Journal of Solar Energy Engineering, Transactions of the ASME : A Scientometric Analysis

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Abstract

This article presents the findings of the scientometric analyses of the Journal "Journal of Solar Energy Engineering, Transactions of the ASME" during the period 1980-2016. The study mainly focused the Publishing Trend, Growth Ratio, Relative Growth Rate, Doubling Time, Authorship Pattern, Degree of Collaboration and Time Series Analysis in the Journal during the period 1980-2016. The data were taken from the year 1980 to 2016. It covered 37 years of Data which is retrieved from the Scopus Database. The Journal of Solar Energy Engineering, Transactions of the ASME has published 2361 articles during the period of 1980-2016 with an yearly average of 63.81. The maximum number of articles 114 (4.83%) were published in the year of 2015. In the Authorship Pattern, the major contribution of articles was from two authors 776 (32.87%). The Time series analysis technique reveals the estimated future growth of articles in the Journal will be increased from 63.81 (2016) to 88.13 in 2020 and 93.66 in the year 2025

.Keywords

Scientometric Analysis; Relative Growth Rate; Doubling Time; Time Series Analysis; Solar Energy Engineering

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1. INTRODUCTION

According to Alan Pritchard "Bibliometrics is statistical analysis of written publications, such as books or articles. Bibliometrics are used to provide quantitative analysis of academic literature. Citation analysis and content analysis are commonly used bibliometric methods. Numerous research fields use bibliometrics to explore the impact of their field and the impact of a particular paper. It has a wide range of other applications, such as in descriptive linguistics, the development of thesauri, and evaluation of reader usage.

The Journal of Solar Energy Engineering publishes research papers which contain original work of solar energy and energy conservation, as well as discussions of policy issues that affect renewable energy technologies and their implementation. It also publishes Technical briefs that present quality analysis or incremental improvements to past work. The impact factor of the Journal is 1.19.

2. REVIEW OF LITERATURE

Aswathy, S., and Gopikuttan, A. (2013)[1] analyzed the science publications of the faculty members from three universities of Kerala namely University of Kerala , Mahatma Gandhi University and University of Calicut during 2005 to 2009. This study focuses Authorship pattern and Designation wise distribution. Among the journal publications, University of kerela topped with 966. In designation wise distribution university of Calicut topped with 734. In Authorship pattern, multi authors contributed more than the single author in all universities. Baskaran, C. (2013)[2] conducted bibliometric study on Research productivity of Alagappa University during 1999-2011. The study analyses the productivity of authors, Subject-wise and institution-wise collaboration and ranking of authors in research contribution of Alagappa University during 1999-2011. In this study, the Relative growth rate (RGR) was found to be fluctuating trend. The doubling time (DT) was found to be increased and decreased trend in this study. Baskaran, C & Sivakami, N. (2014)[3] carried out a bibliometric analysis on Swine influenza research output. In this study, a total of 2360 articles were downloaded from Pubmed database using the search term" Swine*". The study focuses publication frequency, country, and institution productivity. Analysis shows that majority of the scientists preferred to publish research papers in multiple authorship. It also analyses the characteristics of most

productive institutions, languages and journals. Baskaran, C. (2013)[4] examined the Research growth trend and author collaboration of Alagappa University in India during 1999-2011, The study analyses the authorship Productivity, Discipline-wise and institution-wise collaboration and ranking of authors. In this study, The Degree of collaboration and its means value is found to be 0.963. The top three institutions with Alagappa University are Central Electro Chemical Research Institute, National Cheng King University and Anna University. Baskaran, C. (2012)[5] analyzed the Research Productivity of Graph Theory during 2004-2011. The average number of papers published per year was 910.75. The highest numbers of papers were published above thousand during the years 2009 to 2011. It is observed RGR has been increased and decreased from 2005 (0.113) to 2011 (0.057). At the same time, the doubling time (DT) has fluctuating trend. Relative Growth Rate (RGR) was found to be a decreasing trend between 2005 and 2007. Baskaran, C and MS Batcha. (2012)[6] evaluated the Publications Pattern and Author Collaboration of Cardiology Research. The paper covers the authorship pattern and collaborative research in the field of Cardiology. In this research, the maximum number of records in the year 2000 is 829, followed by 826 in 2003 and 789 in 2002. Relative Growth Rate (RGR) and Doubling Time (DT) were found to be an increasing and decreasing trend in this study. Baskaran,C & Karuilancheran,C. (2015)[7.] carried out a bibliometric study in this paper which concentrates on Activity Index and Lotka's Law Application with Diabetes and Allied Diseases in India During 1995–2013.In this study, the calculated values of Maximum Likelihood Estimator, n and k are 0.24, 2.66 and 0.78 respectively. The CV at 0.05 significant level for 29 degrees of freedom is 42.56 and the calculated value of Chi-Square (X 2) obtained in this case is 5309.368. After words, the performance of researchers started diminishing. It was supported by SPI that ranges between 9 and 10 only. Sudharani, Y., and Nagaraju, K. (2013)[8] analyzed the research publications from Webology as the source journal during 2004 to 2012. The single authored contributions 55(54.55%) have dominated followed by two authored were 32 (31.68%), three author were 12 (11.88%). The degree of collaboration was 0.45. In Country wise distribution, the majority of the contributors are from both India and Iran 11 (10.89%). Swain, C., Swain, D. K., and Rautaray, B. (2013)[9] analyzed 275 scholarly articles of Library Review from the year 2007 to 2011. The study shows that single authored articles occupy the prominent position. The degree of collaboration in the publications of this journal is found to be 0.36. Related to country wise productivity, the UK leads the table, followed by the USA and Nigeria. Elango, B., and Rajendran, P. (2012)[10] examined the authorship and collaboration trend pattern in Marine Sciences literature from the Indian Journal of Marine Sciences published from 2001 to 2010. The average number of authors per paper is 3.4 and average collaboration rate 0.57 that shows the better collaboration among the authors. 58 % of the papers are collaborated within the same institution.

