



A Study of Indian Theses on Applied Bibliometrics, Informetrics, Scientometrics and Citation analysis

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Metric studies of scientific literature like bibliometrics and scientometrics are popular among the researchers in library and information science. The authors of this paper identified the theses in these subject fields which had used the principles of metric studies in India. Majority of theses was found from the Indian database of theses known as Shodhganga and rest from various credible sources. The authors also describe the challenges they faced while accessing data from Shodhganga and suggest possible solutions. 604 theses on the metric studies were identified and analysed for their metadata. Metric studies are showing generally an upward trend among the recent years, especially in the last decade. Tamil Nadu, southern most Indian state was found to be the most productive among the theses on metric studies. Universities from the same state seem to compete among themselves producing theses. Most productive research supervisors who guided the research theses were also identified. Different types of metric studies are also evaluated and their relationships are also explained.

Keywords: LIS Research; Research in LIS; PhD Theses; Research in Scientometrics; Bibliometrics; Citation Analysis; BISCA; India-LIS Research Trends

Introduction

Scientific research and development is the cornerstone for progress of humanity. A lot of academic research is happening in all disciplines spanning among sciences, social sciences, humanities, technology and medicine.

Measurement of the scientific research is essential:

- To assess the significance and efficacy of research initiatives
- To assess the accountability and transparency of research processes
- To allocate resources required for research
- To benchmark and compare the effectiveness of individuals and institutions involved in research
- To identify areas for improvement, cooperation and knowledge-sharing as well as best practices
- To formulate policy and support decision-making by the authorities like governments and regulatory organisations

Thus measurement of research helps to promote a culture of constant improvement in researchers and their activities. It is crucial for assessing impact,

encouraging accountability and openness, directing resource allocation decisions, benchmarking and comparison, informing policy formation, and encouraging continual improvement. It is an essential instrument for ensuring the efficacy and relevance of research efforts for academics, institutions, funding agencies, and policymakers.

Scientometric studies is one of the prominent method for measuring scientific research. Generally considered to be a part of library and information science (LIS), scientometrics measures and analyses the scholarly literature produced by the researchers. This paper analyses the growth of the discipline of scientometrics itself by identifying the theses submitted to Indian universities. Bibliometrics, informetrics and scientometrics are terms which are used closely related to each other to describe the studies in measuring the scholarly literature. Citation analysis is also closely related to these fields of studies while studying the quantitative aspects of academic writings. To avoid the confusions and the repetitions in using these words the acronym BISCA (bibliometrics/informetrics/

scientometrics/citation analysis) is used throughout this study unless and otherwise explicitly mentioned.

Review of literature

Researchers have tried to identify the trends in the topics at PhD level in LIS as a whole in India and they have pointed out the significance of research in BISCA. Chatterjee et al. (1995)¹ have identified users/use studies (n=number of theses=37) and academic libraries (n=29) are the two most popular areas of research among Indian researchers. Bibliometrics/citation studies (n=15) was the next most sought after area among 212 theses they analysed. Analysing 293 Indian LIS theses, Kumar (1998)² identified 11 bibliometric studies, two scientometric studies and seven citation analysis. In 1998 itself, Satija³ has stated that the popular areas of research in LIS was university libraries, bibliometrics, library use and user studies etc. Another study (Kannappanavar & Vijayakumar, 2000)⁴ spanning fifty years of research in LIS from 1950 to 1999 identified 346 theses during the period. It was revealed that the research areas like planning and management constitutes 19.65% (n=68) theses, user studies and bibliometric study follows with 10.40% (n=36), 9.53% (n=33) of studies.

Kumbar and Raju (2008)⁵ studied research productivity in LIS during 1957-2006 and they found 590 PhD theses were produced in India since 1957. They identified areas like bibliometrics/scientometrics/informetrics analysis were one of the favourite subjects of PhD research among professionals. Mestri (2008)⁶ analysed 219 PhD theses in LIS submitted in 45 Indian universities from 2001-2007 and found 15 theses on bibliometrics were awarded PhD. In two papers presented at Asia-Pacific Conference on Library and Information Education and Practice (A-LIEP), 2009 held in Japan, more than 800 theses were reported to have submitted in Indian universities in LIS till 2007. Chandrashekara and Ramasesh (2009)⁷ have established that bibliometrics/scientometrics/informetrics is the most popular subject among LIS researchers. Out of 802 theses identified by them, 85 (10.60%) were on these topics. Another paper presented by Shivalingaiah et al. (2009)⁸ in the same conference analysed 851 LIS doctoral theses submitted from 1980 to 2007 and found 41 bibliometric and 21 citation studies among them.

