

Scholarly Citation Trends in Chemical Engineering Research: Evidence from Doctoral Dissertations in Andhra Pradesh, India

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ABSTRACT

Bibliometric studies serve researchers in Library and Information Science to track academic production, document exchange habits, and evidence source preferences throughout doctorate writing projects. Experts rely on citation statistics as valid markers for defining disciplinary foundations while monitoring student preferences. This report surveys bibliometric trends within chemical engineering dissertations completed at universities across Andhra Pradesh, India, spanning the years from 1942 to 2023. Our review audited 7,981 specific citations found in 52 separate manuscripts to map the characteristics of included evidence. Writing trends verify an ongoing shift toward group projects, given that dual author documents occupy large sections of reference lists. Geopolitical citation spread often proves heavy reliance upon overseas archives, notably those based in American locations, showing their reach, clout, plus utility. Analytical output highlights why paper records retain prominence regarding long duration doctoral research work, regardless of new digital file access. Language surveys identify English dominance during universal scholar communication cycles. Periodical scrutiny notes texts printed between 2002 plus 2010 appeared most frequent. The Journal of Hazardous Materials surfaces as one primary citation choice. Recent reviews clarify journal specific metrics validating why influential, precise, topic concentrated serial publications serve consistently inside post graduate academic thesis projects, confirming major parts regarding scholarly success directions for budding young growing candidates engaged concerning finding valid empirical work for producing thesis reports while evaluating standard findings found during current scholarly output trends regarding these engineering graduate student doctoral level papers within local Indian technical institutions.

KEYWORDS: Bibliometrics, Citation Analysis, Doctoral Theses, Chemical Engineering, Andhra Pradesh.

1. INTRODUCTION

Bibliometric is a robust quantitative framework used to examine academic texts and map trends regarding information sharing. This practice labeled bibliometrics gained prominence after Pritchard (1969) started applying

statistical math models to printed archives. Researchers since updated these processes while exploring volume growth writer habits source linkage plus knowledge spread throughout diverse field silos (Price, 1963).

Among various options citation study stands out as a top tool for measuring intellectual weight plus connections. Experts use this review process to scan specific document references while judging author reach plus journal impact (Garfield, 1972). Aggregating findings helps define influential journals high caliber papers and lead researchers to clarify internal research dynamics within specialized groups.

Growth in information technology helped scale current analytic power for these bibliometric pursuits. Today databases web portals index services plus modern software allow broader precise massive scans of printed research collections. Technological gains reshaped methods for reading source materials fostering greater global reach while improving teamwork on collaborative projects.

Doing a careful look at historical data remains vital to achieve academic truth plus rigor within university work. Serious students formulate original thoughts only when honestly looking at current theories finding neglected areas then creating arguments built atop known past truths. Ethical scholarly practice requires proper acknowledgment of earlier studies through citations, which reflect the intellectual indebtedness of current research to prior contributions (Cronin, 1984).

Doctoral students cite a wide range of information sources in their theses, including books, journals, conference proceedings, and reports. By analyzing these citations, researchers can learn a lot about how they seek information and what resources they prefer. Such studies are particularly useful for library collection development and management, as they help librarians identify core resources, optimize acquisition policies, and make informed decisions regarding subscription renewals and cancellations. Citation analysis also supports the efficient weeding and rationalization of library collections in a time of rising journal prices and limited budgets (Line, 1977).

Thus, citation analysis, as a key subfield of bibliometrics, plays a crucial role in evaluating research trends, supporting library decision-making, and enhancing the overall effectiveness of scholarly communication systems.

2. REVIEW OF LITERATURE

Numerous bibliometric studies exist pertaining to doctoral dissertations on a wide a wide range of topics, none of which are dealing with citation aspects. In addition, there are citation analysis studies on Ph.D. theses on a plethora of topics. Since the present study examines the Chemical engineering Ph.D.'s citation analysis theses, those have been examined by the authors. Previous studies on citation analysis of Ph.D. theses in Chemical engineering only. A few recent studies include reviewed here and a few others are listed in the reference. Reviews are given in reverse chronological order.

