

# An Analysis of Research Publications of Central University of Gujarat: A Scientometric View

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## Abstract

*The main objective of this study is to find the authorship patterns and degree of collaboration of Central University of Gujarat with a total number of 301 publications during the period 2010 to 2017 derived from Scopus database. The research method of this study was scientometric analysis method. The main research area of Central University of Gujarat was Chemistry. The most preferred journal for publication was Journal of Molecular Liquids and the most prolific author was Prof. Man Singh. The present study revealed several numbers of scientometric indicators like citation pattern, collaborative institutions, most prolific authors etc.*

**Keywords:** *Scientometrics, Research productivity, Authorship pattern, Scopus, Central University of Gujarat*

## 1. INTRODUCTION

Now, most of the LIS researchers are using scientometrics method to describe the patterns of publications within a given field. Pritchard (1969) stated that "...the use of bibliometrics and scientometrics to evaluate research in any field of knowledge has spread to a wide range of areas of knowledge". Scientifically, in the field of library and information science, the term 'Scientometrics' was coined in the year 1969, by the Russian authors Nalimov and Mulchenko. Scientometric studies are used to provide quantitative analysis of academic literature. Scientometrics research helps in developing policy in science and technology and open the long-term economic and social benefits. It is used to identify the publication pattern, the productivity of author, author's affiliation, year-wise growth, citations.

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## **2. BACKGROUND OF THE STUDY**

The growth of scientometrics studies is partly due to the existence of large bibliographic databases like Web of Science, Scopus and other specialized in different fields of knowledge that facilitate the collection of data. Scientometric analysis is one of those techniques that allows us to know and describe a discipline, through the application of descriptive and inferential for trends, indicators and growth-related literature behaviours statistical evaluation of academic journals, a collaboration of authors, analysis of citations, citation networks of authors.

## **3. ABOUT UNIVERSITY**

The Central University of Gujarat is a central university set up by an Act of Parliament 2009 (No. 25 of 2009). The university currently functioning two campuses in Sector 29 and 30, Gandhinagar, Gujarat. University offers several master level courses and doctoral research programs in various disciplines.

## **4. REVIEW OF LITERATURE**

Review of literature is a text written by someone to reflect the critical points of current knowledge to a topic. This is a staple for research in nearly every academic field. There are so many qualitative and quantitative studies in the scientometric analysis have been accomplished earlier in various disciplines in India.

Koganuramath, Angadi and Kademani (2002) performed a bibliometric study of publications published by the authors of TISS during 1990 to 2000. Agadi, Angadi and Koganuramath (2012) demonstrated a quantitative study on the growth and development on Social Psychology literature of the Asian region from PsycINFO database during 2000 to 2009. Mathew and NK (2014) observed the research patterns of Cochin University of Science and Technology from Web of Science database. V. K. Singh (2015) analysed the impact and research growth of Jawahar Nehru University during 1990 to 2014. Similarly, a study was taken by Hanumappa, Desai, and Dora (2015), on Gujarat University during the period 2004-2013 to find out research patterns. Gautam and Bala (2015) examined the research productivity of Lucknow University in Department of Botany. N. K. Singh (2016) studied chemistry publications and citation impact of Panjab University for the period 2008 to 2015. Khanna, Singh, Tewari, and Saini (2017) summarised the research output of Physics and Astronomy at GNDU, Amritsar during period 2006 to 2015 in Scopus database.

It is observed from the literature review that most of the studies have been done in research output of university-level research in India.

## **5. OBJECTIVES OF THE PRESENT STUDY**

Objectives for the present study as follows:

- To understand the yearly contribution of research in terms of research Papers.

- To recognize most productive authors of Central University of Gujarat.
- To find out the distribution of papers by Type of Documents.
- To identify the most preferred journals by researchers of Central University of Gujarat.
- To know the authorship pattern of Central University of Gujarat.
- To find the degree of collaboration of Central University of Gujarat, etc.

## 6. METHODOLOGY OF THE STUDY

In the present study, the publication data of Central University of Gujarat retrieved and downloaded from the Scopus database covering the study period 2010 to 2017. *Scopus* is an online international multi-disciplinary citation index database hosted by Elsevier covering 53 million records which are designed for providing access to cross-disciplinary research within an academic or scientific discipline.

The database was searched by using the keyword "Central University of Gujarat" in the "Affiliation tag". The search string so created was further limited to publication years "2010 to 2017". After that, analysis of bibliographic data for publication growth, citation quality, publications share by subjects, most productive journals, etc. by exploring the combination of various search tags as available in Scopus database. The final search statement as used for the purpose is given below...