3. OBJECTIVES

The Main purpose of the study is to analyze the publishing trend, Authorship pattern, Growth Ratio, Relative Growth Rate, Doubling Time, Degree of collaboration and Time Series Analysis in the Journal "Journal of Solar Energy Engineering, Transactions of the ASME" from 1980 to 2016.

4. METHODOLOGY

Scopus Database was used to retrieve the data from the Journal "Journal of Solar Energy Engineering, Transactions of the ASME". Articles published from 1980-2016 were analysed. The collected data has been analysed with OpenOffice Spreadsheet and given in the form of Tables and charts in order to find the Publishing Trend, Authorship Pattern, Growth Ratio, Relative Growth Rate, Doubling Time, Degree of collaboration and Time Series Analysis.

5 RESULT AND DSCUSSIONS

5.1 Publishing Trend

During the period of 1980-2016, Journal of Solar Energy Engineering, Transactions of the ASME has published 2361 articles with an yearly average of 63.81; a minimum of 31 articles (1.31%) in 2000 and a maximum of 114 articles (4.83%) in the year of 2015

Table.1: Year wise distribution of articles

Year	No. of articles	Percentage	Cumulative	Cumulative %
1980	46	1.95	46	1.95
1981	57	2.41	103	4.36
1982	61	2.58	164	6.95
1983	72	3.05	236	10.00
1984	76	3.22	312	13.21
1985	61	2.58	373	15.80
1986	61	2.58	434	18.38
1987	57	2.41	491	20.80
1988	51	2.16	542	22.96
1989	55	2.33	597	25.29
1990	49	2.08	646	27.36
1991	42	1.78	688	29.14
1992	39	1.65	727	30.79
1993	37	1.57	764	32.36
1994	35	1.48	799	33.84
1995	59	2.50	858	36.34
1996	44	1.86	902	38.20
1997	53	2.24	955	40.45
1998	44	1.86	999	42.31
1999	33	1.40	1032	43.71
2000	31	1.31	1063	45.02
2001	69	2.92	1132	47.95
2002	69	2.92	1201	50.87
2003	77	3.26	1278	54.13
2004	79	3.35	1357	57.48
2005	78	3.30	1435	60.78
2006	78	3.30	1513	64.08
2007	74	3.13	1587	67.22
2008	86	3.64	1673	70.86
2009	71	3.01	1744	73.87
2010	78	3.30	1822	77.17
2011	79	3.35	1901	80.52
2012	67	2.84	1968	83.35
2013	93	3.94	2061	87.29
2014	98	4.15	2159	91.44
2015	114	4.83	2273	96.27
2016	88	3.73	2361	100.00
Total	2361	100.00		

5.2 Growth Ratio by Year-wise Publications

The growth ratio of articles published in the Journal of Solar Energy Engineering, Transactions of the ASME progress over the previous period has been calculated and the same shown in Table 2. The Growth ratio varies from 0.94 to 2.23; from the table it is observed that there exists fluctuation. The overall observation in trend is shown in Figure 2; the growth ratio is slightly downwards.

