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Research Productivity of Chemistry Department, Tezpur University: A Scientometric Study

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Abstract: The purpose of the study is to evaluate the research publication of Chemistry department, Tezpur University. The SCOPUS database has been used to extract the data published during 2000 to 2020. The retrieved data has been analyzed on the following parameters; year wise distribution of publication, form wise distribution, authorship pattern, degree of collaboration, most productive authors, collaborative institution and preferred source for publication. A total of 1148 records have been retrieved and MS Excel is used to analyze the data. During the time period the highest number of publication were in 2014, 95.56% of the publication were published in the form of article, RSC Advances is one of the most preferred journal for publication, highest number of paper have been collaborated with Dibrugarh University.

Keywords: Scientometrics, Tezpur university, Research productivity, Authorship pattern, Degree of collaboration

Introduction

Research is the key source to any development. Analysis of research productivity helps to identify the overall performance of any institution. So the ranking of academic institution is mainly based on the quality and the quantity of the research output of the institution. Hence the study of research output has become increasingly important. Research productivity in higher education relates to both knowledge creation and knowledge dissemination through its various forms of research, teaching and outreach activities. Research productivity forms a very distinguishing part of the universities as a consequence, the ranking of academic institutions based on research productivity have become increasingly important.

Scientometrics can be defined as the “quantitative study of science, communication in science and science policy” (Hess, 1997, at p.75)¹. Scientometrics is a useful tool for the assessment of research performance. In this paper an attempt has been made to analyze the research output of Tezpur University using scientometric tools and techniques.

Tezpur university is a central university situated in Tezpur, Assam. It was established by an act of parliament in 1994. The university accredited with ‘A’ grade by the National Assessment and Accreditation Council (NAAC).

On the basis of National Institute Ranking Framework (NIRF) ranking 2020, Tezpur University is in the 60th position on overall ranking and 39th position among all the universities of India and it is on the top among the universities of north east India.

Review of related literature

Kumbar, et al. studied the growth and impact of research output of University of Mysore during 1996-2006. From the study it is found that annual average growth rate of publication is 23.9%. Average citation per paper is also increased from 1.53 in 1996 to 2.62 in 2003. Most of the publications are from chemistry, physics and astronomy, biochemistry, genetics and molecular biology and agriculture and biological sciences. Chemistry department leads in publications productivity with 379 papers during 1996-2006, followed by Physics department and zoology department. The university published nearly 14% of its papers through international collaboration with institutions from USA, Germany, Japan, Canada, South Korea and Denmark etc. It is also found that majority of authors from university of Mysore show low publication frequency.²

Majhi and Maharana studied the research productivity of Physical science disciplines in Sambalpur University from the publications available in Scopus database. They analyzed year wise growth of publications, most preferred journal, impact factor of the publishing journals, authorship pattern, subject wise distribution of papers etc. From the study it is found that Chemistry has the highest contribution, average growth rate increased gradually. Journal of Indian chemical society is found to be the most preferred journal having maximum number of contributions.³

Baskarn studied the research productivity of Alagappa university during 1999 -2011. He analyzed the year wise distribution, relative growth rate, authorship pattern and degree of collaboration. From the study it is found that South Korea has high collaborative link with Alagappa University. Degree of collaboration and its mean value is found to be 0.963. Multi authored publications are more than the single author publications.⁴

Gopikuttan and S studied the publication productivity of University of Kerala based on the data collected from Web of Science over a period of thirteen years from 2000-2012. They analyzed the overall performance of the faculty members of science departments using parameters such as form wise, year wise, subject wise classification of published papers, most productive authors and the most preferred journal etc. From the study it is found that chemistry is the subject which produces more number of papers and multi authorship also possesses a lead role in this subject. Indian journals are most preferred journals to publish the articles which are followed by UK. Collaborative coefficient varies from subject to subject.⁵

N K, Cherukodan and T K analyzed the growth and trends of research productivity of universities in Kerala using SCOPUS database during 1960 to 2015 and found that total number of documents published by the university academics of Kerala is 11764. The study was limited to six state universities of Kerala. From the study it was found that university academics prefer foreign journals to publish their research output. Total 978 documents were produced by collaboration with foreign countries, which are France, Germany, Japan, UK and US. Sabu Thomas from Mahatma Gandhi University was the most prolific author with 566 publications and 13889 citations. Most productive area of research in Kerala were materials science, physics and astronomy, chemistry and engineering. It was observed that compared to other universities of India, the research productivity is found to be low in universities in Kerala.⁶

