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## Scientometric Mapping of Research Productivity of Madurai Kamaraj University (2006-2020) : An Exploration of Author Metrics

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### Abstract

*The present study aimed at exploring the author metrics of research output of Madurai Kamaraj University with 2993 records harvested from Web of Science database covering the period 2006-2020. Bibexcel and MS Excel were used for analyzing the collected data. The findings reveal that :The overall DC is (0.99) indicating that 99% of research productivity of Madurai Kamaraj University is out of collaborative research work. The overall RSA is 0.01. The overall AAPP was 4.52 and the overall PPA was 0.19. Dhakshinamoorthy A has received the highest number of citations (4667) followed by Perumal S with 3548 citations and Pitchumani K with 3130 citations. In terms of Relative Citation Index, only one author Dhakshinamoorthy, A has obtained a RCI score of more than 2 (2.55). Perumal S is the second most productive author with 141 records, contributing 4.69% of total research output.*

### Keywords

Scientometrics; Madurai Kamaraj University; Author Metrics; Degree of Collaboration; Prolific authors;

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## Introduction

Scientometrics is “a discipline that uses mathematical methods to quantify the scientific research personnel and achievements to reveal the process of scientific development, and can provide scientific basis for scientific decision making and management” (Qiu,Zhao, Yang & Dong, 2017). Scientometrics uses citation analysis and other quantitative methods to evaluate scientific research activities and thus guide the policy of science (Egghe, 2005).

Thus, Scientometrics provides information about the structure of knowledge and the way it is communicated; measures the publication patterns of all forms of written communication; provides evaluative measures to indicate individual country’s output; indicate the citation pattern of literature and studies the use of documents.

## Madurai Kamaraj University

“Started as a Post Graduate Extension Centre of the University of Madras and elevated to the status of State University in the year 1965, Madurai University renamed as Madurai Kamaraj University in the year 1979 has recorded a phenomenal growth over the years. It has 106 Colleges affiliated to it. Madurai Kamaraj University was accredited with four star status in 1999 and was re-accredited with ‘A’ grade in subsequent cycles of re-accreditation in 2006 and 2014. The University was rightly rewarded with the status of University with Potential for Excellence (UPE) in 2005. Ranked as 77th in the University Category under NIRF ranking in 2017, the University improved its ranking to 54 in the subsequent year, and with 2019 NIRF ranking it entered into the league of top 50 Universities of India with the ranking of 45 among Indian Universities. The University secured IInd rank in 2017 among HEIs in SWACHHTA ranking process. The University entered into QS India ranking in the rank band 86-90 among Indian Universities and 351-400 band among QS Asia ranking “ (“M K University”, 2020).

## Review of Literature

Pradhan, SahooandPadhan (2021) performed a scientometrics Study of Research Productivity of VSS University of Technology (VSSUT) as Reflected in Scopus Database during 2015-2020 with 1889 records. Rahaman, Ahmad, Waris, Naseer, Muhammad and Peter (2021) conducted a systematic

analysis of the development and trends in scientific literature production and collaboration pattern of the faculties of Imam Abdulrahman Bin Faisal University (IAU), between 2010 to 2020 with the data collected from the web of science core collection (WoSCC). Senthilkumar and Ulagannathan (2017) investigated about the published research articles and its citation available in the Indian Citation Index by the authors from SRM University. A total of 510 records were collected from Indian Citation Index. Kumar, Gupta and Gupta (2016) examined the scientometric aspects of Research Performance of Maharishi Markandeshwar University, Mullana-Ambala during 2007-2015 with 648 records harvested from Scopus International database. Selvantony, Ravanand Murugan (2015) carried out ascientometric study on Research publications of B.S.AbdurRahman University during 1995-2014 with 598 papers downloaded from Scopus database. Swain, Rautaray and Swain(2013) explored the scientometric dimensions of Research Productivity of a Leading Private University in India with 361 papers downloaded from Scopus database from the year 2000 to till February, 2013.

**Aim of the study**

The aim of the study is to explore the author metrics of MKU research productivity during 2006-2020.

**Objectives of the study**

The present study was conducted with the following objectives:-

- To find out the Co-authorship Index of MKU research productivity during 2006-2020
- To find out the Degree of Collaboration and Rate of Single Authorship of the given MKU research output
- To calculate the Average authors per paper and Productivity Per Author value for the given MKU research output
- To know the Relative Citation Index of the authors
- To trace out the authorship pattern of the given MKU research output
- To identify the most prolific authors of the given MKU research output
- To disclose the year-wise research productivity of prolific authors
- To list the most prolific authors based on h-index ranking

**Research Methodology**

The study undertaken by the researcher is a quantitative study. It is a scientometric mapping of research productivity of Madurai Kamaraj University during 2006-2020.