Rana (2011)⁹ has analysed the research trends in LIS in India by obtaining a list of theses submitted in

Indian universities from 1957 to 2009. She collected the details of 623 theses in the subject and identified 32 theses in bibliometrics and 9 on citation analysis during the period which together constituted 6.58% of the theses submitted till then. Singh and Babbar (2014)¹⁰ analysed 1754 LIS theses awarded by 81 Indian universities and found that bibliometrics/scientometrics/webometrics studies taken together to be the most popular area of research with 9.75 % (n=171). In 2015, Maity and Hatua¹¹ have analysed 1058 theses in LIS and found 108 theses in library management and administration. Analysing 177 doctoral degrees awarded in LIS during 2010-2014, Pandita and Singh (2017)¹² found that metric studies including bibliometrics, scientometrics, citation studies, research output etc. is one of the main subject areas of doctoral study. In his thesis on bibliometric study of electronic theses in LIS on Shodhganga repository, Vyas (2017)¹³ has studied about 108 theses submitted till 10th March 2014. Among these 108 theses, only 10 (bibliometrics – 4, scientometrics - 4 citation analysis – 2), i.e. less than ten percent of total theses, were from the fields of BISCA. Within ten years from 2014 to 2024, the number of theses in the subdomains of LIS like BISCA has increased to 530. This does not mean all these studies were done during the years from 2014 to 2024; reasons like the delays in conversion from printed format to digital form and uploading of theses may be attributed for the increase in numbers now. In her paper analysing 548 LIS theses available on Shodhganga, Gogoi (2018)¹⁴ found that theses on bibliometrics/scientometrics/webometrics constitutes 17.15% of studies (n=94) and citation analysis 3.10% (n=17).

Objectives of the study

The objectives of this study is to examine the PhD theses awarded in the discipline of BISCA by the Indian universities, to determine the following:

1. To discover the trends in PhD research using BISCA in India
2. To find out the most productive research supervisors, universities and states in India in PhD level research on BISCA and,
3. To find out the distribution of various types of studies in theses using BISCA.

Scope of the study

The study included only those doctoral studies which apply various methods of metric studies for

analysing the productivity of institutions or growth of disciplines which were obtained from credible sources like Shodhganga. Other sources are explained in the “methodology” section. Although one can find a few theses on these subjects in non-English languages, only those theses in English were selected for this study.

The following types of BISCA were included in the study, based on the entities on which the research has been carried out.

1. Study of discipline/disciplines limited by region/institutions/period/journal/database,
2. Study of journal/ journals limited by period,
3. Study of institution/institutions which may be in same discipline/type/regional area/country/funding type/ etc. limited by period/journal/discipline(s)/database,
4. Study of doctoral theses/dissertations submitted to a higher education institution (HEI) limited by discipline or departments/period,
5. Study of person/s (personal scientometric portrait), and
6. Study of proceedings of conferences or seminars.

Shodhganga contains ten pure webometric studies which are based on the websites or webpages of institutions. As they are not dealing with scholarly resources they were not included in the present study. Two webometric studies which are also bibliometric studies of open access journals are included in the study. Two altmetric studies are available on Shodhganga which were also not included because of their heterogeneity.

Theses on theoretical research within these disciplines, i.e., development of new theories or methods of BISCA were not included in this study.

For example, theses with following titles and like were excluded:

- *Towards a Composite Bibliometric Indicator for Ranking journals using JCR Data*
- *Redesigning Power Law of Scientometrics with Different Levels of Numerical Integration*

- *A modified k means clustering and linear regression algorithms to assess quality of bibliometric indices versus citation parameters of journals*

Shodhganga: reservoir of Indian theses

The present study is mainly based on Shodhganga, the national electronic theses database of India. Shodhganga is the reservoir of Indian theses maintained by Information and Library Network (INFLIBNET) Centre, Gandhinagar, Gujarat. All Indian universities have to submit the soft copies of the theses submitted to them to Shodhganga through statutory requirement. This repository of theses is based on DSpace, an open source repository software package developed jointly by Massachusetts Institute of Technology (MIT) and Hewlett-Packard (HP) Labs.

As on 5th August 2024, there were 548361 theses in Shodhganga. All numbers related to Shodhganga (INFLIBNET, 2024)¹⁵ was obtained from the website itself. The list of universities with more than 10000 theses are listed in Table 1.

It is interesting to note that the youngest institution in the list, Anna University tops with 15906 theses. Faculty of Information and Communication Engineering (n=5721), Faculty of Science and Humanities (n=3020) and Faculty of Mechanical Engineering (n=2636) of Anna University are the individual collections in Shodhganga having the highest number of theses. The top two universities are from the state of Tamil Nadu. Two other Indian states Maharashtra and Uttar Pradesh have two universities each in the list. The three universities established through Wood's dispatch in 1857 have produced more than 10000 theses. The top five universities contribute more than 2% of theses each and cumulatively their theses form 12.67% (n=69494) of total 548361 theses. This means that top five universities have produced more than one eighth of the total theses produced by 790 universities contributing to Shodhganga. Except Chhatrapati Sahuji Maharaj University, all seven universities are within the top 50 universities in National

Table 1 — Universities with more than 10000 theses in Shodhganga

Name of university	State	Year of establishment	No. of theses in Shodhganga	% of theses
Anna University	Tamil Nadu	1978	15906	2.90
University of Madras	Tamil Nadu	1857	15001	2.74
University of Calcutta	West Bengal	1857	14244	2.60
Savitribai Phule Pune University	Maharashtra	1949	12754	2.33
University of Mumbai	Maharashtra	1857	11589	2.11
Aligarh Muslim University	Uttar Pradesh	1875	10237	1.87
Chhatrapati Sahuji Maharaj University	Uttar Pradesh	1966	10180	1.86
Andhra University	Andhra Pradesh	1926	10079	1.84

Institute Ranking Framework (NIRF) - 2023 conducted by Ministry of Education, Government of India.¹⁶

According to Shodhganga, there are 142 LIS departments which together have contributed 3592 theses in the subject as on the above date, which means the percentage of LIS theses in Shodhganga is not even one percent (0.655 %). Only four universities have more than 100 LIS theses to their credit as shown in the Table 2.