AF-ID ("Central University of Gujarat" 60107668) AND (LIMIT-TO (PUBYEAR, 2017) OR LIMIT-TO (PUBYEAR, 2016) OR LIMIT-TO (PUBYEAR, 2015) OR LIMIT-TO (PUBYEAR, 2014) OR LIMIT-TO (PUBYEAR, 2013) OR LIMIT-TO (PUBYEAR, 2012) OR LIMIT-TO (PUBYEAR, 2011) OR LIMIT-TO (PUBYEAR, 2010))

A total number of 301 articles were retrieved for the period of 2010 to 2017 on 4th February 2018 at 2 pm. All the bibliographic data of the retrieved 301 articles were recorded in a Microsoft Excel spreadsheet.

The study is mainly exploratory in identifying research output and it is also analyzed with suitable statistical tools.

## 7. DATA ANALYSIS

The data regarding research productivity and contribution of researchers of Central University of Gujarat is collected with special reference to Scopus database have been analysed in tables.

### 7.1 Year-wise Contribution of Publications

Table-1 shows year wise growth pattern of publications in Central University of Gujarat during the period of study. The maximum number of documents published in 2016 and 2017 with 73 (24.25 percentage) number of publications and the minimum documents 4 (1.32 percentage) published in the year 2010.

Table 1: Year-wise contribution of Publications

| Year  | No. of Papers | Cumulative No. of Papers | Percentage | Cumulative Percentage |
|-------|---------------|--------------------------|------------|-----------------------|
| 2017  | 73            | 73                       | 24.25      | 24.25                 |
| 2016  | 73            | 146                      | 24.25      | 48.50                 |
| 2015  | 49            | 195                      | 16.28      | 64.78                 |
| 2014  | 40            | 235                      | 13.29      | 78.07                 |
| 2013  | 41            | 276                      | 13.63      | 91.70                 |
| 2012  | 15            | 291                      | 4.98       | 96.68                 |
| 2011  | 6             | 297                      | 1.99       | 98.67                 |
| 2010  | 4             | 301                      | 1.32       | 100                   |
| Total | 301           |                          | 100        |                       |

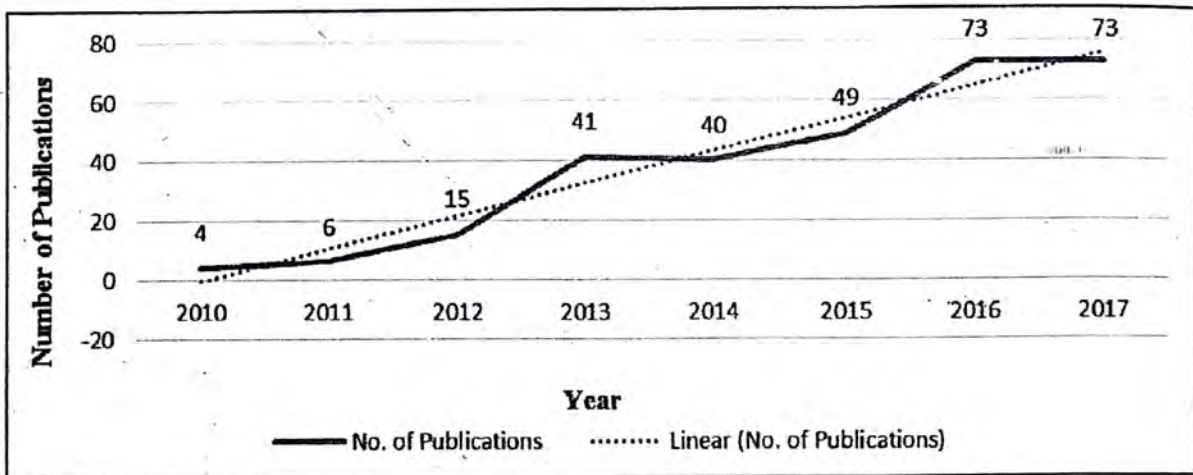


Figure 1: Number of Publications

## 7.2 Authorship Pattern

Table-2 presents the overall analysis of the pattern of authorship. The authors are classified according to their contribution that they have published. The total contribution made by faculties and scholars of Central University of Gujarat comes to 301 documents over the period of study. It could be noted that three authored papers rank first in order sharing 24.25 percent of the total research output. The five & more authored papers follow second in order taking 23.93 percent of the total research contributions. Two authored contributions take the third position in order sharing 21.59 percent of the total research output during the study period. Four authored papers rank next in order reporting 54 contributions that result in 17.94 percent of total research output followed by single authored 12.29 percent publications.