**Data Collection**

Step I: Logged on to Web of Science database in MK University(In the Department of Library and Information Science) on 24.03.2021

Step II: Chose ‘Web of Science Core Collection’ in ‘select a database option’.

Step III: Selected ‘Institution’ in the option available right of the search box

Step IV: The keyword “Madurai Kamaraj University” is chosen as a search term in the search interface of web of science.

Step V: In the time slot, 2006- 2020 was set as the range for the data collection period.

Step VI: The result was displayed in the screen showing an output of 3007 records.

Step VII: The data was downloaded into 7 different text files (first 6 consist of 500 records each and the last file consists of 7 records). Records were saved in Plain Text Format.

Step VIII: Then, the researcher has uploaded 3007 records of Madurai Kamaraj University into Bibexcel software and mapped the data.

Step IX: Data was analyzed and required reports were gathered for data interpretation.

**Data Analysis**

The data was fed into Bibexcel software and a good number of operators were used to draw few tables. Few results got from Bibexcel software, are taken to MS Excel programme and necessary calculations were done to draw few more inferences. Whenever cross tabulation was required, the output of Bibexcel software was copied to MS Excel programme and cross tables were generated using pivot table option. Apart from the tables, charts and diagrams like pie chart, bardigram, line diagram and stacked cylinders were used to illustrate the interpretation in a visual/graphical pattern.

**Findings of the Study**

**Table 1 :Co-authorship Index**

Year	Single Author	CAI	Two Authors	CAI	>2 authors	CAI	Total
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2006	5	371.71	33	160.00	84	83.98	122
2007	3	186.36	45	182.31	98	81.87	146
2008	7	434.85	47	190.42	92	76.85	146
2009	4	279.07	33	150.15	93	87.25	130
2010	1	68.71	26	116.51	105	97.02	132
2011	2	87.21	42	119.44	164	96.16	208
2012	1	45.58	29	86.20	169	103.58	199
2013	0	0.00	45	126.75	165	95.83	210
2014	1	36.13	40	94.26	210	102.04	251
2015	2	72.85	30	71.27	217	106.29	249
2016	1	39.43	27	69.44	202	107.12	230
2017	2	69.77	40	91.00	218	102.26	260
2018	3	105.05	30	68.51	226	106.42	259
2019	1	41.80	22	59.97	194	109.04	217
2020	0	0.00	17	42.97	217	113.10	234
	33		506		2454		2993

Table 1 shows the Co-authorship Index of Madurai KamarajUniversity research productivity during 2006-2020.

Single Author :The CAI was more than 100 in the beginning years2006-2009 and in 2018 whereas the CAI was less than 100 during 2010-2012, 2014-2017 and 2019. The single author CAI score shows nillvalue in 2013 and 2020. The CAI was the highest in 2008(434.85) and the least in 2014(36.13).

Two Authors :The CAI was more than 100 in the beginning years i.e. 2006-2011 and2013 whereas the CAI was less than 100 during 2014-2020 and in 2012. The CAI was found to be the highest in 2008(190.42) and the least in 2020(42.97).

More than two authors :The case is reverse here. The CAI was less than 100 in the beginning years i.e. 2006-2011 and 2013 whereas the CAI was more than 100 in the last seven years i.e. from 2014-2020 and in 2012. The CAI was seen to the most in 2020(113.10) and the least in 2008(76.85).

This shows the increased inclination of the researchers at MKU towards multiple-research behaviour.

**Table 2 :Degree of Collaboration Rate of Single Authorship**

Year	Total No. of Publication	Single Author	Multiple Authors	Degree of Collaboration	RSA
2006	122	5	117	0.96	0.04
2007	146	3	143	0.98	0.02
2008	146	7	139	0.95	0.05
2009	130	4	126	0.97	0.03
2010	132	1	131	0.99	0.01
2011	208	2	206	0.99	0.01

2012	199	1	198	0.99	0.01
2013	210	0	210	1.00	0.00
2014	251	1	250	1.00	0.00
2015	249	2	247	0.99	0.01
2016	230	1	229	1.00	0.00
2017	260	2	258	0.99	0.01
2018	259	3	256	0.99	0.01
2019	217	1	216	1.00	0.00
2020	234	0	234	1.00	0.00
Total	2993	33	2960	0.99	0.01
Overall Score				0.99	0.01

