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RESEARCH PRODUCTIVITY OF PANDIT DEENDAYAL PETROLEUM UNIVERSITY AT GANDHINAGAR DURING 2008-2019: A BIBLIOMETRIC STUDY

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Abstract:

This study endeavours to embrace a bibliometric analysis of the research publications of Pandit Deendayal Petroleum University (PDU) from 2008-2019. It is in this context that the present study aims to audit the exploration execution the research performance of PDU based on the papers published in journals that have indexed in Scopus for as far back as eleven years. The total number of 931 publications has retrieved from the Scopus database. Amongst them, 64.44 % are research articles published in scholarly journals and 28.89 % in Conference proceedings. The paper also analyzed the publication trend of Pandit Deendayal Petroleum University and found that from 2008 onwards there was a steady increase in the number of publications. The authors attempt to identify the current trends in research output by PDU, which includes the most prolific authors, institutional collaborative works, research productivity in terms of publications, highest citations papers, most preferred publications, etc.... The research publications was found highest numbers of publications in the year 2019. Findings of this study also reveal that the "AIP Conference Proceedings" is the most preferred journal, and Mukhopadhyay, I, is the most prolific author and has made the highest number of publications.

Keywords: Pandit Deendayal Petroleum University, Bibliometric Study, SCOPUS, Research Publications of PDU

Introduction:

The British Standard Institution (1976) portrayed the bibliometric as the "Application of mathematical and statistical methods in the study of the use of documents and statistical methods in the study of the use of documents and publication patterns" (Tandale, 2017). Over numerous years bibliometric has emerged as a basic device in assessing the exploration efficiency of an

association and investigate the pattern of the branch of knowledge. An absolute 962 colleges are in India. These colleges have a significant job in general instruction. They are not just satisfying the job of an instructive foundation yet in addition a generator of new information through research production. A couple of years back, the academic research papers have been expanded monstrously (Bhakta, 2018). Colleges are the prevailing player in the considerable development of research everywhere throughout the world. As of late NIRF (National Institutional Ranking Framework) was created by MHRD (Ministry of Human Resource Development) to rank the Indian Institute on various parameters. The ebb and flow study attempted to follow the exploration that has been done as such far by a solitary college called Pandit Deendayal Petroleum University (PDPU) from its beginning. Checking the examination paper is a procedure that assists with discovering the quality and shortcomings of the exploration item. The examination organization makes the use of all bibliometric information, incorporating reference includes in their subject space for assessing various parameters like the most favoured diary, most productive creator, and so forth. Reference concentrates likewise assume an exceptionally urgent job in evaluating any insightful yield. At the same time, the distribution year, the mechanism of academic yield, community designs, and so forth are searched for to be concentrated in detail to recognize the general research result of any organization (Hood and Wilson, 2001). Accordingly, the present examination intends to recognize the exhibition of the establishment under the audit of Pandit Deendayal Petroleum University, Gandhinagar as far as research distribution, most productive creator, centre diaries, level of coordinated effort, and so on for the years 2008 to 2019 from Scopus database.

Institutional Profile:

Pandit Deendayal Petroleum University (PDPU) has been established by GERMI as a Private University with 100 acre campus in 2007. Pandit Deendayal Petroleum University is located in Gandhinagar, which is the capital city of Gujarat. This university is an UGC recognized and NAAC accredited University. Pandit Deendayal Petroleum University has been promoted by Government and Petrochemical Department to create a world class University in energy education with special focus on the oil and gas sector. PDPU offers multiple programs from engineering, arts and management along with maximum exposure and opportunities to its students through various national and International exchange programs with best universities worldwide. Engineering, arts and management courses are offered by respective schools like School of Technology, School of Liberal Studies and School of Petroleum Management. Under these schools the different courses like B.Tech, BA, BBA, B.Com, B.Sc have been offered under UG programs, M.Tech, MBA and MA

under the PG Programs and PhD programs also offers in various subject. For development of its faculties and staff the University endeavours for various Joint Exchange and Research programs.