Table.2: Growth Ratio by Year wise

Year	No. of articles	Growth Ratio
1980	46	
1981	57	1.24
1982	61	1.07
1983	72	1.18
1984	76	1.06
1985	61	0.80
1986	61	1.00
1987	57	0.93
1988	51	0.89
1989	55	1.08
1990	49	0.89
1991	42	0.86
1992	39	0.93
1993	37	0.95
1994	35	0.95
1995	59	1.69
1996	44	0.75
1997	53	1.20
1998	44	0.83
1999	33	0.75
2000	31	0.94
2001	69	2.23
2002	69	1.00
2003	77	1.12
2004	79	1.03
2005	78	0.99
2006	78	1.00
2007	74	0.95
2008	86	1.16
2009	71	0.83
2010	78	1.10
2011	79	1.01
2012	67	0.85
2013	93	1.39
2014	98	1.05
2015	114	1.16
2016	88	0.77
Total	2361	

5.3 Relative Growth Rate (RGR) and Doubling Time (DT) of Year-wise Publications

The rate of growth of articles published in the Journal "Journal of Solar Energy Engineering, Transactions of the ASME" is determined by calculating relative growth rates and doubling time for publications. Table.3 predicts data of relative growth rate and doubling time for the

articles published in the Journal "Journal of Solar Energy Engineering, Transactions of the ASME".The RGR from the year 1981 is 0.81, the final year 2016 is 0.04, and the overall value is 3.94, the values gradually decreased from over the years. On the other hand, the Doubling Time (DT) show as increasing trend, from the year 1981 is 0.86 and the final year 2016 is 18.24 but in the middle, there are some fluctuations.

Table.3: Relative Growth Rate and Doubling Time of Year-wise Publications

Year	No of articles	Cumulative	W1	W2	RGR	DT
1980	46	46		3.83		
1981	57	103	3.83	4.63	0.81	0.86
1982	61	164	4.63	5.10	0.47	1.49
1983	72	236	5.10	5.46	0.36	1.90
1984	76	312	5.46	5.74	0.28	2.48
1985	61	373	5.74	5.92	0.18	3.88
1986	61	434	5.92	6.07	0.15	4.58
1987	57	491	6.07	6.20	0.12	5.62
1988	51	542	6.20	6.30	0.10	7.01
1989	55	597	6.30	6.39	0.10	7.17
1990	49	646	6.39	6.47	0.08	8.79
1991	42	688	6.47	6.53	0.06	11.00
1992	39	727	6.53	6.59	0.06	12.57
1993	37	764	6.59	6.64	0.05	13.96
1994	35	799	6.64	6.68	0.04	15.47
1995	59	858	6.68	6.75	0.07	9.73
1996	44	902	6.75	6.80	0.05	13.86
1997	53	955	6.80	6.86	0.06	12.14
1998	44	999	6.86	6.91	0.05	15.39
1999	33	1032	6.91	6.94	0.03	21.32
2000	31	1063	6.94	6.97	0.03	23.41
2001	69	1132	6.97	7.03	0.06	11.02
2002	69	1201	7.03	7.09	0.06	11.71
2003	77	1278	7.09	7.15	0.06	11.15
2004	79	1357	7.15	7.21	0.06	11.55
2005	78	1435	7.21	7.27	0.06	12.40
2006	78	1513	7.27	7.32	0.05	13.09
2007	74	1587	7.32	7.37	0.05	14.51
2008	86	1673	7.37	7.42	0.05	13.13
2009	71	1744	7.42	7.46	0.04	16.67
2010	78	1822	7.46	7.51	0.04	15.84
2011	79	1901	7.51	7.55	0.04	16.33
2012	67	1968	7.55	7.58	0.03	20.01
2013	93	2061	7.58	7.63	0.05	15.01
2014	98	2159	7.63	7.68	0.05	14.92
2015	114	2273	7.68	7.73	0.05	13.47
2016	88	2361	7.73	7.77	0.04	18.24
Total	2361					

5.4 Authorship Pattern

Table 4 shows the authorship pattern observed in the articles published in the "Journal of Solar Energy Engineering, Transactions of the ASME" during the year 1980-2016. In the authorship pattern, Two authors contribute the highest percentage 776 (32.87%) followed by Three authors 634 (26.85%); Single author 379 (16.05%) and Four authors 300 (12.71%).

Table.4: Authorship Pattern

No. of Authors	No. of articles	Percentage	Cumulative	Cumulative %
1	379	16.05	379	16.05
2	776	32.87	1155	48.92
3	634	26.85	1789	75.77
4	300	12.71	2089	88.48
5	136	5.76	2225	94.24
6	70	2.96	2295	97.20
7	29	1.23	2324	98.43
8	11	0.47	2335	98.90
9	16	0.68	2351	99.58
10	7	0.30	2358	99.87
11	2	0.08	2360	99.96
15	1	0.04	2361	100.00
Total	2361	100.00		

5.5 Single vs. Multiple Authors

The Contribution of single and multiple authors clearly presented in the Table.5.In the Journal "Journal of Solar Energy Engineering, Transactions of the ASME", the contribution of articles of multiple author 1982 (83.95%) is higher than the contribution of single author 379 (16.05%).