Table 2 shows the degree of collaboration and the rate of single authorship found in research productivity of Madurai KamarajUniversity.The degree of collaboration shows that the DC was the least in 2008 (0.95). It steadily rose from 0.97 in 2009 to 1.00 in 2014. Again went down in 2015 (0.99) and rose in 2019-2020 (1.00). The overall DC is (0.99) indicating that 99% of research productivity of Madurai KamarajUniversity is out of collaborative research work.The rate of single authorship shows that RSA was the highest in 2008 (0.05) followed by 0.04 in 2006, 0.03 in 2009 and 0.02 in 2007. It went down to 0.01 and 0.00 in the following years. The overall RSA is (0.01) conveying that only 1% of research productivity of Madurai KamarajUniversity is out of single author contributions.

**Table 3 :Average Authors per Paper/ Productivity Per Authors**

Year	Total Articles	No.of Authors	AAPP	PPA
2006	122	431	3.53	0.28
2007	146	657	4.50	0.22
2008	146	520	3.56	0.28
2009	130	518	3.98	0.25
2010	132	587	4.45	0.22
2011	208	859	4.13	0.24
2012	199	858	4.31	0.23
2013	210	834	3.97	0.25
2014	251	1107	4.41	0.23
2015	249	1106	4.44	0.23
2016	230	1108	4.82	0.21
2017	260	1275	4.90	0.20
2018	259	1289	4.98	0.20

2019	217	1125	5.18	0.19
2020	234	1244	5.32	0.19
	2993	13518	4.52	0.22

Table 3 shows the Average Authors per Paper (AAPP) and Productivity Per Authors(PPA) of Madurai KamarajUniversity.The number of average number of authors per paper was found to be the highest (5.32) in the year 2020 and the least (3.53) in the year 2006. This clearly indicates that on an average the MKU publications had 3.53 -5.32 authors per paper.The average number of papers per author was found to be the highest (0.28) in the year 2006 and 2008 and theleast (0.19) in the year 2019 and 2020. On an average, the authors had less than a paper.The table also shows that the overall AAPP was 4.52 and the overall PPA was 0.19.

**Table 4 :** Relative Citation Index of Authors

Author	Paper	Citations	RCI
Muthusubramanin S	146	1366	0.48
Perumal S	141	3548	1.29
Gunasekaran P	116	2120	0.94
Pitchumani K	104	3130	1.55
Natarajan S	102	1072	0.54
Dhakshinamoorthy A	94	4667	2.55
Kumar GG	93	2845	1.57
Ramakrishnan V	87	1481	0.88
Ramaraj R	82	2121	1.33
Kumar RR	78	1344	0.89
Rajagopal S	75	1322	0.91
Rajendhran J	74	931	0.65
Ramchandran K	71	1440	1.04
Rajan M	69	698	0.52
Kumar RS	58	745	0.66
Athimoolam S	58	379	0.34
Anitha K	56	601	0.55
Sethuraman K	54	558	0.53
Sarawathi R	53	1375	1.33
Siva A	51	578	0.58
Total	1662	32321	1.00

Table 4shows the Relative Citation Index of Authors of Madurai KamarajUniversity during 2006-2020.Among the authors, Dhakshinamoorthy A has received the highest number of citations (4667) followed by Perumal S with 3548 citations and Pitchumani K with 3130 citations. Three authors namely Kumar GG (2845), Ramaraj R (2121) and Gunasekaran P (2120) have obtained more than 2000 citations. Seven authors have obtained 1000-1500

citations and other seven authors have obtained 370-950 citations.In terms of Relative Citation Index, only one author Dhakshinamoorthy, A has obtained a RCI score of more than 2 (2.55). Six authors namely Kumar G G (1.57), Pitchumani K (1.5), Ramaraj R (1.33), Saraswathi R (1.33), Perumal S (1.29) and Ramachandran K (1.04) have obtained a RCI score ranging from 1.04 to 1.57. Athimoolam S has the least RCI score of 0.34 among the top listed authors.