Sharma, J analyzed research productivity of Library and Information science faculty members of selected universities of Punjab and Chandigarh using questionnaire as data collection source and time period up to 31st December, 2014 and found that the number of total publication is highest in Punjabi University, Patiala. He analyzed the relative growth rate, authorship pattern, degree of collaboration etc.⁷

Kpolovic and Dorgu studied the comparative determination of faculty's research productivity in Africa using h index and citation index from Google Scholar database. From the study they found that African h index and citation index are significantly lower than the world averages of 17.50 and 971 respectively. The h index and citation index of the University of Cape Town, University of Pretoria and Cairo University are significantly greater than those of other African universities. Southern Africa and north Africa each has h index and citation index that are significantly higher than those in the other African regions. South Africa and Egypt have h index and citation index that are not only greater significantly than those of other African countries but also significantly higher than the world averages.⁸

Scope

The scope of the present study covers the research publications of Chemistry department of Tezpur University available in Scopus database. The scope is further limited to the period of 2000 to 2020 i.e., 21 years. The publications of Chemistry department are available in SCOPUS from the year 2000, so the time period has been taken from 2000 to 2020. The Data has been collected in 6th December, 2020, so the publications available till 6th December 2020 are being studied.

Objectives

The prime objective of the study is to analyze the research publication of Chemistry department, Tezpur university during 2000-2020. The following are the main objectives of the study

1. To examine the year wise distribution of the publications
2. To find out form wise distribution of publications

3. To find out the authorship pattern and degree of collaboration
4. Most productive authors from Tezpur university
5. To analyze the top ten preferred journal for publication

Methodology

The present study aims to calculate the research publications of Chemistry department of Tezpur University which are available in SCOPUS database. The affiliation search was performed to find out the research publication. The data were retrieved from the database with the search term AF-ID("Tezpur University" 60007709P) and SUBJAREA(chem) AND (EXCLUDE(PUBYEAR, 2021)). Data were retrieved on 6th December, 2020 and the search term Tezpur University was used. A total of 1148 articles were downloaded and the collected data were analyzed with the help of MS Excel.

Operational Terminology

Degree of collaboration

In order to calculate the degree of collaboration among the authors of research publication of Chemistry department, Tezpur University during 2000 to 2020, the formula given by Subramanyam (1983)⁹ is used.

Degree of collaboration

$$DC = \frac{Nm}{Nm + Ns}$$

Here N_m is the number of multi authored papers during a specific period in a discipline and N_s is the number of single authored papers during a specific period in a discipline.

Collaborative Index

It is one of the measure of degree of collaboration derived by Lawani(1986)¹⁰. Mathematically it can be expressed as

$$CI = \frac{\sum_{j=1}^A j f_j}{N}$$

It is a measure of mean number of authors.

Where,

j = The number authors in an article i.e. 1,2,3,.....

f_j = The number of j authored articles

N = The total number of articles published in a year

A = The total number of authors per article

Data analysis

Year wise distribution of research productivity

Table 1: Year wise distribution of research productivity

Year	No. of Publications
2000	1
2001	2
2002	2
2003	4
2004	9
2005	12
2006	13
2007	18
2008	21
2009	29
2010	51
2011	63
2012	70
2013	102
2014	152
2015	104
2016	98
2017	114
2018	90
2019	100
2020	93