Literature Review:

As indicated by the information of Wani, et al. investigated the examination yield of All India Institute of Medical Sciences (AIIMS) from 1959-2011, absolute 17,181 research papers extracted from Scopus database. The study found that there was a requirement for appropriate wanting to adjust the distribution and research profitability of different parts of clinical sciences at AIIMS as a portion of the branches outpaced others by huge edge. (Kumar, Dora & Desai, 2015) study a ten-year research productivity of Gujarat University during the year 2004-2013 utilizing Scopus auxiliary information. There were 760 no of publication found which were affiliated to Gujarat University. The research shows that the most preferred publication source was journals. Apart from the top author, top publication, the paper review the collaboration trends and find out the list of top collaborative institutes. The author concludes that there is an increase in research collaboration during this year 2004-2013.

More recently (Parabhoi, Sahu, & Kumari, 2017) conducted a bibliometrics study on Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Solan, indexed papers in Scopus database during 2006-2015. They found 560 papers during this period. The authors analyzed the papers in pre-define objectives i.e. authorship patterns, subject wise distributions, preferable journals, types of publications etc... To analyse the "Research Productivity of Universities in Kerala: Growth and Trends" using Scopus database, (Sheeja, Cherukodan & Sageer, 2015) found 11764 no of documents for six universities. From the six universities, CUSAT (Cochin University of Science and Technology) was the top university in Kerala followed by the University of Kerala and MG University (Mahatma Gandhi University) in the context of a total number of research papers. The analysis shows that subject like science and technology contribute more than other branches of humanities and social science.

As investigated the research (Siwach & Kumar, 2015) contributions of Maharshi Dayanand University, Rohtak in terms of its production yield during 2000-2013 as reflected through Scopus database. The investigation broke down year-wise research productivity, its citations impact, national and international collaborations and top collaborating institutions. A study conducted (Chirici, 2012) to introduce the consequences of an appraisal of the worldwide accumulated scientific productivity of the Italian forestry community during 1996-2010 using the SCOPUS data available from the on-line SCIMAGO system; and to compare the Web of Science and SCOPUS

for the quantity of distributions to the number of publications, number of citations and h-index. The study found that both Web of Science and SCOPUS were appropriate wellsprings of information for evaluating the logical profitability of Italian authors.

Research Objective:

The significant target of this study is to analyse the research output of Pandit Deendayal Petroleum University during the year 2008 - 2019. Coming up next are some various objectives:

- To find out types of research publications and year
- To find out the year wise research productivity
- To identify the most prolific authors of PDPU.
- To identify the most cited papers.
- To identify most Institutional collaboration
- To identify most preferred journals/conference publications.
- To find out the major subject area of research work at PDPU.

Methodology:

The present study is quantitative study of various aspects of literature and it is based on data from globally satisfactory Scopus indexing and abstracting database. Bibliographic data of all authors of Pandit Deendayal Petroleum University was extracted from SCOPUS database, which is the widespread sources of information that deals abstract and index of publications at a world-wide. The publications of PDPU for 2008 – 2019 were considered to access the research output in regard to this investigation. For this study the data was collected through the Scopus database by physically searching for the Pandit Deendayal Petroleum University. The information which were initially downloaded in the CSV format were changed over to MS-Excel for advance analysis. The final data contained of 931 publications by 562 authors from Pandit Deendayal Petroleum University during the years 2008 and 2019. The scope of the present study is to evaluate the research efficiency of PDPU and the study restricted to just a single database i.e. SCOPUS.

Data Analysis

Types of Research Publications:

The productivity of the authors of Pandit Deendayal Petroleum University were spread over diversity of scientific communication like journal articles, conference papers, review, book chapters, book, note and so on. The table represent that most of the literature is in the form of journal article

64.44 % (600) out of the total 931 publications. The conference papers is at the second position in the list with 28.89% (269) literatures followed by review 24, book chapter 24 and so on.

Sr No	Item Type	No. of publications	Percentage
1	Journal Article	600	64.44
2	Conference Paper	269	28.89
3	Book Chapter	24	2.57
4	Review	24	2.57
5	Editorial	3	0.32
6	Books	2	0.21
7	Data Paper	2	0.21
8	Note	2	0.21
9	Erratum	1	0.10
10	Letter	1	0.10
11	Undefined	3	0.31

Table – 1 Types of Research Publications

Year Wise research productivity:

The below figure portrays 931 publications incorporated in Scopus database during 2008-2019 from the Pandit Deendayal Petroleum University in chronologically. The faculties and research scholar of PDPU fraternity has published 931 papers. There has been a constantly progress in research publications at PDPU in the year 2008-2019. From 2008 – 2016 the publication under the 100 publications per year but after 2017 distinct increase in the number of being published was seen in figure with more than 100 to 300 publications. The year 2019 is the most productive year with 302 publication of research work.