**Table 5 :**Authorship pattern

Authorship pattern	No of Records
Sing Author	33
Joint Authors	506
3 Authors	595
4 Authors	628
5 Authors	551
6 Authors	306
7 Authors	174
8 Authors	73
9 Authors	44
10 Authors	30
11 Authors	18
12 Authors	11
13 Authors	7
14 Authors	5
15 Authors	1
16 Authors	5
17 Authors	1
18 Authors	6
19 Authors	4
25 Authors	1
27 Authors	1
30 Authors	1
32 Authors	2
34 Authors	1
35 Authors	1
49 Authors	1
110 Authors	1
Total	3007

Table 5 shows the authorship pattern found in research productivity of Madurai Kamaraj University during 2006-2020. Single authored contributions are just 33 out of 3007 total records. Joint authored publications were counted to be 506. Three authors authorship pattern has contributed 595 documents while four authors authorship pattern has given the highest score of 628 records. Five authors authorship pattern has contributed 551 papers while six authors authorship pattern has given 306 papers. Eight authors and nine authors authorship pattern have

contributed 73 and 44 papers respectively. Ten authors authorship pattern has contributed 30 papers. The number of papers published in more than 10 authors authorship pattern ranges between 1 and 7. There is a research paper authored by 110 authors and there is an another research paper with 49 authors.

**Table 6 :Most Prolific Authors**

Author	Count	% (of 3007)
Muthusubramanian S	146	4.86
Perumal S	141	4.69
Gunasekaran P	116	3.86
Pitchumani K	104	3.46
Natarajan S	102	3.39
Dhakshinamoorthy A	94	3.13
Kumar GG	93	3.09
Ramakrishnan V	87	2.89
Ramaraj R	82	2.73
Kumar RR	78	2.59
Rajagopal S	75	2.49
Rajendhran J	74	2.46
Ramachandran K	71	2.36
Rajan M	69	2.29
Athimoolam S	58	1.93
Kumar RS	58	1.93

Anitha K	56	1.86
Sethuraman K	54	1.80
Saraswathi R	53	1.76
Siva A	51	1.70
Varalakshmi P	50	1.66
Ashokkumar B	48	1.60
Garcia H	48	1.60
Suresh J	44	1.46
Selvam GS	43	1.43
Vasantha VS	43	1.43
Mayandi J	42	1.40
Chen SM	42	1.40
Umapathy S	40	1.33
Iyakutti K	40	1.33

Table 6 shows the Most Prolific Authorsof Madurai KamarajUniversityduring 2006-2020. Muthusubramanian Sis the most productive author of the university with 146 records contributing 4.86% of total research output. Perumal S is the second most productive author with 141 records, contributing 4.69% of total research output. Three authors namely Gunasekaran P (116), Pitcumani, K (104) and Natarajan, S (102) have contributed 3.86%, 3.46% and 3.39% of total research output of the university. There are 16 authors whohave published 50-100 records and there are 9 authors who have published 40-49 records.

**Table 7 :Year-wise research productivity of prolific authors**

Author	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Grand Total
Muthusubramanian S	5	12	16	6	9	15	14	17	16	10	12	3	3	5	2	1	146
Perumal S	9	29	10	13	10	15	13	20	8	4	5	1		3	1		141
Gunasekaran P	1	4	7	9	7	10	15	17	13	12	7	5	1	5	2	1	116
Pitchumani K	4	2	5	3	7	11	15	13	17	9	8	3	7				104
Natarajan S	24	30	10	6	9	7	4	4	3	3	1		1				102
Dhakshinamoorthy A	1		2	1	1	2		5	10	7	8	14	10	14	19		94
Kumar GG						5	3	2	10	10	11	16	14	11	11		93
Ramakrishnan V	5	9	8	6	4	7	9	13	14	5		1	2	2	2		87
Ramaraj R	2	3	2	5	2	10	6	10	8	10	6	5	5	4	4		82

Kumar RR	3	9	7	3	1	2	1	7	7	10	7	2	6	2	9	2	78
Rajagopal S	4	3	2	6	2	5	5	14	10	10	4	4	3	3			75
Rajendhran J		2	1	2	2	3	8	10	7	10	7	8	3	7	3	1	74
Ramachandran K	7	9	4	5	3	7	5	3	8	8	5	4	1	2			71
Rajan M										2	4	17	22	11	13		69
Kumar RS	1	9	3	3	4	4	1	5		5	5	4	7	3	3	1	58
Athimoolam S	15	22	4	1	4	3	1		1		4		3				58
Anitha K	4						2		3	5	2	16	11	9	4		56
Sethuraman K							1	1	6	9	4	6	12	9	6		54
Saraswathi R	1	3	2	3	3	5	4	4	9	3	5	7		4			53
Siva A									3	8	12	8	5	9	5	1	51
Varalakshmi P						1	1	1		9	6	7	8	6	10	1	50
Garcia H								2	5	6	6	9	5	6	9		48
Ashokkumar B						1	1	2		10	5	11	8	3	6	1	48
Suresh J	8	9	5	8	5	4	2	1	1						1		44
Vasanth VS							1	1	5	8	5	4	9	3	7		43
Selvam GS	4	3	3	3	1	2	3	3	4	2	1	2	6	2	4		43
Mayandi J									2	4	9	4	6	6	3	8	42
Chen SM						2	4	2	8	12	5	5		4			42
Umopathy S	4		2	4	7	2	8	4	3	2	2	2					40
Iyakutti K			2	5	3	10	7	4	6		1	2					40

