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Uncited Publications in MEMS Literature: A Bibliometric Study

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ABSTRACT

In this paper attempt has been made to identify the uncited publications in 'micro-electro mechanical systems (MEMS) literature which is one of the emerging field in electronics. The search term 'MEMS' was used for retrieving literatures from SCOPUS database. A total of 294573 records were identified in the field of MEMS during the period 1970-2013. Out of which, 85146 (28.90 %) records were uncited publications. The uncited paper ranges between 0.09 % and 0.72 %. It can be seen that from 1988 onwards uncitedness has been reduced below the global average and it persists till 2010. Almost 56 % of the uncited publications are from the conference proceedings. 44.56% of China publications in MEMS were uncited followed by India (31.44 %), Japan (24.40 %), and France (19.44 %). Majority of the uncited publications, are of collaborative authors besides the self-citations. Mostly more than four authors' papers were uncited. Even top author papers were also uncited. The uncitedness may be due to non-awareness of those papers in the MEMS literature.

Keywords: Uncitedness, citation analysis, bibliometrics study, MEMS literature, uncited publications, scientific output

1. INTRODUCTION

Over the past three decades, citation analysis along with peer review has been increasingly used to judge and quantify the importance of scientists and scientific research. Citation analysis is also used as the mean behind journal impact factors. Indeed, the output from citation studies is often the only way that un-specialists in governments and funding bodies–or even those in different scientific disciplines–can judge the importance of a piece of scientific research. These studies focused on the scientific output and impact of the research output published during different periods.In the past, several authors have examined the issue of uncitedness of journals as well as the subject specific disciplines. The studies on uncitedness of journals—*Journal of American Chemical Society*[1], *Nature*[2]; subject-specific disciplines—Library and information science[3], physics, chemistry, biological sciences, geosciences, engineering and medicine[4]; index database–ISI[5]; country-wise[5-6] are the few. However, till date no study has been examined the uncitedness of a particular field or domain indexed by SCI-E or SCOPUS database. Therefore, an attempt has been made to identify the uncitedness in the field of MEMS (micro-electro mechanical systems).

1.1 Micro-Electro Mechanical Systems

The term 'micro-electro mechanical systems (MEMS)' one of the emerging filed in electronics, has been first included in the project proposal submitted to DARPA in 1986. Since then it has good impact on global economy for incorporating this techniques in mico system-based devices as tiny integrated product or the combination of both mechanical and electrical components. Integrated circuit (IC) has been used to fabricate the devices using these techniques and it ranges from millimeters to micro-millimeters. The main aim is to reduce not only the size of the system but also to reduce significantly

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the energy and material requirements which results in cost/performance advantage. These devices are possible to be embedded in a small area.

The MEMS, a combination of silicon-based microelectronics and micromachining technology, is an interdisciplinary nature used in areas like design, engineering and manufacturing products. It utilises expertise from a wide and diverse range of technical areas including IC technology, IC fabrication technology, mechanical engineering, electrical and material engineering, chemistry and chemical engineering, fluid engineering, optics, instrumentation and packaging. It is used to develop very small devices called to be in nano-scale. Today, MEMS emerged as a field in the modern technological era because of its impact in computer technology, mechanical engineering, manufacturing, production, and medical instrumentation.

2. REVIEW OF LITERATURE

Garg & Kumar[7] identified that 6231 (17.5%) out of 35,640 Indian scientist papers published during the period 2008-2013 remained uncited. Most of the uncited papers were published by State Agricultural Universities and the Indian Council of Agricultural Research. The highest proportion of uncited papers was in the area of agricultural sciences followed by multidisciplinary and mathematical sciences. The Evidence report of Thomson Reuters has shown that there is a decrease in the percentage of papers emanating from India which do not receive citations[8]. High share of uncited publications, which included those produced by top scientists, was repeatedly reported to exceed 10 % of the total papers produced.

Petr Heneberg[9] analysed the uncitedness among two independent groups of highly visible mathematicians represented by field medalists, researchers in physiology or medicine represented by Nobel Prize laureates. Over 90 % of the uncited database records of highly visible scientists have been presented in progress reports, meeting abstracts, letters to the editor, discussion, personalia by errors of omission and commission of the Web of Science (WoS) database and of the citing documents. Only 0.9 and 0.3 %, of original articles and reviews were found to be uncited.Uncitable documents were responsible for up to 30% of the total citations to the top-tier journals, with the highest values found for medical science journals (*New England Journal of Medicine, JAMA,* and *Lancet)* and lower values found for the science, nature, and cellseries journals. Self-citations to some of the top-tiert journls reach values higher than the total citation counts accumulated by papers in most of the Web of Scienceindexed journals[10]. Ayanguasgil[11] indicated that a perfect correlation between the times a paper is cited and peer recognition cannot be seen.