Table 2: Authorship Pattern

| Year  | Authorship Pattern |       |       |       |          | Total |
|-------|--------------------|-------|-------|-------|----------|-------|
|       | 1                  | 2     | 3     | 4     | 5 & more |       |
| 2017  | 7                  | 18    | 19    | 16    | 13       | 73    |
| 2016  | 5                  | 12    | 15    | 15    | 26       | 73    |
| 2015  | 6                  | 16    | 6     | 4     | 17       | 49    |
| 2014  | 8                  | 6     | 12    | 6     | 8        | 40    |
| 2013  | 5                  | 8     | 12    | 12    | 4        | 41    |
| 2012  | 5                  | 3     | 4     | 0     | 3        | 15    |
| 2011  | 0                  | 0     | 5     | 0     | 1        | 6     |
| 2010  | 1                  | 2     | 0     | 1     | 0        | 4     |
| Total | 37                 | 65    | 73    | 54    | 72       | 301   |
| %     | 12.29              | 21.59 | 24.25 | 17.94 | 23.93    | 100   |

### 7.3 Degree of Collaboration (DC)

To determine the collaboration, the formula suggested by Subramanyam (1983) was tested. Table 3 explains the degree of collaboration in research output during the study period. The maximum degree of collaboration 1.0 noted in the year 2011 and the minimum 0.66 in the year 2012.

$$DC = Nm / Nm + Ns$$

Table 3: Degree of Collaboration (DC)

| Year  | Single Authors | Multiple Authors | DC   |
|-------|----------------|------------------|------|
| 2017  | 7              | 66               | 0.90 |
| 2016  | 5              | 68               | 0.93 |
| 2015  | 6              | 43               | 0.87 |
| 2014  | 8              | 32               | 0.80 |
| 2013  | 5              | 36               | 0.87 |
| 2012  | 5              | 10               | 0.66 |
| 2011  | 0              | 6                | 1    |
| 2010  | 1              | 3                | 0.75 |
| Total | 37             | 264              | 0.87 |

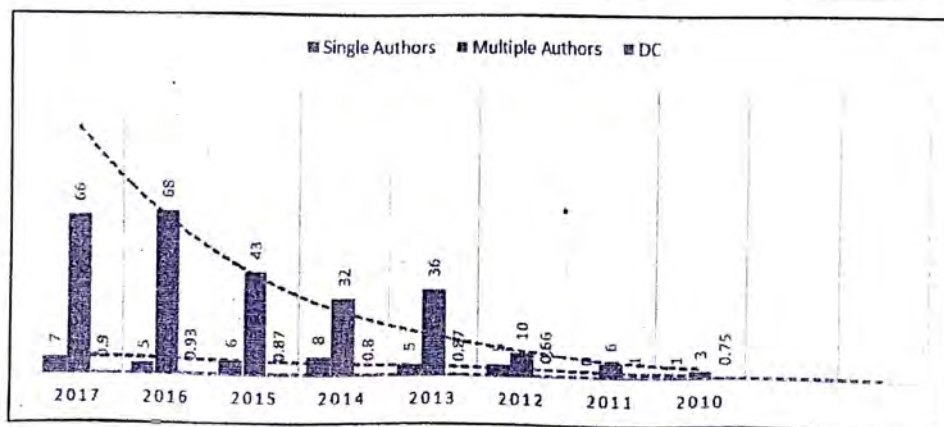


Figure 2: Degree of Collaboration

#### 7.4 Distribution of Publications by Source Type

Table-4 shows publications by source type. Out of 301 documents, 84.05% are published in journals. 8.3% of documents are published in book series. 4.65% is published as conference proceedings where less than 2% are published through trade publications and books which are all indexed in the Scopus database.

Table 4: Distribution of Publications by Source Type

| Sr. No. | Source Type            | No. of Papers | Cumulative no. of Papers | Percentage | Cumulative Percentage |
|---------|------------------------|---------------|--------------------------|------------|-----------------------|
| 1       | Journals               | 253           | 253                      | 84.05      | 84.05                 |
| 2       | Book Series            | 25            | 278                      | 8.30       | 92.35                 |
| 3       | Conference Proceedings | 14            | 292                      | 4.65       | 97.00                 |
| 4       | Books                  | 5             | 297                      | 1.67       | 98.67                 |
| 5       | Trade Publications     | 4             | 301                      | 1.33       | 100                   |
| Total   |                        | 301           |                          | 100        |                       |