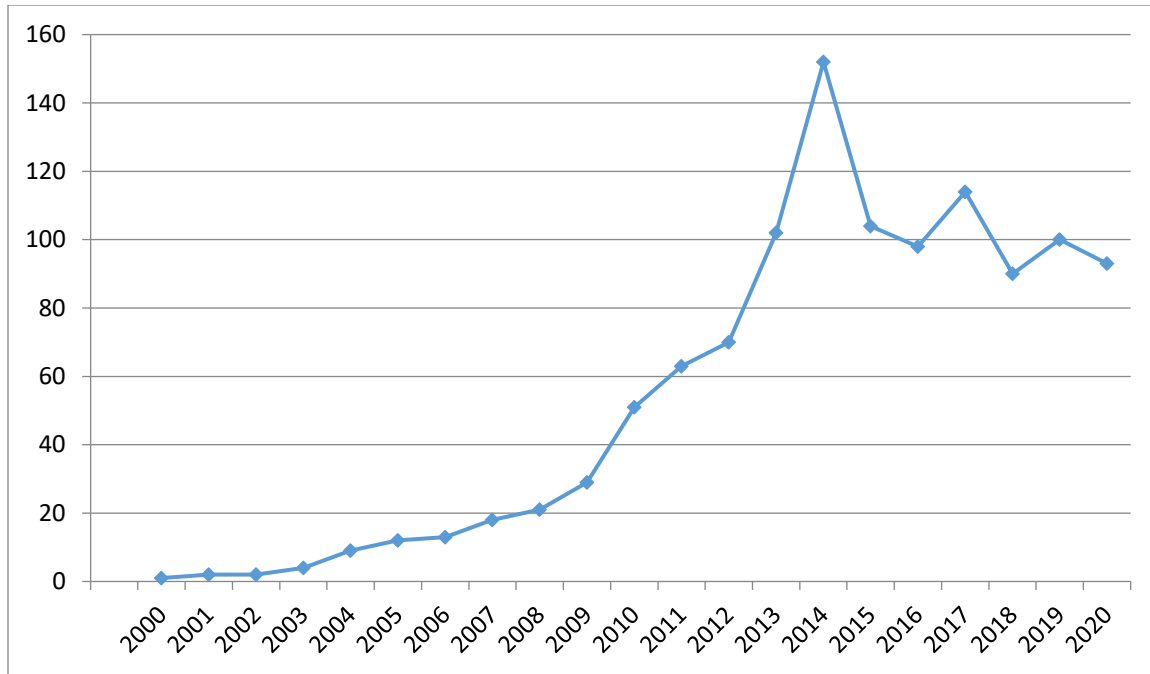


Fig1: Year wise distribution of research publication

Year-wise research publication of Tezpur University is given in Table 1. A total 1148 publications were published during the study. The highest number of publication were published in the year 2014 with 152 number of publications. This is followed by the year 2017 and 2015 in which 114 and 104 article were published respectively. In the year 2000 there were least number of publications.

Year wise authorship distribution of research productivity

Table 2: Year wise authorship pattern

Years	single	Two	Three	Four	Five	More than five	Total
2000	0	0	1	0	0	0	1
2001	0	1	1	0	0	0	2
2002	0	0	1	0	1	0	2
2003	0	0	3	0	1	0	4
2004	0	5	3	0	1	0	9
2005	1	4	2	3	0	2	12
2006	0	6	4	1	2	0	13
2007	1	10	5	1	1	0	18
2008	1	7	6	5	0	2	21
2009	0	12	9	5	1	2	29
2010	1	19	17	9	0	5	51
2011	3	20	16	12	10	2	63
2012	0	22	16	18	8	6	70
2013	2	24	29	25	9	13	102
2014	5	38	36	32	14	17	152
2015	1	22	26	23	17	15	104
2016	1	19	19	30	11	18	98
2017	1	26	26	23	16	22	114
2018	2	22	21	19	11	15	90
2019	0	26	18	22	13	21	100
2020	0	30	15	19	10	19	93
Total	19	323	274	247	126	159	