3. OBJECTIVES

Some of the objectives of this study are:

- Identify the uncited publications in the field of MEMS during the period of 1970-2013
- Explore the growth rate of uncited publications
- Find out the relative growth rate and doubling time of the uncited publications
- Country-wise distribution of uncited publications in the field of MEMS
- Identify the bibliographic form of publications those are uncited
- Explore uncited publications of top authors cited

3.1 Hypotheses

Based on the objectives, the following hypotheses were framed:

- There exist considerable amount uncited publications exist in MEMS literature output.
- There is a substantial amount of uncited publications from the countries that has contributed to MEMS literature.
- The conference papers are the major contribution for the uncited literature.
- There exist uncited among the top cited authors publications.
- There is no significant difference in authorship pattern for uncited publications.

4. METHODOLOGY

For this study, literature on MEMS was downloaded from online multidiscipline database SCOPUS, an international indexing and abstracting database using the search term 'MEMS'. A total of 294573 records were identified in the field of MEMS worldwide for the period 1970-2013. Out of which, 85146 (28.90 %) records were identified as uncited publications.

The data have been classified by using Excel and the same been loaded into SPSS (statistical package for social sciences) for the purpose of statistical analysis. Statistical tools such as frequency distribution and percentage analysis and bibliometric techniques such as relative growth rate, doubling time, citation analysis were used.

5. ANALYSIS

5.1 Total Uncited Publications

Out of 2,94,573 publications, 85146 (28.90 %) of MEMS literature were uncited during the study period of 1970-2013 whereas 2,09,427 (71.10 %) of articles were cited at least once including self-citations (Table 1).

5.2 Ratio of Uncited Publications (Year-wise)

Year-wise distributions of uncited publications were identified from the collected data. The ratio of growth has been calculated between the cited and uncited publications. The year-wise distribution (Table 2) contains total publications, cited publications, uncited publications, percentage of uncited, cumulative uncited, percentage of cumulative uncited publications, ratio, R&G, uncited/cited publication.

Table 1. Total publications

S. No.	Description	TP	%
1.	Cited publications	209427	71.10
2.	Uncited publications	85146	28.90
	Total	**294573**	**100.00**

It is seen from Table 2 that the uncited publications are in the rising side and every year it is getting increased. In 2013, approx. 15 % of the publications were uncited. Figures 1-3 show the raising trend of uncited publications.To visualise clearly, a two way trend line has been drawn (downward line indicates linear trend and arrow head line) and also a global uncited average has been indicated in doted. The uncited papers range between 0.09 and 0.72. The importance of cited has been realised from the beginning of 1970 onwards. It can be seen that from 1988 onwards uncitedness has been reduced below the global average and it persists till 2010. The piling of uncited literature is to be dealt with carefully and uncited articles are to be projected or brought to the attention of researchers.

The study has further been extended to block year-wise to identify the block period in which the raise of uncitedness were more. The entire study period has been divided in eleven-years block. Table 3 shows that between the block years 2003-2013, 73.31 % (62419) publications are uncited which gives an alarm to the researchers that they could not cite or refer the required papers for their research. The Ratio of Growth Rate in the block year 2003-2013 is 7.23% which is in the higher side.

5.3 Relative Growth Rate and Doubling Time

The relative growth rate (RGR) and doubling time (Dt) have been calculated and are shown in Table 4, Figs 4 & 5. The RGR between 1970 and 2013 is between 5.27 and 11.19. The Dt in 1970 is 0.13 whereas in 2013, it is 4.17 which clearly confirms that the uncited publications over the year is in the increasing trend.

5.4 Country-wise Distribution

The country-wise distribution of uncited publications are shown in Table 5 and Fig. 6. It can be seen to that the uncited publications are more in the case of China (44.56 %), followed by India (31.44 %), Japan (24.40 %) and France (19.44 %). The least

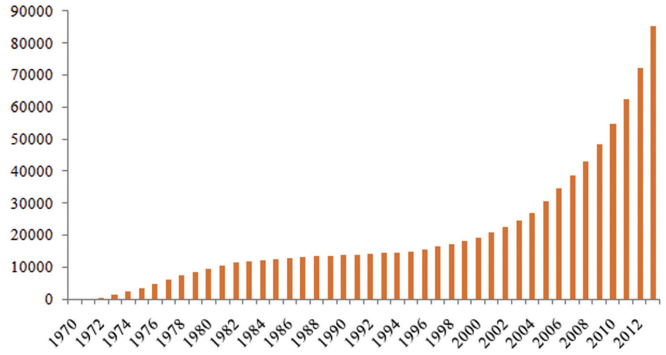

Figure 1. Year-wise uncited publications.