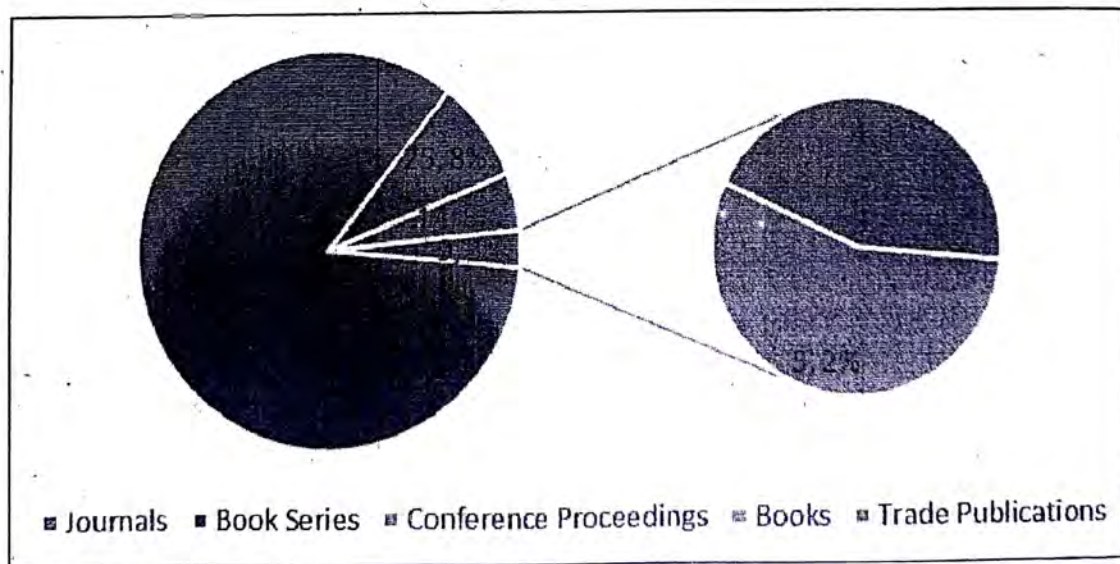


Figure 3: Distribution of Publications by Source Type

#### 7.5 Distribution of Publications by Type of Documents

Table-5 presents the distribution of publications by the type of documents. Out of 301 documents, 217 (72.09 percentage) are articles, 30 (82.06 percentage) reviews, 19 (6.31 percentage) book chapters, 14 (4.66 percentage) conference papers. As well as 5 (1.66 percentage) are books, 3 notes and 1 letter. The maximum documents are articles and minimum are notes and letters.

Table 5: Distribution of Publications by Type of Documents

| Sr. No. | Type of Documents | No. of Papers | Cumulative no. of Papers | Percentage | Cumulative Percentage |
|---------|-------------------|---------------|--------------------------|------------|-----------------------|
| 1       | Article           | 217           | 217                      | 72.09      | 72.09                 |
| 2       | Review            | 30            | 247                      | 9.96       | 82.06                 |
| 3       | Book chapter      | 19            | 266                      | 6.31       | 88.36                 |
| 4       | Conference Paper  | 14            | 280                      | 4.66       | 93.02                 |
| 5       | Editorial         | 6             | 286                      | 1.99       | 95.01                 |
| 6       | Article in Press  | 6             | 292                      | 1.99       | 97.00                 |
| 7       | Book              | 5             | 297                      | 1.66       | 98.66                 |
| 8       | Note              | 3             | 300                      | 1.00       | 99.66                 |
| 9       | Letter            | 1             | 301                      | 0.34       | 100                   |
| Total   |                   | 301           |                          | 100        |                       |

## 7.6 Most Preferred Subject Area

The published documents are reflected in different subjects. Total papers are indexed in 22 subjects. Table 6 presents the results of the Subject-wise Contribution of researchers in Central University of Gujarat. It was seen that Chemistry occupies 35.21 percent of total research output, and it is placed first in order followed by Biochemistry, Genetics and Molecular Biology (22.59 percent), Material Science (20.93 percent), Physics and Astronomy (16.27 percent), Social Sciences (15.28 percent), Chemical Engineering (14.61 percent), Environmental Science (9.63 percent). The remaining departments namely Medicine, Pharmacology, Toxicology and Pharmaceutics, Immunology and Microbiology, Agricultural and Biological Sciences, Economics, Computer Science, Arts and Humanities, Business, management and Accounting, Earth and Planetary Sciences etc. record less than 9 percent. However, the highest number of publications was observed in Chemistry while the lowest number of publications was observed in Psychology which accounts for 0.33 percent.