Among them Bharathiar University tops the list with 140 LIS theses. Manonmaniam Sundaranar University has 125 LIS theses to its credit. Third and fourth positions in LIS is held by Karnatak University and Bharathidasan University with 117 and 102 theses respectively. Except Karnatak University which is in Karnataka, all other three universities are in Tamil Nadu.

The authors have identified 530 theses in BISCA from Shodhganga. This forms 14.76% of the total theses in LIS (n=3592) available on Shodhganga.

Methodology

Shodhganga was searched with keywords like “informetric”, “scientometric”, “bibliometric”, “research output”, “research productivity”, and “citation analysis”. Although it seems very easy to fetch data from Shodhganga, it was not an easy task due to the server problems which occur very often. 648 articles were retrieved from Shodhganga during a span of almost three weeks, which bear these words within their titles. The fetched records contain a lot of errors and duplications which were corrected after meticulous analysis and the data was cleaned and the number of theses fetched from Shodhganga came down to 530.

Shodhganga contain those theses which are born digital and theses which are converted from print. There are many theses which may be still in print and thus not available on Shodhganga. In order to find such theses, IndCat was searched. IndCat is a union catalogue of hard copies of documents available in different universities in India maintained by INFLIBNET Centre. 234 theses on the subject could be found from IndCat.

Apart from Shodhganga and IndCat, sources like references of certain theses, books and articles,

websites of HEIs recognised by University Grants Commission (UGC) and *University News* published by the Association of Indian Universities were also consulted to identify theses which were not included in both databases. The *University News* usually contain a column “Theses of the month” which contain the details of the latest theses submitted in Indian universities. Websites of various Indian HEIs were searched for the list of theses, but very few institutions have a list of PhD holders and the related details. From all the sources other than Shodhganga, 456 titles of theses in BISCA could be found. These titles were matched with those obtained from Shodhganga and duplicates were removed. 74 more unique titles of theses could be located from the sources other than Shodhganga. Finally, 604 unique theses on BISCA were identified as summarised in the Table 3. All these searches were conducted during July 2023 to July 2024.

Challenges while accessing and using Shodhganga

The website of Shodhganga was not accessible always. While accessing or searching, the website went down several times. It was really time consuming to fetch all the required data for the study.

Discrepancies in metadata in Shodhganga

The quality of metadata in Shodhganga needs thorough improvement. The authors illustrate this with some cases as follows.

Typographical errors

The typographic errors and lack of spaces in between words are crucial while searching for theses. Thesis entitled “Biomedical research in bric Brazil Russia India and china ascientometric approach” at <http://hdl.handle.net/10603/136134> is an example for this. The space between the words “a” and

Table 3 — Number of theses on BISCA identified from different sources

Sources	Number of theses identified	Percentage
Shodhganga	530	87.75
References	29	4.80
IndCat	20	3.31
HEI websites	20	3.31
University news	5	0.83
Total	604	100

Table 2 — Universities with more than 100 LIS theses in Shodhganga

Name of the University	State	No. of theses in LIS	Homepage of collection in Shodhganga
Bharathiar University	Tamil Nadu	140	http://hdl.handle.net/10603/33643
Manonmaniam Sundaranar University	Tamil Nadu	125	http://hdl.handle.net/10603/19426
Karnatak University	Karnataka	117	http://hdl.handle.net/10603/6889
Bharathidasan University	Tamil Nadu	102	http://hdl.handle.net/10603/5103

“scientometric” is not only missing in the title but also in the keyword. Thesis at <http://hdl.handle.net/10603/196475> has a subtitle “a biometric study”, instead of “bibliometric”.

Inappropriate keywords

In the above-mentioned title, the entered keywords "Bric Brazil Russia India" and "Russia India and China" shows that the data entry operator has no idea about how the search works in DSpace, the base software of Shodhganga.