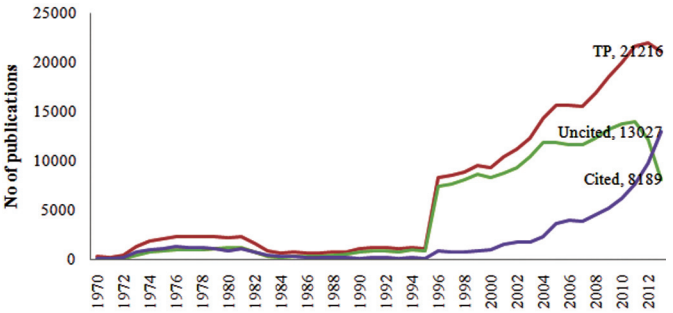

Figure 2. Year-wise cited Vs uncited publications.

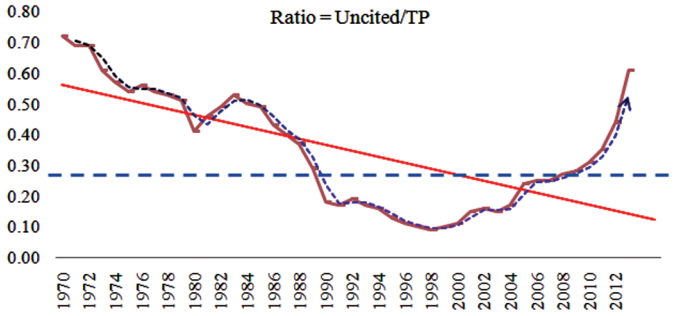

Figure 3. Ratio of uncited and total publications.

uncited publications are from Germany (14.62 %) (Fig. 6). The study has further been extended to block years and shown in Table 6. That shows 10689 belongs to USA in the block year of 2003-2013 followed by China and Japan. Overall from all the countries, the block year 2003-2013 has the highest uncited publications (62419).

5.5 Bibliographic Form

Bibliographic from of uncited publications were identified and the same is shown in Table 7. The maximum numbers of uncited publications were conference papers. It is followed with journal articles. Almost 50 % of the uncited publications are from the conference proceedings. It clearly indicates that more thrust should be given by the database providers while adding the details of the publications in the respective discipline.

Table 8 shows that about 24 % of the publications which were not uncited are authored by more than 4 authors followed by two authors and single author.

Table 2. Year-wise distribution of uncited publications

S. No.	Year	TP	Cited	Uncited	%	Cum.	Cum.%	Ratio uncited R=TP	RoG	Ratio uncited/ cited
1.	1970	271	77	194	0.23	194	0.23	0.72	1.00	2.52
2.	1971	202	63	139	0.16	333	0.39	0.69	0.71	2.21
3.	1972	404	127	277	0.33	610	0.72	0.69	1.99	2.18
4.	1973	1373	529	844	0.99	1454	1.71	0.61	3.04	1.60
5.	1974	1876	813	1063	1.25	2517	2.96	0.57	1.25	1.31
6.	1975	2062	957	1105	1.30	3622	4.25	0.54	1.03	1.15
7.	1976	2370	1036	1334	1.57	4956	5.82	0.56	1.20	1.29
8.	1977	2372	1087	1285	1.51	6241	7.33	0.54	0.96	1.18
9.	1978	2326	1094	1232	1.45	7473	8.78	0.53	0.95	1.13
10.	1979	2336	1156	1180	1.39	8653	10.16	0.51	0.95	1.02
11.	1980	2197	1291	906	1.06	9559	11.23	0.41	0.76	0.70
12.	1981	2376	1290	1086	1.28	10645	12.50	0.46	1.19	0.84
13.	1982	1705	877	828	0.97	11473	13.47	0.49	0.76	0.94
14.	1983	909	426	483	0.57	11956	14.04	0.53	0.58	1.13
15.	1984	626	312	314	0.37	12270	14.41	0.50	0.65	1.01
16.	1985	793	406	387	0.45	12657	14.87	0.49	1.23	0.95
17.	1986	621	355	266	0.31	12923	15.18	0.43	0.68	0.75
18.	1987	665	396	269	0.32	13192	15.49	0.40	1.01	0.68
19.	1988	742	464	278	0.33	13470	15.82	0.37	1.03	0.60
20.	1989	799	566	233	0.27	13703	16.09	0.29	0.83	0.41
21.	1990	1083	890	193	0.23	13896	16.32	0.18	0.82	0.22
22.	1991	1160	961	199	0.23	14095	16.55	0.17	1.03	0.21
23.	1992	1199	974	225	0.26	14320	16.82	0.19	1.13	0.23
24.	1993	1048	874	174	0.20	14494	17.02	0.17	0.77	0.20
25.	1994	1232	1037	195	0.23	14689	17.25	0.16	1.12	0.19
26.	1995	1120	971	149	0.17	14838	17.43	0.13	0.76	0.15
27.	1996	8388	7480	908	1.07	15746	18.49	0.11	6.09	0.12
28.	1997	8554	7725	829	0.97	16575	19.47	0.10	0.91	0.11
29.	1998	8950	8130	820	0.96	17395	20.43	0.09	0.98	0.10
30.	1999	9596	8671	925	1.09	18320	21.52	0.10	1.12	0.11
31.	2000	9346	8343	1003	1.18	19323	22.69	0.11	1.08	0.12
32.	2001	10488	8868	1620	1.90	20943	24.60	0.15	1.61	0.18
33.	2002	11194	9410	1784	2.10	22727	26.69	0.16	1.10	0.19
34.	2003	12331	10496	1835	2.16	24562	28.85	0.15	1.02	0.17
35.	2004	14312	11942	2370	2.78	26932	31.63	0.17	1.29	0.20
36.	2005	15650	11927	3723	4.37	30655	36.00	0.24	1.57	0.31
37.	2006	15729	11723	4006	4.70	34661	40.71	0.25	1.07	0.34
38.	2007	15616	11685	3931	4.62	38592	45.32	0.25	0.98	0.34
39.	2008	16955	12399	4556	5.35	43148	50.68	0.27	1.15	0.37
40.	2009	18579	13296	5283	6.20	48431	56.88	0.28	1.15	0.40
41.	2010	20028	13772	6256	7.35	54687	64.23	0.31	1.18	0.45
42.	2011	21712	14034	7678	9.02	62365	73.24	0.35	1.22	0.55
43.	2012	22062	12308	9754	11.46	72119	84.70	0.44	1.27	0.79
44.	2013	21216	8189	13027	15.30	85146	100.00	0.61	1.33	1.59
	Total	**294573**	**209427**	**85146**	**100.00**			**0.29**		**0.41**