Table 6: Most Preferred Subject Area

| Sr. No. | The Subject Area of Research                 | No. of Papers (n=301) | Percentage |
|---------|--|-----------------------|------------|
| 1       | Chemistry                                    | 106                   | 35.21      |
| 2       | Biochemistry, Genetics and Molecular Biology | 68                    | 22.59      |
| 3       | Material Science                             | 63                    | 20.93      |
| 4       | Physics and Astronomy                        | 49                    | 16.27      |
| 5       | Social Sciences                              | 46                    | 15.28      |
| 6       | Chemical Engineering                         | 44                    | 14.61      |

| Sr. No. | The Subject Area of Research               | No. of Papers (n=301) | Percentage |
|---------|--|-----------------------|------------|
| 7       | Environmental Science                      | 29                    | 9.63       |
| 8       | Medicine                                   | 26                    | 8.63       |
| 9       | Engineering                                | 19                    | 6.31       |
| 10      | Pharmacology, Toxicology and Pharmaceutics | 19                    | 6.31       |
| 11      | Immunology and Microbiology                | 16                    | 5.31       |
| 12      | Agricultural and Biological Sciences       | 14                    | 4.65       |
| 13      | Economics                                  | 14                    | 4.65       |
| 14      | Computer Science                           | 12                    | 3.98       |
| 15      | Arts and Humanities                        | 10                    | 3.32       |
| 16      | Business, management and Accounting        | 9                     | 2.99       |
| 17      | Energy                                     | 7                     | 2.32       |
| 18      | Multidisciplinary                          | 6                     | 1.99       |
| 19      | Nursing                                    | 5                     | 1.66       |
| 20      | Earth and Planetary Sciences               | 2                     | 0.66       |
| 21      | Mathematics                                | 2                     | 0.66       |
| 22      | Psychology                                 | 1                     | 0.33       |