One can find only less than 60 keywords with the word root “scientometric” while there are 273 occurrences of the word “scientometric” in the titles of theses. Similarly, only less than 50 keywords are available with the word “bibliometric” when Shodhganga is having 196 theses with the term “bibliometric” in the title itself. These are evident in Figures 1 and 2, which are the screenshots of the

Bibliometric	10
Bibliometric Analysis	4
Bibliometric analysis	2
bibliometric analysis	1
Bibliometric analysis – Scientific research – Indian Association for the Cultivation of Science (IACS)	1
Bibliometric analysis of literature	1
Bibliometric Analysis-LIS Journals-A study.	1
Bibliometric Study	5
Bibliometric study	5
bibliometric study	1
Bibliometric Study of Agricultural Theses	1
Bibliometric study of periodical literature 2000-2010	1
Bibliometric Study of Ph D Thesis	1
Bibliometric, earthquake, seismology, Lotka s law, Web of Science	1
BibliometricAnalysis	1
Bibliometrics	17
bibliometrics	1
Bibliometrics scientometrics	1
Bibliometrics, Citation, Homographs, Dissertation, Demographic	1

Fig. 1 — Screenshot of the listing of keyword “bibliometric” in Shodhganga

listing of these keywords on Shodhganga. In both figures, one can see words with different cases are treated as different keywords.

Six studies on Shodhganga have the term “informetric” in their title. But only two of them have been supplied with the keyword “informetrics” in Shodhganga. Similarly, there are twelve studies which bear the words “webometric/webometrics” in their title itself, but only six studies have been provided with the keyword “webometric/webometrics”. Among these six studies only three are really webometric studies. This clearly shows that criteria of providing keywords and other bibliographic data to Shodhganga should be improved.

Junk characters

The thesis hosted at <http://hdl.handle.net/10603/284401> has an odd title prefixed and suffixed with

Scientometric	18
scientometric	4
Scientometric Analysis	1
SCIENTOMETRIC ANALYSIS	1
Scientometric Analysis	7
Scientometric analysis	4
scientometric analysis	4
scientometric analysis 2000 2019	1
Scientometric analysis of type 1 diabetes research productivity	1
Scientometric analysis, Agriculture literature, Design and methodology, Analysis and interpretation, Findings	1
Scientometric analysis, Women cancer, Bibliometrics, Radiation therapy, Hormonal therapy	1
Scientometric Approach	1
Scientometric Studies	1
Scientometric studies_Library and Information Science	1
Scientometric Study	1
scientometric study	1
Scientometric study , journal of antimicrobial chemotherapy	1
Scientometric study , antimicrobial agents and chemotherapy journal,journal,Bibliometric Analysis,Citation Analysis,Content Analysis	1

Fig. 2 — Screenshot of the listing of keyword “scientometric” in Shodhganga

“quot” as “quotAnalysis Of Publications In Library And Information Science Indexed In Guide To Indian Periodical Literaturequot”. A list of theses having prefixed with “quot” can be seen in Figure 3. The title of the thesis hosted at <http://hdl.handle.net/10603/513309> is “0and#957; and#946;and#946; Decay in 76Ge Isotope within PHFB Approach”.

Apart from the errors of data entry operators, some theses contain evident typographic errors on their title pages itself. For example, the thesis hosted at <http://hdl.handle.net/10603/556999> has the title as “0information seeking behaviour of B.Ed colleges in Haryana state: a study”. Another thesis at <http://hdl.handle.net/10603/17937> bears the title “100A Descriptive Study to Assess the Psychosocial Impact of Children Suffering from AIDS and their Principal Care-Givers Issues and Challenges of the Future”.

Truncation of titles

Some theses do not have parts of their title as seen in the case of “Citation analysis of doctoral dissertations in

Library and Information Science accepted by the universities of Orissa and Manipur till 1993: A comparative study” at <http://hdl.handle.net/10603/188317>. Here the words after “universities” was trimmed by the data entry operator.

Duplicate theses

The number of duplicate records in Shodhganga is another matter of concern. As an example, one can see that a non-English thesis “16 vi Lok Sabha Mein Alapsankhyak Yuvaon ka Matdan Vyavhar Meerut Baghpat Lok Sabha Shetr Ka Tulnatmak Adhyayan” can be found at three locations namely <http://hdl.handle.net/10603/577528>, <http://hdl.handle.net/10603/577529> and <http://hdl.handle.net/10603/577530> all of which were uploaded on 19th July 2024.

The issue can be further explained as in the case of three days in July 2023. Eight theses among 520 theses uploaded on third July 2023 were found to be duplicates in a random check. The percentage of duplicates is 1.5 and the percentage of duplicates on preceding two

quot Internet user behavior and online shopping in Andhra Pradesh India A study in selected cities of Andhra Pradesh quot
quot A Study on Need Assessment For Developing Exclusive Breastfeeding Advocacy In Surat Cityquot
quot Analysis and Investigation of Modified Drive System for Solar Powered Electric Vehiclequot
quot Chemistry of Albizzia species and some Reactions of Chalkone Epoxides quot
quot Chemistry of Albizzia species and some Reactions of Chalkone Epoxides quot
quot mughalkalin niyay vyavastha avam prashashan
quot Performance Evaluation ok State Financial Corpotations in India A Comparative Studyquot
Quot Schemes and Semistable Vector Bundles
quot Stone Age Archaeology Of Araku Valley Stone Age Archaeology OF Araku Valley VisakhApatnam District Andhra Pradesh Visakhapatnam quot
quot STUDY OF FACTORS INFLUENCING ONLINE AND OFFLINE SHOPPING BEHAVIOR OF CONSUMERS IN PUNE City
quot Study of scientific aptitude of secondary schools students in relation to some variables quot
quot Tribological characterisation of electroless Ni P coatings under high temperature quot
quot3D IQA Analysis of 3D views for no reference and full reference quality assessmentquot
quotA comparative study of economics of factory sponsored, co-operative and private life irrigation schemesquot
quotA comparative study of male and female secondary school teachers with respect to their personality traits, competency and teaching effectivenessquot