Figure – 1 Growth of research productivity from 2008 to 2019

Prolific authors of PDPU

According to data collected from SCOPUS database of PDPU the total numbers of 564 authors have contributed to publishing 931 publications. The data was sorted by the numbers of publications by each author and ranking list of top fifteen authors in descending order was compiled. The ranking also done on basis of the average citations per paper (ACPP) for the current study. It was quiet interesting that among the top fifteen prolific authors is in accordance to their number of publications Mukhopadhyay, I. is the topped with 79 papers but according to ACPP he got the 5 rank. The author Patel, V.K. got the 14 rank according to their number of publications but got 1 rank according to ACPP. There are another observation came out that among the total publication of PDPU these fifteen authors contributed more than 56.6 % of the paper published during 2008-2019.

Rank	Author's name	no. of paper	Citations	h-index	*ACPP	Rank as per ACPP
1	Mukhopadhyay, I.	79	1522	20	19.2	5
2	Ray, A.	62	647	13	10.4	10
3	Tripathi, B.	44	442	13	10.0	11
4	Kumar, M.	41	1200	21	29.2	4
5	Badheka, V.J.	40	617	14	15.4	7
6	Kachhwaha, S.S.	34	624	13	18.3	6
7	Yadav, P.	34	472	14	13.8	8
8	Savsani, V.	32	3161	19	98.7	2

9	Sircar, A.	32	128	6	4.00	13
10	Pandey, K.	30	286	9	9.55	12
11	Doshi, N.	24	84	5	3.50	15
12	Patel, M.	20	1016	18	50.8	3
13	Patel, V.	20	267	9	13.3	9
14	Patel, V.K.	18	2047	21	113.7	1
15	Nagababu, G.	17	64	5	3.76	14
* ACPP --Average Citation Per Paper						

Table – 2 Prolific authors of PDPU

Highly cited papers

The citation is a basic tool to measure the impact of the research and therefore the below table showcase the list of highly cited papers. Citations are indications of positive recognition to the published work of author(s) and the journal itself and it can be said that the number of citations received is directly proportional to the recognition or impact of the published work. According to research output from SOPUS database the paper titled “Structural, optical and electrical properties of spray-deposited CZTS thin films under a non-equilibrium growth condition” by Patel M., Mukhopadhyay I., Ray A. got the highest citation 108 and this paper was published in Journal of Physics D: Applied Physics in 2014. the another paper “Adaptive symbiotic organisms search (SOS) algorithm for structural design optimization” by Tejani G.G., Savsani V.J., Patel V.K. with 87 citation which was published in Journal of Computational Design and Engineering in 2019. With the same 87 citation the paper Arsenic removal by electrocoagulation process: Recent trends and removal mechanism was published in Chemosphere by Nidheesh P.V., Singh T.S.A. in 2019. Out of the 931 publications of PDPU the 35.12% (327) publication have been not cited in any publications. The analysis came out that 12% (112) publication from the overall publications got only single citation per publication. Here highlighted the ranking of highly cited research paper.

Title	Authors	Source title	Year	Citation	Rank
Structural, optical and electrical properties of spray-deposited CZTS thin films under a non-equilibrium growth condition	Patel M., Mukhopadhyay I., Ray A.	Journal of Physics D: Applied Physics	2014	108	1
Adaptive symbiotic organisms search (SOS) algorithm for structural design optimization	Tejani G.G., Savsani V.J., Patel V.K.	Journal of Computational Design and Engineering	2019	87	2
Arsenic removal by electrocoagulation process:	Nidheesh P.V., Singh T.S.A.	Chemosphere	2019	87	2