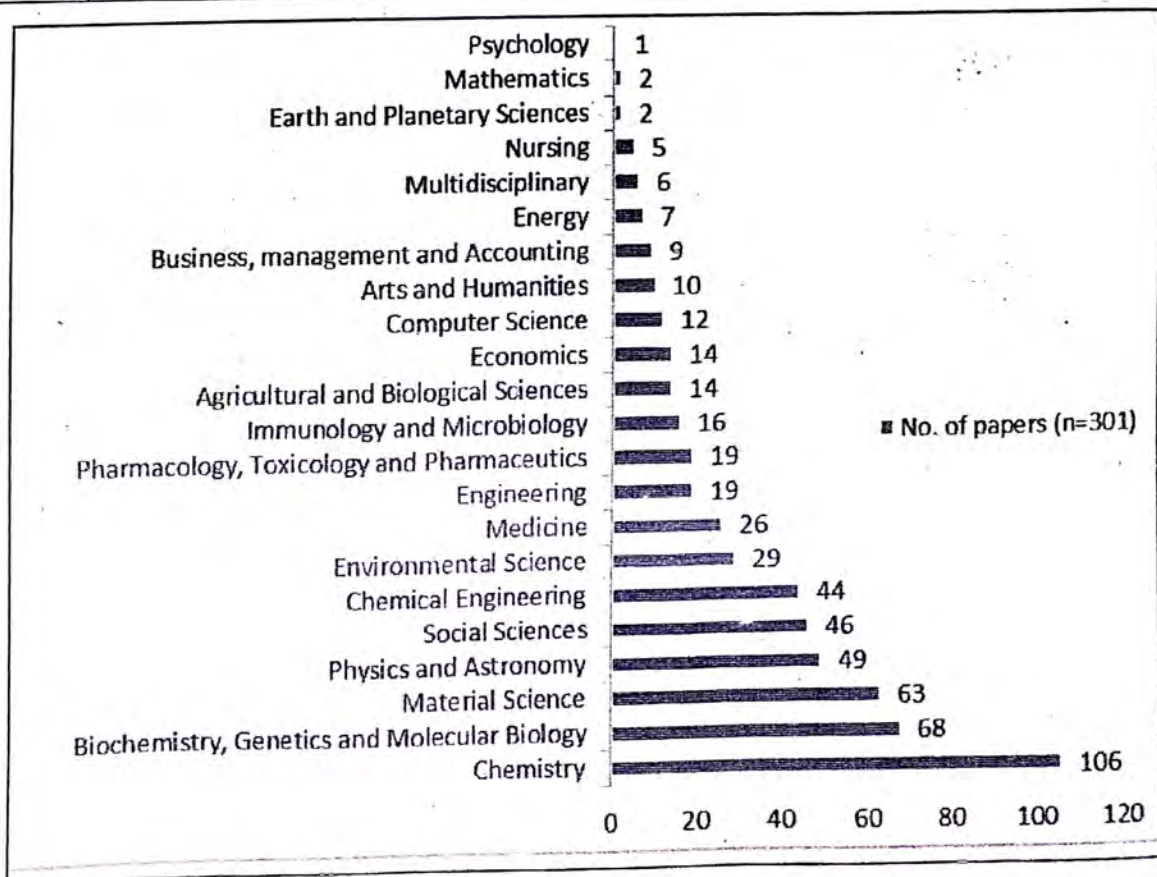


Figure 4: Most Preferred Subject Area



### 7.7 Most Prolific Authors

Table-7 shows the most prolific authors of Central University of Gujarat. This study reveals that Prof. Man Singh, Professor at School of Chemical Science is on the top position with 73 (24.26 percentage) number of documents during the study period which is followed by P. C. Jha and R. K. Kale with 48 (15.95 percentage) and 31 (10.30 percentage) number of documents respectively.

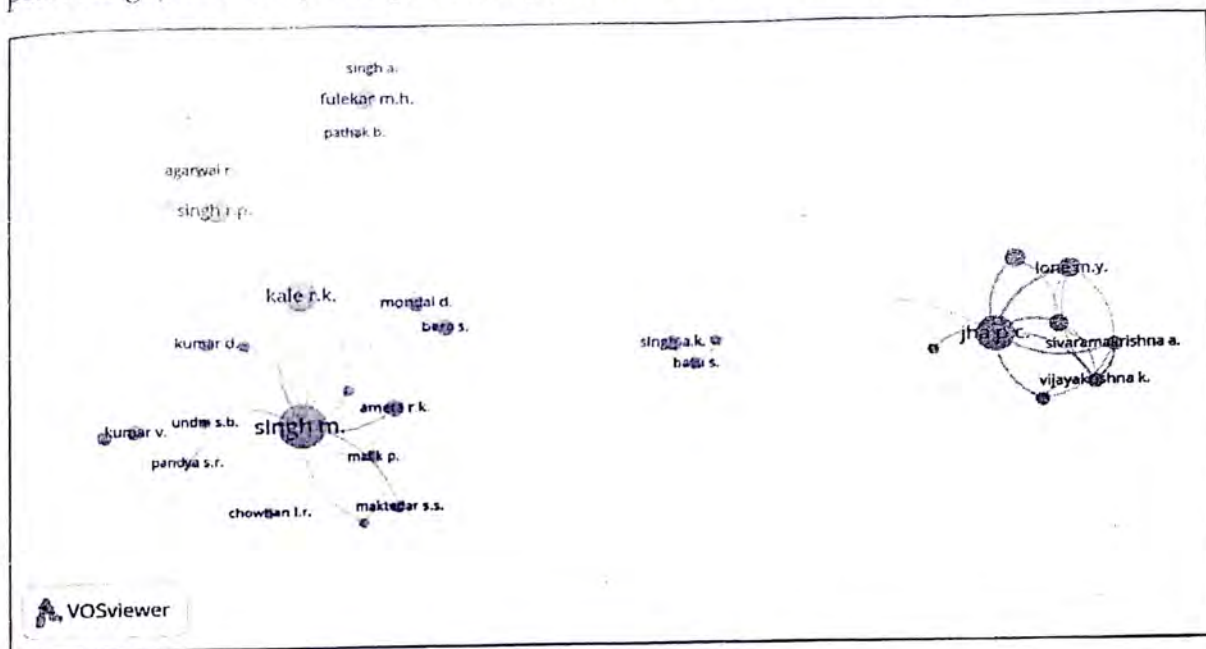


Figure 5: Author's Network Graph

Table 7: Most Prolific Authors

| Name of the Author | Subject               | No. of Papers | Percentage | Rank as per Publication | h-index | Rank as per h-index |
|--------------------|-----------------------|---------------|------------|-------------------------|---------|---------------------|
| Singh, M.          | Chemical Science      | 73            | 24.26      | 1                       | 23      | 4                   |
| Jha, P.C.          | Applied Chemistry     | 48            | 15.95      | 2                       | 12      | 8                   |
| Kale, R.K.         | Chemical Science      | 31            | 10.30      | 3                       | 16      | 6                   |
| Singh, R.P.        | Chemical Science      | 23            | 7.65       | 4                       | 51      | 2                   |
| Fulekar, M.H.      | Environmental Science | 17            | 5.65       | 5                       | 15      | 7                   |
| Lone, M.Y.         | Chemical Science      | 15            | 4.99       | 6                       | 4       | 15                  |
| Ameta, R.K.        | Chemical Science      | 12            | 3.99       | 7                       | 5       | 14                  |
| Bera, S.           | Chemical Science      | 12            | 3.99       | 7                       | 11      | 9                   |