Fig. 3 — List of theses having prefixed with “quot”

working days were 1.5 and 3.1 respectively as shown in the Table 4. Two more duplicates were found when the theses uploaded for above three days were cumulated. The average percentage for the duplicates uploaded in Shodhganga was 2.1. The number of theses uploaded on Shodhganga is 548361 as on 05.08.2024; if the above 2.1 percentage of duplicates is extrapolated to this number, it can be assumed that Indian reservoir of theses contains around 11516 duplicate theses which should be removed.

Theses without titles or authors

Records of two theses uploaded on behalf of Lalit Narayan Mithila University on third July 2023 did not possess title of theses, names of researchers or guides at <http://hdl.handle.net/10603/496153> and <http://hdl.handle.net/10603/496129>. These records should not have approved by the local administrator of Shodhganga.

Inversion of names

Two examples for duplicates which were encountered during the data cleaning are shown in

Table 4 — Duplicate theses found among the theses uploaded between 28 June and 3 July 2023

Date uploaded	No. of records	Duplicates found	Percentage of duplicates
03-Jul-23	520	8	1.5
30-Jun-23	523	8	1.5
28-Jun-23	379	12	3.1
Cumulative number for three dates above	1422	30	2.1

Table 5. The names of researchers and guides are inverted in some cases, while it is not done in other cases. This inconsistency causes errors while calculating the numbers for the study.

Rendering of names of guides

The users of Shodhganga can find inconsistency in rendering the names of the same guides and universities, which lead to much confusion. As an example, one can find twelve different entries for Dr S. Srinivasaragavan, Professor & Head, Department of Library and Information Science, Bharathidasan University, Tiruchirappalli, Tamil Nadu, as shown in Table 6.

Rendering of names of in inappropriate letter cases

Rendering of names and titles of thesis have been done both in complete lower cases and upper cases which is not desirable in English language. The theses “literature on library and information science a bibliometric analysis” at <http://hdl.handle.net/10603/479960> and “research productivity on paediatric medicine a bibliometric study” at <http://hdl.handle.net/10603/466857> has all of their letters of titles in lower case. The titles of theses “A SCIENTOMETRIC ASSESSMENT OF RESEARCH ACTIVITIES IN SENSOR NETWORKS” at <http://hdl.handle.net/10603/210356> and “BIBLIOMETRIC ANALYSIS ON SMART JOURNAL OF BUSINESS MANAGEMENT STUDIES” at <http://hdl.handle.net/10603/209405> are examples for those with upper case letters.

Table 5 — Two sets of duplicate theses rendering metadata differently and identically

Sl no.	URL	Title	Researcher	Guide
1	http://hdl.handle.net/10603/381500	Scholarly Publications on Neuroscience A Scientometric Analysis	Karthikeyan, G	Srinivasa Ragavan, S
2	http://hdl.handle.net/10603/381501	Scholarly Publications on Neuroscience A Scientometric Analysis	Karthikeyan, G	Srinivasa Ragavan, S
3	http://hdl.handle.net/10603/210731	Resource Development of University Libraries in Tamilnadu an Analytical Study	Jayanthi P.	Srinivasaragavan S.
4	http://hdl.handle.net/10603/30272	Resource Development of University Libraries in Tamilnadu an Analytical Study	Jayanthi P.	Srinivasaragavan S.

Table 6 — Twelve variations of the name of same person as it appears in different records of Shodhganga

Sl no.	Variations in name	URL of item
1	.Srinivasa Ragavan S	http://hdl.handle.net/10603/333687
2	Dr S Srinivasa Ragavan	http://hdl.handle.net/10603/94883
3	Dr S. Srinivasaragavan	http://hdl.handle.net/10603/90017
4	Dr.S.SRINIVASARAGAVAN	http://hdl.handle.net/10603/33857
5	S. SRINIVASARAGAVAN	http://hdl.handle.net/10603/469811
6	Srinivasa ragavan S	http://hdl.handle.net/10603/221527
7	Srinivasa Ragavan, S	http://hdl.handle.net/10603/133867
8	SRINIVASA RAGAVAN, S.	http://hdl.handle.net/10603/209405
9	Srinivasaragavan S	http://hdl.handle.net/10603/221525
10	Srinivasaragavan S.	http://hdl.handle.net/10603/210731
11	Srinivasaragavan, S	http://hdl.handle.net/10603/136663
12	Srinivasaragavan. S	http://hdl.handle.net/10603/89996

Duplicate copies of same theses with different set of authors

A thesis titled “Bibliometric study of desidoc journal of library and information technology during 2010 to 2019” from Shri Jagdishprasad Jhabarmal Tibarewala University was found duplicated in metadata and bitstreams at two consecutive URLs; i.e. <http://hdl.handle.net/10603/438751> and <http://hdl.handle.net/10603/438752>. But in the second URL the names of researcher and guides were both entered wrong, which actually belong to the Faculty of Nursing of same university and their thesis was uploaded under a different URL. The URLs <http://hdl.handle.net/10603/355531> and <http://hdl.handle.net/10603/355535> contain the same thesis title, while in reality the second thesis belongs to the Department of Biotechnology of Mizoram University.