Recent trends and removal mechanism					
MHD natural convection flow with radiative heat transfer past an impulsively moving plate with ramped wall temperature	Seth G.S., Ansari M.S., Nandkeolyar R.	Heat and Mass Transfer/Waerm e- und Stoffuebertragung	2017	85	3
A review on dissimilar friction stir welding of copper to aluminum: Process, properties, and variants	Mehta K.P., Badheka V.J.	Materials and Manufacturing Processes	2019	82	4
Basal tuffs and contemporaneity of the Chattisgarh and Khariar Basins based on new dates and geochemistry	Das K., Yokoyama K., Chakraborty P.P., Sarkar A.	Journal of Geology	2019	77	5
Heat transfer search (HTS): A novel optimization algorithm	Patel V.K., Savsani V.J.	Information Sciences	2018	77	5
Enhancement of output performance of Cu ₂ ZnSnS ₄ thin film solar cells— A numerical simulation approach and comparison to experiments	Patel M., Ray A.	Physica B: Condensed Matter	2018	71	6
Formation of Stable Mixed Guanidinium-Methylammonium Phases with Exceptionally Long Carrier Lifetimes for High-Efficiency Lead Iodide-Based Perovskite Photovoltaics	Kubicki D.J., Prochowicz D., Hofstetter A., Saski M., Yadav P., Bi D., Pellet N., Lewinski J., Zakeeruddin S.M., Gratzel M., Emsley L.	Journal of the American Chemical Society	2018	69	7
Thermal stability of oil-in-water Pickering emulsion in the presence of nanoparticle, surfactant, and polymer	Sharma T., Kumar G.S., Chon B.H., Sangwai J.S.	Journal of Industrial and Engineering Chemistry	2013	66	7
A multi-objective improved teaching-learning based optimization algorithm (MO-ITLBO)	Patel V.K., Savsani V.J.	Information Sciences	2019	63	8
Effects of tilt angle on the properties of dissimilar friction stir welding copper to aluminium	Mehta K.P., Badheka V.J.	Materials and Manufacturing Processes	2019	62	9
Optimization of a plate-fin heat exchanger design through an improved multi-objective teaching-learning based optimization (MO-ITLBO) algorithm	Patel V., Savsani V.	Chemical Engineering Research and Design	2016	56	10

Table – 3 Highly Cited Paper

Research Collaboration

The analysis on the collaboration with other institutions in India the analysis is shown in Table 6 that top twenty institutions with at least 9 documents who collaborated with Pandit Deendayal Petroleum University authors. The Maharaja Sayajirao University of Baroda is the topped the list of collaborating institutions with 27 of its documents collaborating with the Pandit Deendayal Petroleum University authors. These top twenty institutions are collaboration with PDPU and published papers more than 31 % from all publications with over all collaboration institutions of India.

Sr. No	Affiliation name	Numbers of Documents
1	The Maharaja Sayajirao University of Baroda	27
2	Incheon National University	20
3	Institute for Plasma Research	18
4	Indian Institute of Technology Indian School of Mines, Dhanbad	17
5	Polish Academy of Sciences	17
6	Institute of Physical Chemistry of the Polish Academy of Sciences	17
7	Massachusetts Institute of Technology	16
8	Indian Institute of Technology, Bombay	15
9	Innovation and Incubation Centre	14
10	Northwestern Polytechnical University	14
11	Council of Scientific and Industrial Research India	14
12	Indian Institute of Technology Madras	14
13	S. V. National Institute of Technology	13
14	Sharif University of Technology	12
15	Indian Institute of Technology Gandhinagar	12
16	Indus University, Ahmedabad	12
17	Maharaja Agrasen Institute of Technology	12
18	Saurashtra University	11
19	National Institute of Technology, Tiruchirappalli	9
20	State Key Laboratory of Solidification Processing	9

Table - 4 Top Collaboration Institutions in India

Preferred Journal for Publication

Accordingly to above table the data were collected for the study shows the ranking of top five journals which are most preferred for publications. From the total 931 publications of the authors of PDPU 64.44% of them (600) published in total 160 different Journals. Among these 160 journals AIP Conference Proceedings got the first rank as most preferred journal with 36 publications having impact factor 0.40. Energy Procedia & Procedia Computer Science got the second rank with 15

publication in each journal having impact factor 1.15. Advances in Intelligent Systems and Computing was on third rank with 14 publications during the 2008 to 2019. The Journal of Petroleum Exploration and Production Technology was on the fourth position with 11 publications and fifth position followed by Materials And Manufacturing Processes with 10 publication by PDPU authors publications. Accordingly to table of prolific authors, it is also noted that mostly authors from engineering department. The journals in the area of science and technology and especially which is related to the subject of Petroleum and Computer science are the popular and most productive areas of research at PDPU.