Table 3. Block year-wise distribution of uncited publications

S. No.	Block Year	TP	Cited	Un-cited	%	Cumulation	Cumulation%	ROG	Uncited/ cited
1	1970-1980	17789	8230	9559	11.23	9559	11.23	1.00	1.16
2	1981-1991	11479	6943	4536	5.33	14095	16.55	0.47	0.65
3	1992-2002	71115	62483	8632	10.14	22727	26.69	1.90	0.14
4	2003-2013	194190	131771	62419	73.31	85146	100.00	7.23	0.47
	Total	**294573**	**209427**	**85146**	**100.00**				

Table 4. RGR and Dt of uncited MEMS publications

S. No.	Year	TP	Cumulation	W1	W2	RGR	Dt
1.	1970	194	194		5.267858	5.27	0.13
2.	1971	139	333	5.267858	5.808142	0.54	1.28
3.	1972	277	610	5.808142	6.413459	0.61	1.14
4.	1973	844	1454	6.413459	7.282074	0.87	0.80
5.	1974	1063	2517	7.282074	7.830823	0.55	1.26
6.	1975	1105	3622	7.830823	8.194782	0.36	1.90
7.	1976	1334	4956	8.194782	8.508354	0.31	2.21
8.	1977	1285	6241	8.508354	8.738896	0.23	3.01
9.	1978	1232	7473	8.738896	8.919052	0.18	3.85
10.	1979	1180	8653	8.919052	9.065661	0.15	4.73
11.	1980	906	9559	9.065661	9.165238	0.10	6.96
12.	1981	1086	10645	9.165238	9.272846	0.11	6.44
13.	1982	828	11473	9.272846	9.347752	0.07	9.25
14.	1983	483	11956	9.347752	9.388989	0.04	16.81
15.	1984	314	12270	9.388989	9.414913	0.03	26.73
16.	1985	387	12657	9.414913	9.445966	0.03	22.32
17.	1986	266	12923	9.445966	9.466764	0.02	33.32
18.	1987	269	13192	9.466764	9.487366	0.02	33.64
19.	1988	278	13470	9.487366	9.50822	0.02	33.23
20.	1989	233	13703	9.50822	9.52537	0.02	40.41
21.	1990	193	13896	9.52537	9.539356	0.01	49.55
22.	1991	199	14095	9.539356	9.553575	0.01	48.74
23.	1992	225	14320	9.553575	9.569412	0.02	43.76
24.	1993	174	14494	9.569412	9.58149	0.01	57.38
25.	1994	195	14689	9.58149	9.594854	0.01	51.86
26.	1995	149	14838	9.594854	9.604947	0.01	68.66
27.	1996	908	15746	9.604947	9.664342	0.06	11.67
28.	1997	829	16575	9.664342	9.715651	0.05	13.51
29.	1998	820	17395	9.715651	9.763938	0.05	14.35
30.	1999	925	18320	9.763938	9.815749	0.05	13.38
31.	2000	1003	19323	9.815749	9.869051	0.05	13.00
32.	2001	1620	20943	9.869051	9.94956	0.08	8.61
33.	2002	1784	22727	9.94956	10.03131	0.08	8.48
34.	2003	1835	24562	10.03131	10.10896	0.08	8.93
35.	2004	2370	26932	10.10896	10.20107	0.09	7.52
36.	2005	3723	30655	10.20107	10.33055	0.13	5.35