Non-related attached bitstreams

The full text files which are uploaded into DSpace software, which is the base of Shodhganga, is referred to as bitstreams. Some theses contain files which are not at all related to the metadata. The thesis entitled “Trends of Indian research performance in chemistry during 1991 to 2020 based on Scopus database: a scientometric and computational evaluation” has the problems of truncated title, duplication and incorrect bitstreams. It is available under three different URLs: <http://hdl.handle.net/10603/572491>, <http://hdl.handle.net/10603/572424> and <http://hdl.handle.net/10603/571862>. None of them have the complete title in metadata. The keywords “Computer Science” and “Engineering and Technology” are misleading ones. The latter two URLs have a typographic error as “Trends iof”. The last URL has a different set of files of another thesis which have an entry at <http://hdl.handle.net/10603/521935>. The metadata and bitstreams have no relation at all.

Postgraduate theses

Although a research degree, dissertations of MPhil are very little on Shodhganga. But it contain theses of postgraduate theses of some universities as can be seen in the case of Department of Extension Education of Banaras Hindu University at <http://hdl.handle.net/10603/313838>, <http://hdl.handle.net/10603/313622>, <http://hdl.handle.net/10603/313618> etc. The above URLs contain theses of MSc students. The scope of the theses is not clear to many data entry operators to Shodhganga.

Data analysis**Chronological growth of theses**

Table 7 shows the number of theses submitted on BISCA in each year. The year 2019 saw most number of submission of theses, i.e. 52. In 2015 the number of submissions was 50. Soon after the Covid-19 pandemic, 49 theses were submitted in 2021.

In the Figure 4, which shows the chronological growth of theses on BISCA, one can see an almost

Table 7 — Number of theses on BISCA produced each year from 1980.

Year of submission of theses	Number of theses submitted in the corresponding year
1980	1
1982	1
1983	1
1984	1
1985	1
1986	1
1988	1
1989	1
1990	1
1991	4
1992	3
1993	2
1994	5
1995	1
1996	3
1997	7
1998	5
1999	10
2000	4
2001	5
2002	6
2003	6
2004	6
2005	10
2006	12
2007	9
2008	9
2009	7
2010	8
2011	16
2012	15
2013	18
2014	33
2015	50
2016	47
2017	41
2018	41
2019	52
2020	34
2021	49
2022	37
2023	25
2024	2
n.d.	4
NA	9
Total	604

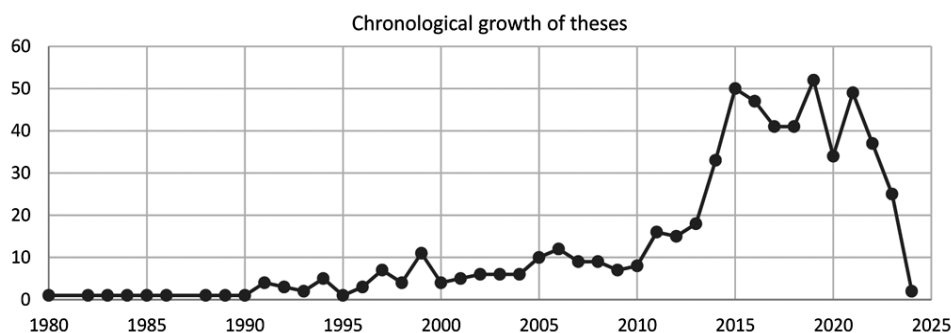


Fig. 4 — Chronological growth of theses on BISCA

steady surge in the submission of theses starting from 2010. A major dip is visible only in the year 2020, which can be attributed to Covid-19 pandemic. The number of theses in the years 2022, 2023 and 2024 seems to be less because many theses are yet to be uploaded to the database. The lesser number of records in these years may be due to the gap between submission of theses and uploading of theses into Shodhganga. Four theses in Shodhganga does not bear any date even in their full text. Submission dates of nine theses found in references were not provided. Combining these two, year of submission of thirteen theses could not be identified.

State-wise distribution of theses

The theses submitted at different universities were grouped and tabulated under the states which they are located as in Table 8.

The most productive state, Tamil Nadu has contributed more than three times of theses produced by the universities of Maharashtra, which is at second place. 15 universities from Tamil Nadu have produced 229 theses in BISCA with an average of 15.27 theses per university. Maharashtra holds the second position among the states in India with 70 theses produced by 10 universities at a rate of 7 theses per university. When combined together, Tamil Nadu and Maharashtra produced 49.2% (n=300) of all theses in the field. i.e. About half of the theses in the field of BISCA is produced by the two states through their 25 universities. Karnataka produced 61 theses through their 11 universities at a rate of 5.55 theses per university. These are the three states which have ten or more universities produced theses in BISCA.