Sr No	Indian Journal	No of Papers	Publisher	Country	Impact factor (2019)	Rank
1	AIP Conference Proceedings	36	American Institute of Physics	United States	0.4	1
2	Energy Procedia	15	Elsevier	United Kingdom	1.15	2
3	Procedia Computer Science	15	Elsevier	Netherlands	1.26	2
4	Advances In Intelligent Systems And Computing	14	Springer	Germany	0.57	3
5	Journal of Petroleum Exploration And Production Technology	11	Springer	Germany	0.28	4
6	Materials And Manufacturing Processes	10	Taylor & Francis	United States	1.3	5

Table – 5 Most preferred Journals for Publications

Specific area-wise distribution of research publications

The purpose of analysis of the subject-wise scientific research output is to observe the research trends in terms of research output in specialised disciplines of the subject interest. The subject-wise distribution of research publications accordingly to table no 5 the data shows the major areas where a researcher from PDPU is publishing their study. These data also highlighted the strength of university in a subject area. Engineering and material science are the most published subject areas which have 19.58 % (351) and 13.11% (235) research publications. The other major subject areas are Energy with 11.21% (201), Physics and Astronomy with 10.71% (192) and Computer science 7.81% (140) research publications. Chemistry, Earth and Planetary Sciences and

Chemical Engineering subjects have also good number of publications. The subject area which have very few publications like Agricultural and Biological Sciences, Arts and Humanities, Psychology which is mere 1% of the total publication.

Sr No	Department	Publications	Percentage
1	Engineering	351	19.58
2	Materials Science	235	13.11
3	Energy	201	11.21
4	Physics and Astronomy	192	10.71
5	Computer Science	140	7.81
6	Chemistry	123	6.86
7	Earth and Planetary Sciences	105	5.85
8	Chemical Engineering	96	5.35
9	Mathematics	75	4.18
10	Environmental Science	75	4.18
11	Business, Management and Accounting	61	3.40
12	Decision Sciences	38	2.12
13	Social Sciences	24	1.33
14	Biochemistry, Genetics and Molecular Biology	18	1.00
15	Medicine	16	0.89
16	Economics, Econometrics and Finance	12	0.66
17	Multidisciplinary	11	0.61
18	Agricultural and Biological Sciences	8	0.44
19	Arts and Humanities	4	0.22
20	Psychology	3	0.16
21	Health Professions	2	0.11
22	Immunology and Microbiology	1	0.05
23	Neuroscience	1	0.05

Table – 6 Subject wise distribution of Research Work

Conclusion

In the present study, the investigation of the research output of PDPU displays that there has been a general pattern of development in inquire about productions over the eleven-year time frame (2008-2019). During this period the total numbers of documents is 931 published by PDPU. The study obviously demonstrates that as per the kind of publication by the university, 64.44% of total literatures are published in journals. The study also found that academicians of PDPU preferred foreign Journals to publish their research work. Some subject fields like Engineering, Materials Science, Energy and Physics & Astronomy are highest productive area of research in PDPU. The subject wise publication data highlights the strength and weakness of the research output of PDPU. Data on citation revealed that top ten research paper got more than 50 to 90 citation on each paper

and the 35.12% (327) publication have been not cited in any publications till the year 2019. It very well may be seen from the above analysis that Mukhopadhyay, I. is the most prolific author with 79 publications and out of the 160 journals the AIP Conference Proceedings is the most preferred journal for PDPU researchers. The study additionally determines that, however international collaborations existed in its research output, PDPU require impressive improvement right now. Now a days in the field of Library and information science the analysis like Bibliometric, Scientometrics, Informetrics and Webometrics have increased considerable significance. These analysis techniques can be used to identify the emerging research areas, evaluate the research performance, most prolific authors, most preferred journal, years wise research growth of the particular institutions.

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