37.	2006	4006	34661	10.33055	10.45337	0.12	5.64
38.	2007	3931	38592	10.45337	10.5608	0.11	6.45
39.	2008	4556	43148	10.5608	10.67239	0.11	6.21
40.	2009	5283	48431	10.67239	10.7879	0.12	6.00
41.	2010	6256	54687	10.7879	10.90938	0.12	5.70
42.	2011	7678	62365	10.90938	11.04076	0.13	5.27
43.	2012	9754	72119	11.04076	11.18607	0.15	4.77
44.	2013	13027	85146	11.18607	11.35212	0.17	4.17
	Total	**85146**					

Table 5. Country-wise distribution of uncited publications

S. No.	Country	TP	Uncited paper	Proportion of uncited papers	%	cumulation	cumulation%
1.	USA	99766	18345	18.39	21.55	18345	21.55
2.	China	23609	10520	44.56	12.35	28865	33.90
3.	Japan	20574	5020	24.40	5.90	33885	39.80
4.	France	19815	3852	19.44	4.52	37737	44.32
5.	Germany	18259	2669	14.62	3.13	40406	47.45
6.	UK	16365	2440	14.91	2.87	42846	50.32
7.	Italy	15282	2871	18.79	3.37	45717	53.69
8.	Canada	11655	2154	18.48	2.53	47871	56.22
9.	India	8050	2531	31.44	2.97	50402	59.19
10.	Others	61198	34744	56.77	40.81	85146	100.00
Total		**294573**	**85146**	**28.90**	**100.0**		

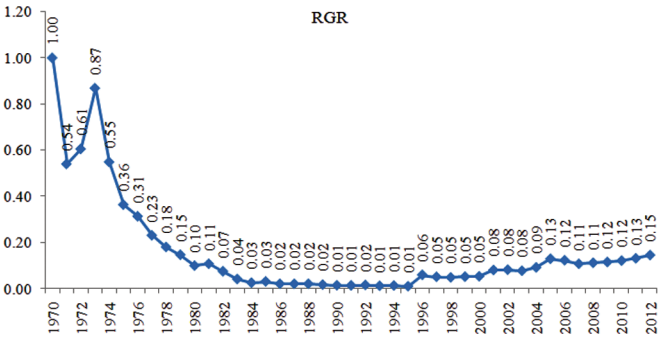

Figure 4. RGR of uncited publications.

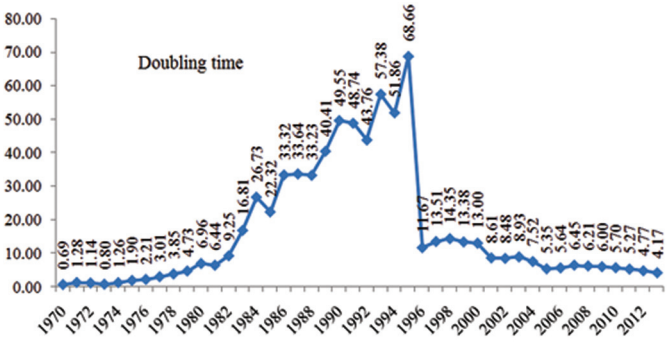

Figure 5. Doubling time of uncited publications.

It can be seen from Table 9 shows that the impacts of uncited publications are from more than 4 authors in particular in 2013 and there is no uniformity in the authortype whereas the uncited publications are

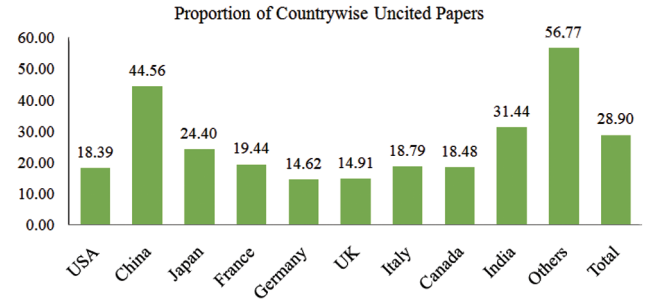

Figure 6. Cited Vs uncited publications.

in the increasing side from year to year.

5.6 Highly Contributed Author Papers

Highly contributed top 10 authors of uncited papers were analysed and the same is shown in Table 10 that indicates that the uncited publications of the author Esashi, M. tops first among the top 10 authors followed by Fujita, H. and Maeda, R. It is seen from Table 11 and Fig. 7 that in the case of cited references, Esashi, M. and Fujita, H. gained the top 2 ranks, respectively, where as, they were placed in the rank of 8 and 9 in respect of uncited publications. Brennan, M.F. and Bhushan, B. were placed in the first two ranks in uncited publications whereas they are in 6th and 3rd in rank in cited publications.