Table 7 shows the year-wise research productivity of prolific authorsof Madurai KamarajUniversityduring 2006-2020. Muthusubramanian S, the most prolific author, has published papers throughout the study period. He has published the highest count of 17 papers in 2013 followed by 16 papers in 2008 and 2014 and 15 papers in 2011 and the least count of 2 papers in 2020. The second most productive author, Perumal S, has no publication in 2018. We can see a decreasing count of his publications during the study period. He has a maximum of 29 papers to his credit in 2007 followed by 20 papers in 2013 and 15 papers in 2011. The productivity of Gunasekaran P shows an oscillating trend. Pitchumani and Natarajan, S have not published any paper in 2019 and 2020. Kumar GG, who has 93 papers, did not publish any paper during the first five years of the study period. The credit of publishing most number of papers in a single year goes to Natarajan S with 30 papers in 2007 followed by Perumal S with 29 papers in 2007.

**Table 8 :**Most prolific authors (based on h-index ranking)

h-index	Author	Citation sum within h-core	All citations	All articles
35	Perumal S	2383	3548	141
32	Pitchumani K	2086	3130	104
32	Dhakshinamoorthy A	4096	4667	94
32	Kumar GG	2117	2845	93
28	Ramaraj R	1585	2121	82
25	Gunasekaran P	1306	2120	116
25	Sivaraman G	1745	1808	32
22	Rajagopal S	807	1322	75
22	Garcia H	3508	3720	48
22	Chellappa D	1637	1700	29
22	Sriram D	1737	1825	28
22	Yogeeswari P	1737	1810	27

21	Ramakrishnan V	985	1481	87
21	Ramachandran K	1046	1440	71
21	Saraswathi R	1155	1375	53
20	Muthusubramanian S	712	1366	146
20	Chen SM	1048	1282	42
19	Natarajan S	697	1072	102
18	Kumar RR	1017	1344	78
18	Yoo DJ	937	1029	29
17	Vasanth VS	506	650	43
17	Kim AR	914	1010	28
17	Pandikumar A	953	1014	24
16	Lu KL	615	656	22
15	Rajendhran J	571	931	74
15	Rajan M	346	698	69
15	Kumar RS	568	745	58
15	Siva A	385	578	51
15	Selvam GS	465	629	43
15	Menendez JC	651	734	24

Table 8 shows the list of 20 most prolific authors, with a h-index score of 15 and above, of Madurai Kamaraj University during 2006-2020. Perumal S is the most productive author with a h-index score of 35 for his 141 papers and 348 citations followed by Pitchumani K with a h-index score of 32 for his 104 papers and 3130 citations. Two authors namely Dhakshinamoorthy A and Kumar GG have obtained a h-index score of 32 each for 94 and 93 papers respectively. There are 11 authors with the h-index score ranging from 21-28. The most prolific author, Muthusubramanian, S, who has the highest number of 146 papers, has scored a h-index score of just 20. Another author, Natarajan, who has published 102 papers, has received a h-index score of just 19. Rajendhran J, Rajan M, Kumar RS, Siva A, Selvam GS and Menendez J C are the prolific authors with a h-index score of 15 each.

### Conclusion

Such a kind of author metric studies will enable both the individual authors and the institutions to take certain solid policy decisions. The institution will be able to a) find out the most prolific authors and award them b) make use of the most productive authors to guide the young and budding researchers c) provide

sufficient funds to the active researchers to emulate their research activities d) plan and conduct training programmes / workshops / hands-on sessions to the low performing researchers e) find and encourage suitable research teams for carrying out major research projects and f) find out the papers on emerging topics and sponsor the publication charges / Article Processing Charges. The most cited papers of the institution may be made available to the fellow researchers. The institution may create an institutional repository (intranet or internet) to showcase the research productivity and enhance the research visibility of the faculty members. Research Hub / Research Cell may be started in the institution with an aim to empower the faculty members with required research competencies and skills. The authors will be able to identify their stand amidst their colleagues in terms of publication and citation. The low cited authors may consult the highly cited authors to know / understand the tips and techniques of effective scientific writing. The funding bodies will be able to recognize and award research grants to most productive authors. The benefits are countless.....

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