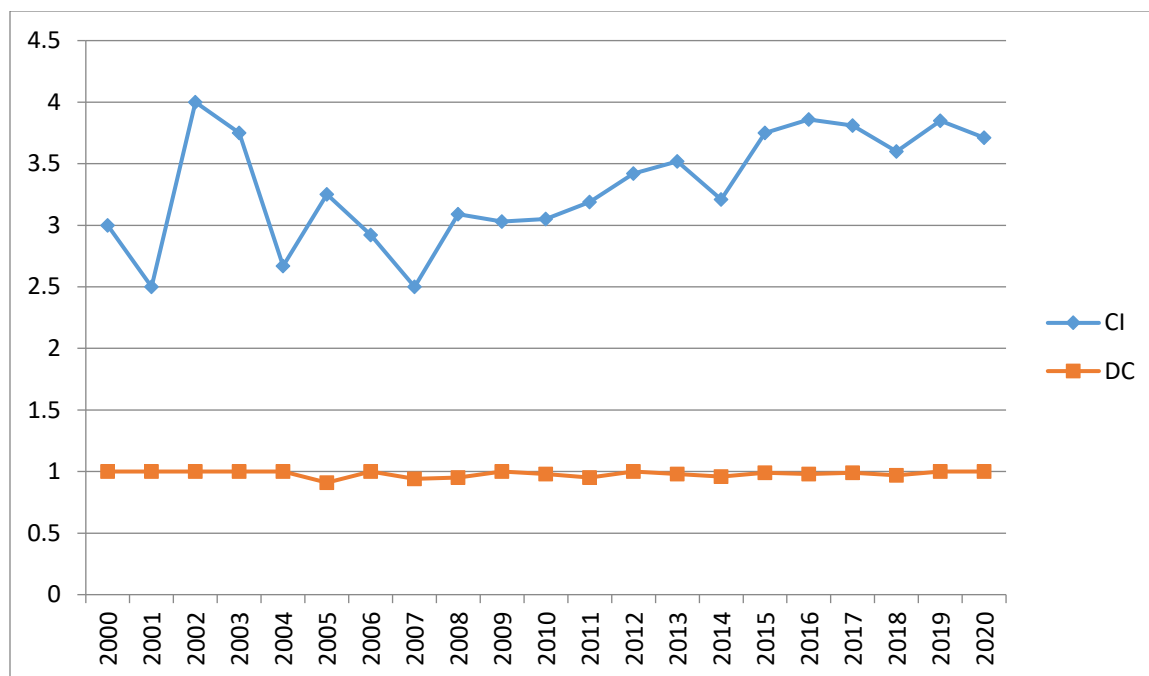
Table 2 indicated that out of total publication 1148, single author produced only 19 research publications while 323 are double authored, 295 are three authored, 247 are four authored, 126 are five authored and 159 publications were produced by more than five authors.

Collaborative Index and Degree of Collaboration

Table 3: Year wise collaborative index and degree of collaboration

Year	CI	DC
2000	3	1
2001	2.5	1
2002	4	1
2003	3.75	1
2004	2.67	1
2005	3.25	0.91
2006	2.92	1
2007	2.5	0.94
2008	3.09	0.95
2009	3.03	1
2010	3.05	0.98
2011	3.19	0.95
2012	3.42	1
2013	3.52	0.98
2014	3.21	0.96
2015	3.75	0.99
2016	3.86	0.98
2017	3.81	0.99
2018	3.6	0.97
2019	3.85	1
2020	3.71	1

The table 3 revealed the degree of collaboration and collaborative index during 2000 to 2020 lies from 0.91 to 1 and 2.5 to 4 respectively. From the observation it is found that the average collaboration index is 6.33. The overall degree of collaboration is 0.98 during the study.



Type of document

Table 4: type of document

Document type	Record count	Percent
Research article	1097	95.56
Review	26	2.26
Conference paper	10	0.87
Letter	1	0.08
Erratum	5	0.43
Book chapter	8	0.69
Short survey	1	0.08