| Name of the Author  | Subject                            | No. of Papers | Percentage | Rank as per Publication | h-index | Rank as per h-index |
|---------------------|------------------------------------|---------------|------------|-------------------------|---------|---------------------|
| Mondal, D.          | Chemical Science                   | 11            | 3.66       | 8                       | 8       | 12                  |
| Khedkar, V.M.       | Pharmaceutical Chemistry           | 11            | 3.66       | 8                       | 10      | 10                  |
| Singh, A.K.         | Immunology and Microbiology        | 9             | 2.99       | 9                       | 9       | 11                  |
| Nambiar, D.         | Pharmaceutical Sciences            | 9             | 2.99       | 9                       | 9       | 11                  |
| Agarwal, R.         | Bacteriology and Mycology          | 9             | 2.99       | 9                       | 79      | 1                   |
| Sinha, K.           | Social Sciences                    | 8             | 2.66       | 10                      | 1       | 18                  |
| Rani, V.            | Biotechnology                      | 8             | 2.66       | 10                      | 12      | 8                   |
| Vijayakrishana, K.  | Chemical Science                   | 8             | 2.66       | 10                      | 12      | 8                   |
| Sivaramakrishna, A. | Chemical Science                   | 8             | 2.66       | 10                      | 16      | 6                   |
| Yadav, U.C.S.       | Biochemistry and Molecular Biology | 8             | 2.66       | 10                      | 20      | 5                   |
| Kumar, D.           | Chemical Science                   | 8             | 2.66       | 10                      | 26      | 3                   |
| Pathak, B.          | Environmental Science              | 7             | 2.33       | 11                      | 2       | 17                  |
| Athar, M.           | Chemical Science                   | 7             | 2.33       | 11                      | 3       | 16                  |
| Malik, P.           | Nano Sciences                      | 7             | 2.33       | 11                      | 5       | 14                  |
| Maktedar, S.S.      | Chemical Science                   | 7             | 2.33       | 11                      | 6       | 13                  |

### 7.8 Most Preferred Journals

In the present study, the journals are ranked based on their published papers on research output. Table 8 shows the data of most preferred journals by authors of Central University of Gujarat. It is found that Journal of Molecular Liquids ranked number one choice, RSC Advances ranked 2nd and Economic and Political Weekly ranked 3rd by the authors respectively.

Table 8: Most Preferred Journals

| Sr. No. | Name of the Journal           | Country        | No. of Papers | Percentage | SJR   | Cite Score | SNIP  |
|---------|-------------------------------|----------------|---------------|------------|-------|------------|-------|
| 1       | Journal of Molecular Liquids  | Netherlands    | 19            | 6.32       | 0.718 | 3.47       | 1.212 |
| 2       | RSC Advances                  | United Kingdom | 10            | 4.66       | 0.875 | 3.06       | 0.743 |
| 3       | Economic and Political Weekly | India          | 10            | 3.33       | 0.295 | 0.19       | 0.847 |
| 4       | AIP Conference Proceedings    | USA            | 5             | 1.67       | 0.163 | 0.21       | 0.236 |
| 5       | New Journal of Chemistry      | United Kingdom | 5             | 1.67       | 0.869 | 3.08       | 0.766 |
| 6       | Nutrition and Cancer          | United States  | 5             | 1.67       | 0.895 | 2.50       | 0.841 |

## 7.9 Most Collaborative Institutions

It is observed from table 9 that, the authors of Central University of Gujarat doing a collaborative research among various Indian Universities and research institutes. In this study, Jawaharlal Nehru University ranked the first position in the collaborative institution by 13.62 percent of the total contribution. Gujarat University and National Chemical Laboratory ranked second & third position among collaborative institutions by 3.98 percent and 3.65 percent respectively.

Table 9: Most Collaborative Institutions

| Sr. No. | Affiliation                                | Country       | No. of Papers | Percentage |
|---------|--|---------------|---------------|------------|
| 1       | Jawaharlal Nehru University                | India         | 41            | 13.62      |
| 2       | Gujarat University                         | India         | 12            | 3.98       |
| 3       | National Chemical Laboratory               | India         | 11            | 3.65       |
| 4       | Vellore Institute of Technology            | India         | 9             | 2.99       |
| 5       | Maharaja Siyajirao University of Baroda    | India         | 8             | 2.65       |
| 6       | University of KawaZulu-Natal               | South Africa  | 8             | 2.65       |
| 7       | University of Delhi                        | India         | 8             | 2.65       |
| 8       | Jaypee Institute of Information Technology | India         | 8             | 2.65       |
| 9       | University of Colorado                     | United States | 7             | 2.32       |
| 10      | Bhavnagar University                       | India         | 5             | 1.66       |

### 7.10 Collaborative Countries

Collaborative research is better than individual research. So, the authors of Central University of Gujarat are associated with other researchers within India and abroad. This study reveals that the authors published 301 papers during 2010 - 2017. Approximately 98.33% of authors belong to India. 7.65% of researchers among them belong to the United States of America and 3.33% belongs to South Africa. It is also found that 6 countries have listed with the single author to their credit.