Fatemeh and Abdollahzadeh (2025) "This study analysed citation practices in 40 graduate theses, revealing novel citation forms, dual roles, and differences between MA and Ph.D. theses by L1 and L2 writers, with implications for thesis writing instruction and policy translation".

Khawairakpam and Phuritsabam (2024) The dissertation analyses citation patterns in 26 Political Science PhD theses from Manipur University (2000-2007), focusing on authorship, journal ranking, country distribution, and publisher citations, revealing a strong reliance on books and significant use of Indian literature.

Grossman & Aldous (2024) “This study examines 20 clinically-based PhDs by publication from the University of KwaZulu-Natal, South Africa, analysing thesis characteristics, publication outcomes, and diversity, revealing unique outputs that deviate from literature-quoted norms and institutional requirements”.

Schlembach (2023) “A bibliometric analysis was conducted over the bibliographies of chemistry and physics doctoral dissertations between 1970 and 2020 to ascertain what types of documents are cited, average ages of cited references and overall changes of dissertation references that have occurred with the advent of electronic resources as mentioned in this paper”.

Aslan (2022) In this article , “the contributions of the doctoral dissertations completed in the disciplines of economy, law, psychology, political science, and international relations to the literature and practice through the citations to the articles extracted from these studies using bibliometric analysis were analysed”.

Bangani & Moll (2021) The authors employed bibliometrics methods to analyse the scattering of 596 journals cited in legal master's theses and doctoral dissertations in three South African law schools from 2014 to 2018.

Paul Donner(2021) In this article,” the suitability of citation data from Scopus and Google Books is studied and found to be sufficient to obtain quantitative estimates of early career researchers' performance at departmental level in terms of scientific recognition and use of their dissertations as reflected in citations”.

Barkha Kanchan (2020). A total of 50 Ph.D. theses in Environmental Science awarded from 2001 to 2016 were analysed, which contain 13,231 bibliographic references. Single authorship pattern was identified as the popular pattern among the authors, as the citations given in the theses.

Tyagi & Krishna Kumar(2019) In this article “ the authorship pattern in political science theses reveals that 79.6% of citations were the papers written by single authors, which implies that political sciences are less collaborative as compared to sciences and technology”.

Mondal & Bijan Kumar Roy (2018) In this paper, “a bibliometric study based on 4993 citations from 53 PhD theses under four sub-subjects of economics viz. Indian Economics, Rural Economics, Economic Developing and International Economics is presented”.

3. METHODOLOGY

The present study is based on an analysis of 52 doctoral theses in Chemical Engineering awarded by universities in Andhra Pradesh during the period 1942–2023. These theses collectively contained 7,981 citations, which formed the primary dataset for the investigation. Data were collected from multiple components of each thesis, including the title pages, chapter-wise reference lists, and consolidated bibliographies provided at the end of the theses.

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Access to a limited number of theses was obtained directly from **university libraries** after securing the necessary permissions. To ensure completeness and accuracy of data, additional thesis information was retrieved from **ShodhGanga**, the national digital repository maintained by **INFLIBNET Centre**. Supplementary tools such as **SCImago Journal Rank (SJR)** and **Country Rank** were used to identify the country of publication of cited journals. **WorldCat** was employed to verify the bibliographic details of cited documents and to determine their country of origin, while **Google Scholar** was used to confirm document types, authorship patterns, and the presence of collaborative authorship.

All references cited in each thesis were examined manually and systematically recorded in separate data sheets. After that, the collected data were categorized, tabulated, and grouped in accordance with the study's goals. These categories included the type of document, the pattern of authorship, the country of origin, the language, and the chronological distribution. Subsequently, the data were subjected to quantitative analysis using appropriate bibliometric techniques. It was observed that a small number of cited references could not be fully identified due to inconsistencies and incomplete bibliographic details provided in the theses. Despite this limitation, the dataset was considered sufficiently comprehensive for meaningful analysis.