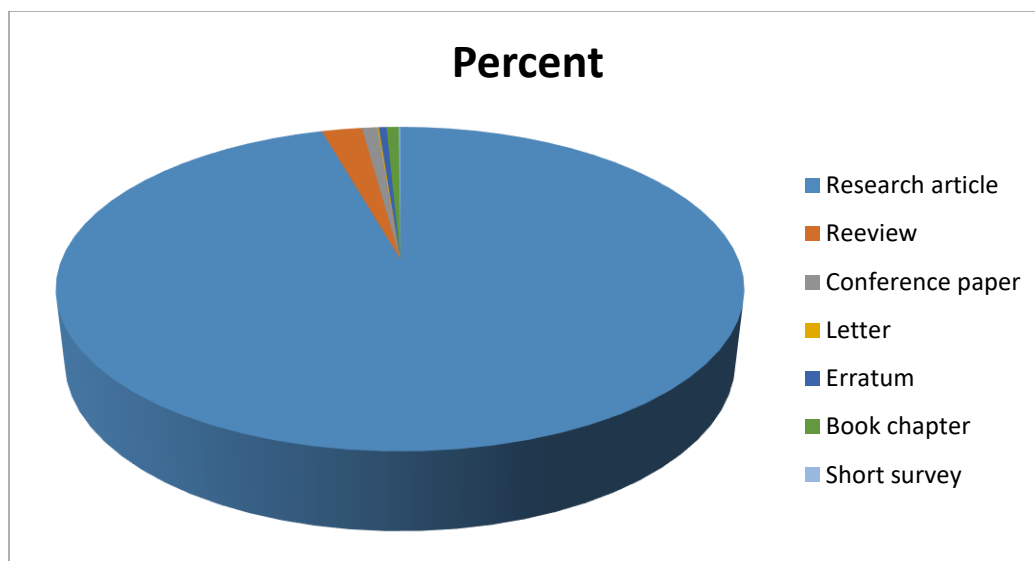


Fig 3: Type of publication

The publication type of Tezpur University during 2000-2020 are listed in Table 3. Out of total 1148 publication 1097(95.46%) are research article, 26(2.26%) are review, 10(0.87%) are conference paper, 1(0.08%) is letter, 5(0.43%) are Erratum, 8(0.69%) are Book Chapter and 1(0.08) is short survey. It is observed that the maximum contribution was research article with 1093(95.46%).

Preferred source for publication

Table 5: Top 10 ranked publication name

Publication name	Articles	Percent
RSC Advances	72	6.27
New Journal Of Chemistry	36	3.13
Chemistryselect	35	3.04
Journal Of Applied Polymer Science	34	2.96
Tetrahedron Letters	30	2.61

Progress in Organic Coatings	27	2.35
Journal Of Food Processing And Preservation	23	2.003
Applied Organometallic Chemistry	22	1.91
Dalton Transactions	21	1.82
Colloids and Surfaces B Biointerfaces	20	1.74

Table 4 depicts the top ten productive journals in which the faculty members and research scholar of chemistry department, Tezpur University prefer to publish their article. According to the table, RSC Advances was one of the most preferred journal with 72(6.72%) number of publications, followed by New Journal of chemistry, Chemistryselect, Journal of applied polymer science, Tetrahedron letters, Progress in organic coatings, Journal of food processing and preservation, Applied organometallic chemistry, Dalton transactions and Colloids and Surfaces B Biointerfaces respectively. The researchers of Tezpur university use to publish their work in a wide range of journals indexed in SCOPUS database.

Most productive authors

Table 6: Top 10 most productive authors

Name of Authors	No. of Publications
Karak, N.	148
Deka, R.C	141
Dolui, S.K	76
Bora, U.	59
Maji, T.K.	55
Phukan, A.K.	53
Thakur, A.J.	51
Sarma, B.	48
Mishra, B.K.	41
Borah, R.	40