Further to the analysis of the global authors, the

Table 6. Block Year-wise distribution of uncited publications

S. No	Country	1970-1980	1981-1991	1992-2002	2003-2013	Total
1.	USA	4737	940	1979	10689	18345
2.	China	1	22	216	10281	10520
3.	Japan	106	188	549	4177	5020
4.	France	459	567	567	2259	3852
5.	Germany	51	24	264	2330	2669
6.	UK	274	58	189	1919	2440
7.	Italy	220	43	211	2397	2871
8.	Canada	338	71	86	1659	2154
9.	India	300	43	177	2011	2531
10.	Others	3020	2557	4295	22765	32637
	Total	**9559**	**4536**	**8632**	**62419**	**85146**

Table 7. Bibliographic form of uncited publications of MEMS

S. No.	Document Type	Total papers	Uncited papers	Unicited/Total paper (%)	Uncited/ Total uncited (%)	Cumulatiive	Cum.%
1.	Conference Paper	66588	36799	55.26	43.22	36799	43.2
2.	Journal Article	198237	35478	17.90	41.67	72277	84.9
3.	Review	11302	1696	15.01	1.99	73973	86.9
4.	Book Chapter	2159	1485	68.78	1.74	75458	88.6
5.	Conference Review	897	885	98.66	1.04	76343	89.7
6.	Editorial	881	510	57.89	0.60	76853	90.3
7.	Note	673	307	45.62	0.36	77160	90.6
8.	Short Survey	756	284	37.57	0.33	77444	91.0
9.	Letter	650	233	35.85	0.27	77677	91.2
10.	Book	345	213	61.74	0.25	77890	91.5
11.	Erratum	145	127	87.59	0.15	78017	91.6
12.	Report	66	12	18.18	0.01	78029	91.6
13.	Others	11874	7117	59.94	8.36	85146	100.0
	Total	294573	**85146**	28.90	**100.00**		

Table 8. Authorship pattern of uncited publications

S. No.	Author collaboration	TP uncited (%)	Cumulation (%)
1.	Single Author	15829 (18.6)	15829 (18.6)
2.	Two Authors	18043 (21.2)	33872 (39.8)
3.	Three Authors	16844 (19.8)	50716 (59.6)
4.	Four Authors	14025 (16.5)	64741 (76.0)
5.	> 4 Authors	20405 (24.0)	85146 (100)
Total		**85146 (100)**	

top 10 Indian authors were analysed (Table 12, Fig. 8) with the cited and uncited publications. Chandra, S. has maximum no. of publications in which 34 are cited and 20 are uncited. Further it is interesting to note that Bhattacharyya, T.K. has almost equal cited and uncited publications. The author Mishra, D.C. has the least uncited publications (4 out of 34 publications) who ranks first in uncited publications. It may be clear that even highly produced authors publications may also go uncited.

6. FINDINGS

Some of the findings derived are:

- Uncited publications in the beginning of the publication are more. The growth of the publications over the year results in reduction in uncited publications.
- An average of 29 % of the publications goes uncited in the MEMS literature during the study period of 1970 to 2013.
- There is a drastic reduction in uncited papers during the period of 1990 to 2010.
- Though there is an increase in uncited publications

Table 9. Authorship pattern vs year for uncited publications

S. No.	Year	Single author	Two authors	Three authors	Four authors	> 4 authors	Total
1.	1970	82	51	36	19	6	194
2.	1971	78	23	26	8	4	139
3.	1972	131	60	49	20	17	277
4.	1973	321	209	199	84	31	844
5.	1974	356	286	246	124	51	1063
6.	1975	358	279	278	144	46	1105
7.	1976	385	317	373	173	86	1334
8.	1977	376	323	369	156	61	1285
9.	1978	329	334	340	164	65	1232
10.	1979	326	274	333	159	88	1180
11.	1980	241	210	255	131	69	906
12.	1981	274	253	322	163	74	1086
13.	1982	216	183	232	144	53	828
14.	1983	119	110	138	74	42	483
15.	1984	77	82	94	39	22	314
16.	1985	102	94	105	56	30	387
17.	1986	71	60	69	33	33	266
18.	1987	55	65	66	47	36	269
19.	1988	74	63	68	35	38	278
20.	1989	71	58	39	23	42	233
21.	1990	56	32	44	26	35	193
22.	1991	63	44	41	24	27	199
23.	1992	66	40	41	29	49	225
24.	1993	69	27	25	17	36	174
25.	1994	91	30	24	22	28	195
26.	1995	75	32	20	12	10	149
27.	1996	204	277	74	151	202	908
28.	1997	276	209	85	92	167	829
29.	1998	78	268	37	163	274	820
30.	1999	232	259	112	150	172	925
31.	2000	258	245	131	158	211	1003
32.	2001	480	358	277	228	277	1620
33.	2002	540	357	320	229	338	1784
34.	2003	427	427	277	307	397	1835
35.	2004	573	479	474	365	479	2370
36.	2005	769	737	771	552	894	3723
37.	2006	527	886	647	739	1207	4006
38.	2007	726	763	818	652	972	3931
39.	2008	783	896	957	795	1125	4556
40.	2009	718	985	928	957	1695	5283
41.	2010	855	1333	1173	1090	1805	6256
42.	2011	1183	1587	1546	1309	2053	7678
43.	2012	1449	2044	2068	1693	2500	9754
44.	2013	1289	2394	2317	2469	4558	13027
Total		**15829**	**18043**	**16844**	**14025**	**20405**	**85146**