University-wise distribution of theses

The universities which have contributed ten or more theses are listed in Table 9. 104 universities from different parts of India has contributed 604 theses on BISCA.

Table 8 — State-wise distribution of theses on BISCA

State	No. of theses
Tamil Nadu	229
Maharashtra	70
Karnataka	61
West Bengal	29
Odisha	25
Andhra Pradesh	24
Uttar Pradesh	23
Rajasthan	22
Kerala	20
Madhya Pradesh	14
Gujarat	12
New Delhi	12
Assam	9
Chhattisgarh	8
Punjab	8
Mizoram	7
Haryana	6
Telangana	6
Chandigarh	4
Jammu and Kashmir	4
Meghalaya	2
Jharkhand	1
Manipur	1
Pondicherry	1
Uttarakhand	1
Not available	5
Grand Total	604

Among the top ten universities which have the highest number of theses in BISCA, seven are in Tamil Nadu. They are Bharathiar University (n=37), Bharathidasan University (n=36), Annamalai University (n=34), Alagappa University (n=32), Madurai Kamaraj University (n=24), Manonmaniam Sundaranar University (n=19) and Periyar University (n=16). Dr Babasaheb Ambedkar Marathwada University (n=29), which is at fifth position and Swami Ramanand Teerth Marathwada University (n=13) at tenth position are in Maharashtra. Karnatak University (n=18) at 8th position and University of Mysore (n=13) at 10th position are in Karnataka. Top twelve universities among 106 universities has

Table 9 — Universities which have produced ten or more theses on BISCA

University	State	No. of theses
Bharathiar University	Tamil Nadu	37
Bharathidasan University	Tamil Nadu	36
Annamalai University	Tamil Nadu	34
Alagappa University	Tamil Nadu	32
Dr Babasaheb Ambedkar Marathwada University	Maharashtra	29
Madurai Kamaraj University	Tamil Nadu	24
Manonmaniam Sundaranar University	Tamil Nadu	19
Karnatak University	Karnataka	18
Periyar University	Tamil Nadu	16
Swami Ramanand Teerth Marathwada University	Maharashtra	13
University of Mysore	Karnataka	13
Andhra University	Andhra Pradesh	11
University of Kerala	Kerala	10
University of Calcutta	West Bengal	10
University of Madras	Tamil Nadu	10
Other universities		287
Not available		5
Total		604

produced 53% (n=324) of theses. If Banaras Hindu University and University of Calcutta are excluded from that list, the rest of the universities from southern part of the country has contributed almost half of theses in the discipline (n= 304, 49.8%).

Guide-wise distribution of theses

A total of 329 research guides including co-guides could be identified who produced 591 theses. Guides of 10 theses could not be identified as they were not available from the sources. 20 theses had co-guides. Among those who acted as co-guides, 10 appeared as co-guides only while the remaining 10 have guided theses alone also.

The names of 24 research guides who have produced five or more theses in BISCA are listed in Table 10.

The top 24 guides are responsible for 26% of (n=159) theses, i.e. more than a quarter of the total count. Among those 24 guides, Dr Vaishali S. Khaparde, Dr B. Vijayalakshmi and Dr C. Sasikala are females. Dr Vaishali is the top guide in the list with 13 theses with affiliations to Dr Babasaheb Ambedkar Marathwada University (BAMU) (n=11) and Swami Ramanand Teerth Marathwada University (n=2), both situated in Maharashtra. Her colleague at BAMU, Dr Shashank S. Sonwane shares the second position with ten theses. Among ten, three of his guidance was affiliated with Kavayitri Bahinabai Chaudhari North Maharashtra University,

Table 10 — Names of research guides who have supervised five or more theses on BISCA

Guide	No. of theses
Khaparde, Vaishali S.	13
Sangam, S. L.	10
Sonwane, Shashank S.	10
Surulinathi, M.	9
Raja, S.	9
Jeyshankar, R.	8
Devarajan, G.	7
Srinivasaragavan S.	7
Kumaravel, J. P. S.	7
Balasubramani, R.	6
Sarangapani R.	6
Thanuskodi, S.	6
Nagarajan, M.	6
Baskaran, C.	5
Dominic J.	5
Gopalakrishnan, S.	5
Kumbar, Mallinath	5
Nithyanandam, K.	5
Panda, Krushna C.	5
Ramesh Babu, B.	5
Senthilkumar R.	5
Vijayalakshmi, B.	5
Sasikala, C.	5
Chellappandi, P.	5
Other guides	432
Not available	10
Independent	3
Total	604

Maharashtra. Both of them are currently in service at the Department of Library and Information Science, BAMU. Dr S. L. Sangam, who also has guided ten theses had guideship in four universities, i.e. Karnatak University, Gulbarga University, and REVA University in Karnataka, and Manipur University.

Among the remaining 21 guides, 16 are from Tamil Nadu, remaining two ladies are from Andhra Pradesh while Dr G. Devarajan, Dr Mallinath Kumbar and Dr Krushna C. Panda belongs to Kerala, Karnataka and Odisha respectively.