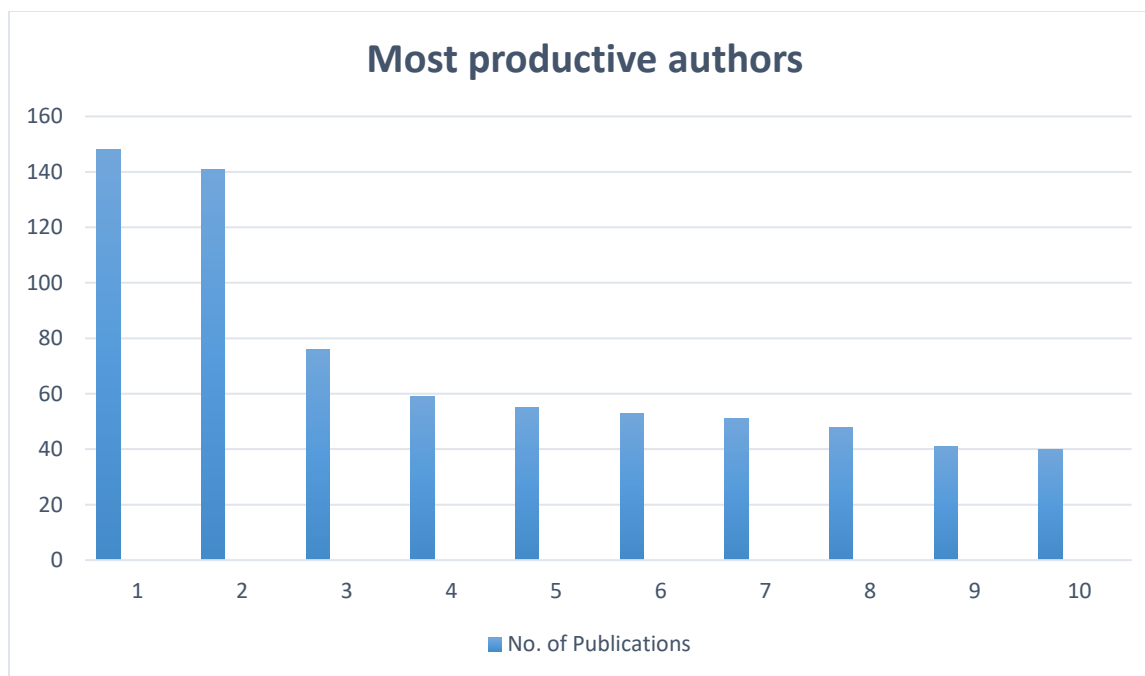


Fig4: Top Ten Productive Authors

Table 5 represents the most productive authors. From the table it is found that Karak, N is on the top with 148 number of publications. Followed by Deka, R.C with 141 publications, Dolui, S.K with 76 publications, Bora, U with 59 publications, Maji, T.K with 55 publications, Phukan, A.K with 53 publications, Thakur, A.J. with 51 publications, Sarma, B with 48 publications, Mishra, B. K. with 41 publications and Borah, R with 40 publications.

Collaborative Institute/ University and colleges

Institute/University and colleges	Papers	% of 1148
Dibrugarh University	51	4.44
Indian Institute of Technology Guwahati	33	2.87
University of Kalyani	23	2.003
Indian Institute of Chemical Technology	21	1.82
Julius- Maxilians Universitat Wurzburg	20	1.74
North-Eastern Hill University	17	1.48
North East Institute of Science and Technology, Jorhat	16	1.39
Gauhati University	15	1.306
Cotton University	13	1.13

Magyar Tudományos Akadémia	4	0.34
North Eastern Regional Institute of Science and Technology	4	0.34
Institute of Coal Chemistry and Material Science of the Siberian Branch of the RAS	4	0.34
National Institute of Technology Meghalaya	4	0.34
Research Centre for Natural Sciences	4	0.34

Table 6 represents top 10 collaborative institutes in which highest number of papers have been collaborated with Dibrugarh University with 51 papers followed by Indian Institute of Technology with 33 papers, University of Kalyani with 23 papers, Indian Institute of Chemical Technology with 21 papers, Julius- Maxilians Universitat Wurzburg with 20 papers, North-Eastern Hill University with 17 papers, North East Institute of Science and Technology, Jorhat with 16 papers, Gauhati University with 15 papers, Cotton University with 13 papers, Magyar Tudományos Akadémia, North Eastern Regional Institute of Science and Technology, Institute of Coal Chemistry and Material Science of the Siberian Branch of the RAS, National Institute of Technology Meghalaya and Research Centre for Natural Sciences with 4 papers.

Findings of the study

- Year wise Distribution: Chemistry department of Tezpur University contributed 1148 publications during 2000-2020 in SCOPUS database. The highest number of publication was in 2014 and the least number of publication was in the year 2000.
- Publication Types: 95.56%(1097) of the publication published in the form of the article
- Authorship Pattern: Single authors produced only 19 publications while joint authorship produced 1129 publications out 1148 publications contributed by Chemistry department, Tezpur University.
- Degree of Collaboration: The degree of collaboration from 2000 to 2020 is 0.98 during the study.
- Most Preferred Source: Journal are the most preferred source for publication and RSc Advances is the most preferred journal with 72 numbers of publication.
- Most Productive authors: The most productive author was Karak, N with 148 publications followed by Deka, R.C with 141 publications.

- Collaborative institute: Chemistry department of Tezpur University has collaborated highest number of papers with Dibrugarh University. 51 papers have been collaborated with Dibrugarh University during 2000 to 2020.

Conclusions

It is found that the publications of Chemistry department, Tezpur university is increasing over the years. Journal article are the main source of publication. The pattern of Authorship indicated that researcher of Chemistry department, Tezpur university is dominated by joint Authorship. It is required to conduct scientometric study periodically to know the current status of university in terms of research output and to know about the weak points in the progress and help the university to attain its goal by producing quality research.

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