Table 10: Collaborative Countries

| Sr. No. | Name of Country | No. of Papers | Percentage |
|---------|-----------------|---------------|------------|
| 1       | India           | 296           | 98.33      |
| 2       | United States   | 23            | 7.65       |
| 3       | South Africa    | 10            | 3.33       |
| 4       | Undefined       | 7             | 2.33       |
| 5       | Canada          | 4             | 1.33       |
| 6       | Japan           | 4             | 1.33       |
| 7       | Belgium         | 3             | 0.99       |
| 8       | Saudi Arabia    | 3             | 0.99       |
| 9       | Sweden          | 3             | 0.99       |
| 10      | Australia       | 2             | 0.67       |
| 11      | China           | 2             | 0.67       |
| 12      | Germany         | 2             | 0.67       |
| 13      | Oman            | 2             | 0.67       |
| 14      | Pakistan        | 2             | 0.67       |
| 15      | Qatar           | 2             | 0.67       |
| 16      | South Korea     | 2             | 0.67       |
| 17      | Fiji            | 1             | 0.34       |
| 18      | Hong Kong       | 1             | 0.34       |
| 19      | Italy           | 1             | 0.34       |
| 20      | Nepal           | 1             | 0.34       |
| 21      | Spain           | 1             | 0.34       |
| 22      | United Kingdom  | 1             | 0.34       |

### 7.11 Citation Pattern

It is observed that the publications of university getting cited by researchers. Table 11 explains the citation range of published documents during the study period. It is noted that 116 documents didn't get any citation. The most citations noted by 2 documents in a range of 46 & more and minimum 112 documents in the range of 1 to 5.

Table 11: Citation Pattern

| No. of Citations | No. of Papers | Percentage (%) |
|------------------|---------------|----------------|
| Nil              | 116           | 38.53          |
| 1-5              | 112           | 37.20          |
| 6-10             | 30            | 9.96           |
| 11-15            | 17            | 5.64           |
| 16-20            | 12            | 3.98           |
| 21-25            | 7             | 2.32           |
| 26-30            | 2             | 0.67           |
| 31-35            | 1             | 0.34           |
| 36-40            | 1             | 0.34           |
| 41-45            | 1             | 0.34           |
| 46 & more        | 2             | 0.67           |
| Total            | 301           | 100            |

## 8. FINDINGS

The present study tried to give a comprehensive evaluation of the research output of Central University of Gujarat. Major findings from this study are:

- The primary source of references used for writing research papers are Journals.
- The authorship pattern indicates that increased collaborations with multiple authors.
- There is inequity research output of different disciplines in Central University of Gujarat.
- It is evident from the study that the average degree of collaboration is 0.87 during the period 2010-2017.
- The extreme research area of Central University of Gujarat is Chemistry compare to other disciplines.
- The contributions of multi-authored publications have the highest number of articles that shows collaborative research has been preferred in comparison to individual research.
- The most collaborative institution with Central University of Gujarat is Jawahar Nehru University followed by Gujarat University and National Chemical Laboratory.
- Professor Man Singh, Dean of School of Chemical Sciences ranked top among all authors of Central University of Gujarat.

## 9. CONCLUSION

The growth of publications is purely dependant on the research output, contribution pattern and the research quality. Overview of important findings of the analysis revealed that 301 publications were published during the period of 2010 - 2017. The highest number of publications (73, 24.25 percentage) were published in 2016 and 2017 respectively. This study also explained that the number of publications is gradually increasing from year to year. However, as a central university in a developed state such as Gujarat, the researcher's contribution, collaborative works with other organizations, the rate of growth on publications need to gear up if it must be in the league of top research universities in the country.

## 10. SUGGESTIONS

The study shows authorship pattern, which indicates that for the development of research in the University. The University should increase the research facilities and promote research work especially for social sciences departments. The University should promote open access movements to increase the citations of the research papers. Authorities of University need to work out to find out the appropriate way where they can chase the faculty and research scholars to enhance their research output.

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