4. OBJECTIVES OF THE STUDY

The present study is undertaken with the following specific objectives:

1. To identify and analyse the various **sources of citations** used in the selected doctoral theses.
2. To examine the **authorship pattern** of the cited literature in order to understand the extent of research collaboration.
3. To determine the **country-wise distribution** of the cited documents.
4. To study the **format-wise distribution** of citations, such as journals, books, conference proceedings, and other document types.
5. To analyse the **language-wise distribution** of the cited literature.
6. To explore the **chronological distribution** of citations in order to identify the periods most frequently cited.
7. To identify the **most frequently cited and top-ranked journals** referenced in the doctoral theses.

5. ANALYSIS OF DATA

5.1. University wise Distribution of Theses

Table 1: Illustrates the university-wise distribution of doctoral theses.

S. No	University	Theses	%
1	SVU	16	30.76
2	JNTUA	25	48.07
3	JNTUK	11	21.15
Total		52	100

Table 1 shows the university-wise distribution of doctoral theses. JNTUA contributes the highest number of theses (25), followed by SVU (16) and JNTUK (11). This indicates that JNTUA has the major share in doctoral research output among the selected universities.

5.2 University wise Distribution of Citations

Table 2: Illustrates the university-wise distribution of Citations

S. No	University	Citations	%
1	SVU	1965	24.62
2	JNTUA	4955	62.08
3	JNTUK	1061	13.29
Total		7981	100

Table 2 shows JNTUA accounts for the highest number of citations with 4,955 citations, representing 62.08 percent of the total citations. SVU follows with 1,965 citations (24.62 percent), while JNTUK contributes 1,061 citations, accounting for 13.29 percent. The results clearly show that JNTUA has the highest citation intensity, reflecting a greater volume of referenced literature in its doctoral theses.

5.3. Source-wise Distribution of Citations

Table 3: Source wise Distribution of Citations

S. No	Source	Svu	Jntua	Jntuk	Total	(%)	Cumulative Citations
1	Journal Articles	1650	4339	983	6972	87.35	6972
2	Book& Book Chapter	136	317	34	487	6.1	7459
3	Conference Proceedings	49	59	20	128	1.6	7587
4	Websites	0	50	4	54	1.46	7704
5	Doctoral Theses	27	9	6	42	0.73	7763
6	Reports	6	48	5	59	0.68	7818
7	Patents	77	40	0	117	0.67	7872
8	Reviews	8	47	0	55	0.52	7914
9	Symposium	10	10	1	21	0.26	7935
10	Workshops	0	6	2	8	0.1	7943
11	Case study	0	3	2	5	0.1	7951
12	Magazines	0	8	0	8	0.1	7959
13	Lectures	0	2	0	2	0.07	7965
14	Occasional Papers	0	6	0	6	0.06	7970
15	Test	2	0	3	5	0.06	7975
16	News	0	4	0	4	0.05	7979
17	Standards	0	7	1	8	0.02	7981
	Total	1965	4955	1061	7981	100	

Table 3 represents the source-wise distribution of citations clearly highlights the dominance of journal articles as the primary source of references. Journal articles account for 6,972 citations (87.35%), forming a significantly taller bar than all other categories, which indicates a strong reliance on peer-reviewed scholarly literature. The second highest bar corresponds to books and book chapters with 487 citations (6.1%), reflecting their supportive but secondary role

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in academic referencing. Conference proceedings occupy the third position with 128 citations (1.6%), showing limited usage compared to journals and books.