Table 10. Global top 10 authors with citation ratio

S. No.	Author	TP	Cited	Uncited	%	Cumulation	Cum. %	Cited ratio
1	Esashi, M.	426	301	125	14.88	125	14.88	0.415282
2	Fujita, H.	406	275	131	15.60	256	30.48	0.476364
3	Maeda, R.	345	231	114	13.57	370	44.05	0.493506
4	Huang, Q.A.	342	188	154	18.33	524	62.38	0.819149
5	Bhushan, B.	305	274	31	3.69	555	66.07	0.113139
6	Zengerle, R.	298	230	68	8.10	623	74.17	0.295652
7	Fang, W.	276	182	94	11.19	717	85.36	0.516484
8	Brennan, M.F.	227	221	6	0.71	723	86.07	0.027149
9	Lin, L.	227	170	57	6.79	780	92.86	0.335294
10	Shimoyama, I.	219	159	60	7.14	840	100.00	0.377358
Total		**3071**	**2231**	**840**	100.00			

Table 11. Ranking of global authors with cited and uncited publications

S. No.	Author	TP	Rank	Cited	Rank	Uncited	Rank	Ratio	Rank
1.	Esashi, M.	426	1	301	1	125	8	0.29	6
2.	Fujita, H.	406	2	275	2	131	9	0.32	7
3.	Maeda, R.	345	3	231	4	114	7	0.33	8
4.	Huang, Q.A.	342	4	188	7	154	10	0.45	10
5.	Bhushan, B.	305	5	274	3	31	2	0.10	2
6.	Zengerle, R.	298	6	230	5	68	5	0.23	3
7.	Fang, W.	276	7	182	8	94	6	0.34	9
8.	Brennan, M.F.	227	8	221	6	6	1	0.03	1
9.	Lin, L.	227	8	170	9	57	3	0.25	4
10.	Shimoyama, I.	219	10	159	10	60	4	0.27	5
Total		**3071**		**2231**		**840**			

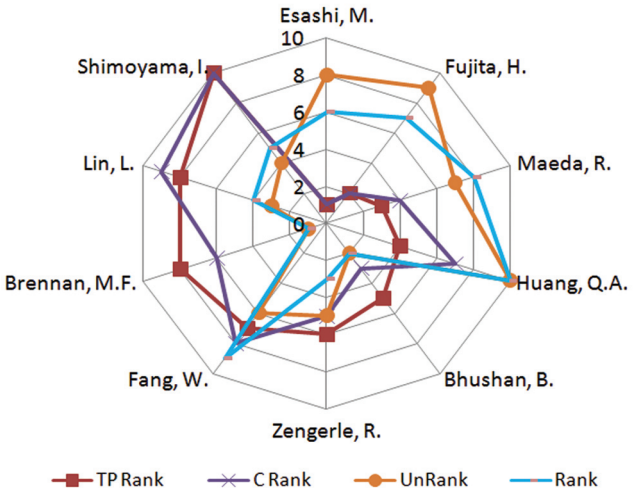

Figure 7. Global top authors rank based on total, citation, uncited and ratio of publications.

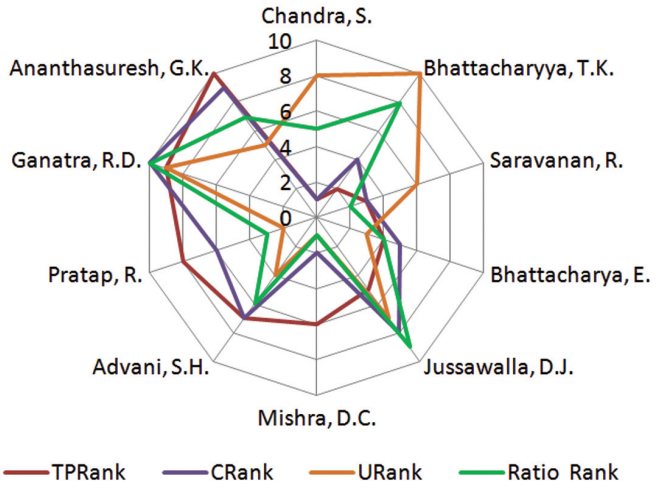

Figure 8. Indian top authors rank based on total, citation, uncited and ratio of publications.

during the period 2011 to 2013, there may be a possibility to cite these publications in later years. This will result in decrease in uncited publications during the period 2011 to 2013.