Table.5: Single vs. Multiple Authors

Number of Authors	No. of articles	Percentage	Cumulative	Cumulative %
Single Author	379	16.05	379	16.05
Multiple Author	1982	83.95	2361	100
Total	2361	100		

5.6 Degree of collaboration

To determine the degree of collaboration in quantitative terms, the formula given by K. Subramaniam (1983) is used. The formula is C= NM/ NM+NS. Where, C=Degree of collaboration.
NM=Number of Multi-authored papers. NS=Number of single-authored papers. C=1982/1982+379
C=0.84. In this present study, the value of C is C=0.84. The degree of collaboration calculated in the Journal "Journal of Solar Energy Engineering, Transactions of the ASME" is 0.84, which clearly shows the dominance of multiple authors' contributions.

Table.6: Time Series Analysis: The future growth of publications

S.No	Year	Count Y	X	X2	XY
1	1980	46	-18	324	-828
2	1981	57	-17	289	-969
3	1982	61	-16	256	-976
4	1983	72	-15	225	-1080
5	1984	76	-14	196	-1064
6	1985	61	-13	169	-793
7	1986	61	-12	144	-732
8	1987	57	-11	121	-627
9	1988	51	-10	100	-510
10	1989	55	-9	81	-495
11	1990	49	-8	64	-392
12	1991	42	-7	49	-294
13	1992	39	-6	36	-234
14	1993	37	-5	25	-185
15	1994	35	-4	16	-140
16	1995	59	-3	9	-177
17	1996	44	-2	4	-88
18	1997	53	-1	1	-53
19	1998	44	0	0	0
20	1999	33	1	1	33
21	2000	31	2	4	62
22	2001	69	3	9	207
23	2002	69	4	16	276
24	2003	77	5	25	385
25	2004	79	6	36	474
26	2005	78	7	49	546
27	2006	78	8	64	624
28	2007	74	9	81	666
29	2008	86	10	100	860
30	2009	71	11	121	781
31	2010	78	12	144	936
32	2011	79	13	169	1027
33	2012	67	14	196	938
34	2013	93	15	225	1395
35	2014	98	16	256	1568
36	2015	114	17	289	1938
37	2016	88	18	324	1584
	Total	2361	0	4218	4663

5.7 Time Series Analysis: The Future Growth of Publications

The multivariate analysis technique is used here to find the future growth of publications The use of this technique is to predict the number of publications for the near future that is 2020 and 2025. From the results of the calculations, it is found that the estimated future growth of articles in the Journal "Journal of Solar Energy Engineering, Transactions of the ASME" increased from 63.81 in the year 2016 to 88.13 in the year 2020 and in the year, 2025 to 93.66, clearly shown in table 6 and Figure 5. Therefore, it inferred that the rate of growth is positive in relation by the year wise publications.

Straight line equation Yc = a+bX
Since X=0
a=Y/N
a=2361/37
a=63.81
b=XY/X2
b=4663/4218
b=1.11

Estimated Literature in 2020 is when X =2020-1998
=22 years
=63.81+1.11*22
=88.13

Estimated Literature in 2025 is when X =2025-1998
=27 years
=63.81+1.11*27
=93.66

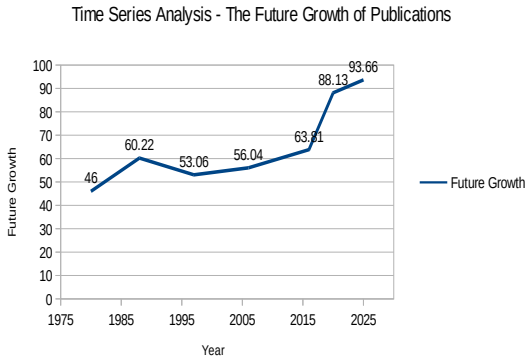

Fig.1: Time Series Analysis

6. CONCLUSION

Journal of Solar Energy Engineering, Transactions of the ASME has published 2361 articles during the period of 1980-2016 with an yearly average of 63.81. Out of 2361 articles, Minimum articles 31 articles (1.31%) were published in the year of 2000 and the maximum of 114 articles (4.83%) were in the year of 2015. The Growth ratio varies from 0.94 to 2.23. From the table it is observed that there exists fluctuation. The RGR from the year 1981 is 0.81, the final year 2016 is 0.04, and the overall value is 3.94, the values gradually decreased from over the years. On the other hand, the Doubling Time show as increasing trend, from the year 1981 is 0.86 and the final year 2016 is 18.24 .In the Authorship Pattern, the major contribution of articles was from two authors 776 (32.87%) followed by Three authors 634 (26.85%) and Single author 379 (16.05%). The Time series analysis technique reveals the estimated future growth of articles in the Journal "Journal of Solar Energy Engineering, Transactions of the ASME" increased from 63.81 (2016) to 88.13 in 2020 and 93.66 in the year 2025. Therefore, it inferred that the rate of growth is positive in relation by the year wise publications.

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