5.4. Authorship Pattern

Table 4: Authorship-wise Distribution of Citations

S. No	Authorship	Citation	% Share	Cumulative Number
1	One	948	11.87	948
2	Two	1897	23.76	2845
3	Three	1872	23.45	4717
4	Four	1460	18.29	6177
5	Five	847	10.61	7024
6	Six	491	6.15	7515
7	Seven	170	2.13	7685
8	Eight	146	1.82	7831
9	Nine	55	0.68	7886
10	Ten	24	0.3	7910
11	Eleven	23	0.28	7933
12	Twelve	8	0.1	7941
13	Fourteen	1	0.01	7942
14	Unknown	39	0.48	7981
		7981	100	

Table 4 shows two-author (23.76%) and three-author (23.45%) publications contribute the highest number of citations, indicating strong collaborative research practices. This is followed by four-author publications (18.29%) and single-author contributions (11.87%). Citations gradually decline as the number of author's increases beyond six, with publications involving ten or more authors contributing only a negligible share. The pattern highlights a clear preference for small to medium-sized research collaborations in the cited literature.

5.5. Country wise distribution of Citations

Table 5: List the Country wise distribution of Citations

S. No	Country	No of Citations	% Of Citations	Cumulation
1	Argentina	2	0.02	2
2	Australia	15	0.18	17
3	Austria	5	0.06	22
4	Bangladesh	1	0.01	23
5	Belgium	6	0.07	29
6	Brazil	19	0.23	48
7	Bulgaria	34	0.42	82
8	Canada	40	0.5	122

9	Chile	8	0.1	130
10	China	92	1.15	222
11	Colombia	1	0.01	223
12	Croatia	12	0.15	235
13	Cyprus	2	0.02	237
14	Czech Republic	2	0.02	239
15	Denmark	4	0.05	243
16	Egypt	9	0.11	252
17	Ethiopia	2	0.02	254
18	Finland	3	0.03	257
19	France	18	0.22	275
20	Germany	467	5.85	742
21	Greece	10	0.12	752
22	Hong Kong	3	0.03	755
23	Hungary	24	0.3	779
24	India	551	6.9	1330
25	Indonesia	4	0.05	1334
26	Iran	22	0.27	1356
27	Iraq	3	0.03	1359
28	Ireland	6	0.07	1365
29	Israel	4	0.05	1369
30	Italy	14	0.17	1383
31	Jamaica	1	0.01	1384
32	Japan	91	1.14	1475
33	Jordon	1	0.01	1476
34	Kazakhstan	1	0.01	1477
35	Kenya	9	0.11	1486
36	Korea	1	0.01	1487
37	Kuwait	1	0.01	1488
38	Luxembourg	1	0.01	1489
39	Macedonia	1	0.01	1490
40	Malaysia	25	0.31	1515
41	Morocco	7	0.08	1522
42	Namibia	1	0.01	1523
43	Nepal	2	0.02	1525
44	Netherlands	1946	24.38	3471
45	Newzeland	8	0.1	3479
46	Nigeria	12	0.15	3491

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47	Oman	1	0.01	3492
48	Pakistan	42	0.52	3534
49	papua new Guinea	1	0.01	3535
50	Philippines	4	0.05	3539
51	Poland	14	0.17	3553
52	Romania	21	0.26	3574
53	Russia	20	0.25	3594
54	Saudi Arabia	4	0.05	3598
55	Serbia	9	0.11	3607
56	Singapore	18	0.22	3625
57	Slovakia	5	0.06	3630
58	South Africa	24	0.3	3654
59	South Korea	45	0.56	3699
60	Spain	2	0.02	3701
61	Sri Lanka	1	0.01	3702
62	Sweden	9	0.11	3711
63	Switzerland	187	2.34	3898
64	Taiwan	24	0.3	3922
65	Thailand	13	0.16	3935
66	Turkey	16	0.2	3951
67	UAE	30	0.37	3981
68	UK	1951	24.44	5932
69	Ukraine	3	0.03	5935
70	USA	1997	25.02	7932
71	Unspecified	49	0.61	7981
		7981	100	

Table 5 shows the publications originating from seventy-one countries. Among these, the United States contributes the highest share, accounting for over 25% of the total publications. The United Kingdom follows closely with approximately 24.22%, while the Netherlands contributes 24.38%. In contrast, publications from the remaining countries individually account for a comparatively smaller proportion of the total output.