- Uncited papers are all higher than the corresponding values of cited papers, again, no matter the journal. These results are in line with well-known trendsregarding citations received by publications[12].
- The citation of papers commences after a year or so from the date of publications.
- Conference publications are more in number in uncited publications than journal publications. Almost 56 % of the uncited publications are

Table 12. Indian top 10 authors with citation ratio and ranking.

S. No.	Authors	TP	Rank	Cited	Rank	Uncited	Rank	%	Cum.	Cum. %	Cited ratio	Rank
1.	Chandra, S.	54	1	34	1	20	8	12.35	20	12.35	0.37	5
2.	Bhattacharyya, T.K.	49	2	24	4	25	10	15.43	45	27.78	0.51	8
3.	Saravanan, R.	44	3	28	3	16	6	9.88	61	37.65	0.36	2
4.	Bhattacharya, E.	35	4	22	5	13	3	8.02	74	45.68	0.37	4
5.	Jussawalla, D.J.	34	5	15	8	19	7	11.73	93	57.41	0.56	9
6.	Mishra, D.C.	34	6	30	2	4	1	2.47	97	59.88	0.12	1
7.	Advani, S.H.	34	7	20	7	14	4	8.64	111	68.52	0.41	6
8.	Pratap, R.	33	8	21	6	12	2	7.41	123	75.93	0.36	3
9.	Ganatra, R.D.	32	9	8	10	24	9	14.81	147	90.74	0.75	10
10.	Ananthasuresh, G.K.	30	10	15	9	15	5	9.26	162	100.00	0.50	7
Total		**379**		**217**		**162**						

from the conference proceedings. It may not surprise if other form of publications such as letters, review papers, erratum, etc.

- 44.56 % of China publications in MEMS were uncited. It is followed by India (31.44%), Japan (24.40 %) and France (19.44 %).
- Majority of uncited publications, besides the self citations, are of collaborative authors. Mostly more than four authors' papers were uncited. Even top author papers were also uncited.

7. SUGGESTIONS

Davis[13,14] indicated citation errors, citation takes time and citation is limited by the universe of indexed papers are the three primary reasons behind this uncited articles. The policy of the citation databases is also one of the primary reasons of uncitedness. Few are discussed as follows:

- Citation errors - Authors misspell journal names or errors in the volume or page numbers. To overcome this error DOIs and disambiguation software at the indexing stage can help correct well-intentioned mistakes, they still take place. Errors prevent a directional link to be made from the citing article to the cited article, which means that it cannot be counted. Counting assumes good metadata.
- Citation takes time. An article may wait years for its first citation. Some papers go unnoticed for decades until they are awakened by a citation event. After which they attract a lot of attention. The longer a paper waits to be cited, the less likely it is to be cited.
- Citation is limited by the universe of indexed papers. Thomson Reuter's datasets embody has policy to index the 'core' literature meaning a smaller collection of elite journals. Scopus in comparison is based on a much broader selection of journals. Google Scholar as mentioned in a recent post has a much broader definition of a scholarly document. All three indexes will provide different citation counts.
- Policy of the database–Non-inclusion of conference proceeding papers in the databases may leads to uncitedness. Similarly the policy of inclusion of few countries publication in the databases which results that majority of the underdeveloped country publications are not included in database.
- Unawareness of the publication by the researchers.

8. CONCLUSIONS

Publications are brought to new things or awesome results, new inventions, and so on. It means to disclose the unknown things to known things to the particular community. In science and technology field, it is quite normal to invent new things or practices and explore to the scientists through publications, especially, scientific scholarly journals. The scientists and researchers are on the same line to utilise these results and make to find new things for their new inventions. The earlier a paper is cited, more likely to be cited. Citations beget citations. Sometimes, it may get delayed citation which may be termed as 'Delayed Recognition'[15]. Publications that are uncited for prolonged period may, subsequently receive more citations are known as 'Sleeping Beauties'[16] . Normally, the researchers take note of the figure of merit on impact factor and citation when deciding which journal to submit their work so that it is read as widely as possible.

This study shows that some of the articles thus published even in reputed journals or by the eminent authors goes uncited. Therefore, instead of sticking into cited articles alone, they may also

peruse the uncited publications too for the scholarly communications. Uncited publication may get citations in the literature that does not included in the bibliographic databases.

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