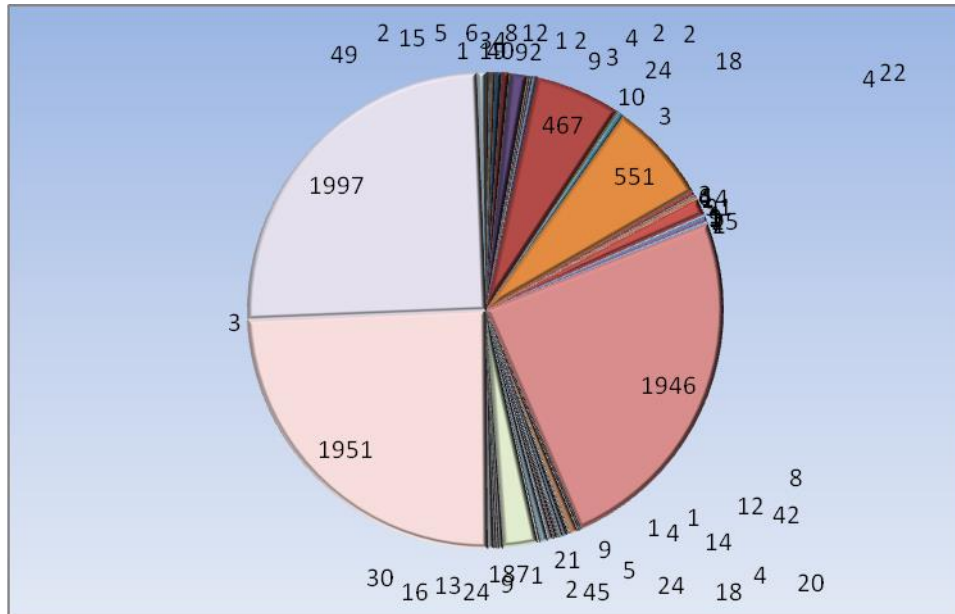


Figure : shows the publications originating from seventy-one countries are represented.

5.6. Format of the Citations

Table 6: Shows that Format or type of citations

S. No	Format	Citations	%
1	Print	6342	79.46
2	Online	1639	20.54
Total		7981	100

Table 6 indicates the distribution of citations by publication format indicates a clear predominance of **print sources**. Of the total **7,981 citations**, **print publications account for 6,342 citations (79.46%)**, while **online publications contribute 1,639 citations (20.54%)**. This shows that print sources remain the primary medium of scholarly communication in the dataset, with online sources representing a substantially smaller share.

5.7. Language wise Distribution of citations

Table 7: Language wise Distribution of citations of doctoral Thesis

S. No	Language	Citations	%	Cumulation
1	Arrabbi	4	0.05	4
2	Chinese	16	0.2	20
3	English	7922	99.26	7942
4	French	1	0.01	7943
5	German	11	0.13	7954
6	Japanese	27	0.33	7981
		7981	100	

Table 7 shows the analysis of citations by language reveals a **clear dominance of English-language publications**. Out of the total **7,981 citations**, **English accounts for 7,922 citations (99.26%)**, indicating that scholarly communication in the field is overwhelmingly conducted in English. Publications in **Japanese (0.33%)**, **Chinese**

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(0.20%), and German (0.13%) contribute only marginally, while Arabic (0.05%) and French (0.01%) together represent a negligible share. Overall, citations in languages other than English constitute **less than 1%** of the total, underscoring the central role of English

5.8. Decade wise Distribution of Citations

The period of citations was grouped into groups of ten years. Table 8 shows that publications during the period 2001-2010 are cited more (38.91%). Those publications in the period from 2011- 2020 cited are (30.67%). Thus, it is seen that more than sixty eight percent of the citations are from 2001-2020.

Table 8: Shows Decade wise Distribution of Citations of doctoral thesis

S. No	Decade	Citations	%	Cumulation
1	Prior-1900	28	0.35	28
2	1901-1910	14	0.17	42
3	1911-1920	22	0.27	64
4	1921-1930	19	0.23	83
5	1931-1940	15	0.18	98
6	1941-1950	35	0.43	133
7	1951-1960	101	1.26	234
8	1961-1970	150	1.87	384
9	1971-1980	317	3.97	701
10	1981-1990	559	7	1260
11	1991-2000	1082	13.55	2342
12	2001-2010	3106	38.91	5448
13	2011-2020	2448	30.67	7896
14	2021-2022	73	0.91	7969
15	Nodate	12	0.15	7981
		7981	100	

5.9. Top Twenty Ranked Journal cited

Table 9: Shows Top Twenty Ranked Journal cited in various doctoral thesis

S. No	Journal Name	Citations	Rank	% Citations
1	Journal of Hazardous Materials	295	1	3.69
2	Journal of Membrane Science	204	2	2.55
3	Bioresource Technology	188	3	2.35
4	The Chemical Engineering Journal	172	4	2.15
5	Chemical Engineering science	133	5	1.66
6	Desalination	94	6	1.17
7	Process of Biochemistry	82	7	1.02
8	Water Research	78	8	0.97
9	Separation and Purification Technology	71	9	0.88

10	Powder Technology	57	10	0.71
11	Journal of colloid and interface science	54	11	0.67
12	Journal of Chromatography	49	12	0.61
13	Industrial and Engineering Chemistry Research	46	13	0.57
14	Journal of Applied Polymer Science	45	14	0.56
15	Indian Engineering Chemical Research	43	15	0.53
16	AICHE Journal	40	16	0.5
17	Journal of Chemosphere	40	17	0.5
18	RSC Advances	36	18	0.45
19	Polymer	35	19	0.43
20	Environmental Science and Technology	34	20	0.42

6. FINDINGS

Major findings of the study are:

- 1) Majority of the documents used by the Chemical Engineering Researchers are Journal Articles (87.35%)
- 2) Double Authorship is predominant (23.76%) in the citations than collaborative authorship
- 3) More than 1/4th of the publications used by them are of USA and second place for UK and third place for Netherlands.
- 4) Majority share (79.46%) of the citations are print Documents
- 5) Citations in 6 languages are found among which almost cent percent of them are in English language.
- 6) Researchers mostly cite documents published during the period of 2001-2010
- 7) The Journal “Journal of Hazardous Materials” Publishing from Netherlands is cited more.

CONCLUSION

The citation patterns of Chemical Engineering researchers are comprehensively examined in this study. The findings demonstrate the significance of peer-reviewed journals as the primary source of scholarly communication in the field by clearly demonstrating a strong preference for journal articles, which account for the majority of cited documents. Double authorship is a sign of a moderate level of research collaboration, suggesting that researchers frequently engage in focused, limited cooperative efforts rather than vast networks of collaborators. Geographically, the citation pattern demonstrates a significant reliance on publications published in the United States, followed by those published in the United Kingdom and the Netherlands. This suggests that these nations have a significant impact on the advancement of research in Chemical Engineering. Despite the increasing availability of digital resources, print documents continue to dominate citations, emphasizing their sustained relevance in academic research. The overwhelming dominance of English as the primary language for scientific communication in Chemical Engineering is demonstrated by language analysis. Temporally, the concentration of citations from the 2001–2010 periods suggests that researchers rely heavily on literature produced during a phase of substantial research development in the field. In addition, the Journal of Hazardous Materials, which is published in the Netherlands, is frequently cited, demonstrating its authority and prominence among researchers in Chemical Engineering.

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