Guides affiliated to only one university

After Dr Vaishali who has guided 11 theses in BAMU, the distinction of producing highest number of theses in BISCA with affiliation to a single university is shared by Dr S. Raja and Dr M. Surulinathi. Dr Raja is Assistant Librarian at Alagappa University and Dr Surulinathi is Assistant Librarian/Assistant Professor at Bharathidasan University. Belonging to Tamil Nadu, both of them have produced nine theses in the subject each. Dr R. Jeyshankar of Alagappa University guided 8 theses while affiliated with it.

Multiple university affiliation of guides

Dr K. Nithyanandam guided his five theses with four different university affiliations, i.e. Anna University, Bharathiar University, Hindustan University, and Sri Chandrasekharendra Saraswathi Viswa Mahavidyalaya. Affiliating to Gulbarga University, Shivaji University and Utkal University, Dr S. R. Gunjal guided four theses. Three theses guided by Dr P. S. G. Kumar was from three different universities, Berhampur University, Rashtrasant Tukadoji Maharaj Nagpur University and Sant Gadge Baba Amravati University. Dr S. Srinivasaragavan is affiliated to three universities and guided seven theses. There are 26 more guides affiliated to two universities.

Independent PhDs: Theses without guides

Shodhganga has indexed 14 theses in various subjects including art history, chemistry, commerce, computer science, dentistry, law, library science etc. which was done independently by the research scholars without research supervisors. Nine of these were awarded PhD by Madurai Kamaraj University (MKU). Among these nine theses from MKU, four are from LIS and among these four, three belongs to BISCAs. It is notable that BISCAs is the largest discipline with more than 21% of independent theses in various subjects in Shodhganga.

Both Dr T. Helen Leema and Dr Manonmony S. have acknowledged Dr B. Suresh, Librarian, Dr Thenpattinam Ponnuswamy Meenakshisundaram Librarian, Madurai Kamaraj University for his guidance. Dr Chellappandi P. and Dr T. Helen Leema were given certificates by Dr Prof. A. Srimurugan, University Librarian and Head-in-charge, Department of Library and Information Science, Madurai Kamaraj University

and abovementioned Dr B. Suresh respectively, that the scholars had completed research independently.

Subject-wise distribution with respect to type of BISCAs studies

The Table 11 depicts the number of different types of studies carried out in various broad subject areas. Among the total 604 studies, 325 theses studied the scientometric behaviour of scholarly literature while 202 theses were dedicated for bibliometric studies. 71 doctoral studies were done on in the field of citation analysis. Compared to the abovementioned type of studies, the number of informetric studies is very few, i.e. only 6.

Among all these kinds of 604 studies, the majority (n=90, 14.9%) has been done in the field of medicine. Library and Information Science (n=60, 9.93%) and Life Sciences (n=45, 7.45%) are on the second and third position. The scientometric studies are also highest in the field of medicine (n=67) which accounts 20.62% of total 325 studies. Theses in Life Sciences occupies the second position among Scientometric studies (n=28, 8.61%). Research in the field of medicine is also comparatively high (n=21, 10.4%) among 204 bibliometric studies. The higher rate of production of literature in the field of medicine and life sciences may be attributed for the increase in the number of studies in those subjects. As majority of studies on BISCAs are conducted by postgraduates in library and information science (LIS) as seen in table 11, the interest in the field of LIS is obvious. Among the total 202 bibliometric studies, the highest is in the field of LIS (n=25, 12.38%) and second position is held by subjects grouped under Arts and Humanities (n=21, 10.4%). Barring the citation analytical studies in the vast discipline of social sciences and other sciences

Table 11 — Different types of BISCAs studies carried out in various broad subject areas

Subjects	No. of different types of studies				Total
	Bibliometric	Informetric	Scientometric	Citation analysis	
Agriculture	12	0	21	6	39
Arts and humanities	21	0	2	3	26
Chemistry	5	0	20	1	26
Computer science	2	0	17	1	20
Economics	6	1	4	3	14
Education	7	0	2	3	12
Engineering	11	0	35	5	51
No specific subject	18	0	23	5	46
Library and information science	25	2	25	8	60
Life Sciences	13	1	28	3	45
Management	9	0	8	3	20
Medicine	21	1	67	1	90
Physics	11	1	24	6	42
Other sciences (combined)	23	0	45	9	77
Social science	18	0	4	14	36
Total	202	6	325	71	604

(combined), LIS has the highest output (n=8, 11.3%) among the total of 71. Doctoral theses in LIS (n=25, 7.7%) is at third position among scientometric studies. Although headings grouped under “other sciences (combined)”, “Engineering” and “no specific subject” has considerable number of studies, they cannot be attributed to a specific field, as they are a combination of wide variety of disciplines.

Some subjects seem to be favourite among the guides and researchers. Four theses are on the literature available on Acquired immunodeficiency syndrome (AIDS) caused by Human immunodeficiency virus (HIV). Two theses from Bharathidasan University are dedicated to Coronavirus research, while one was submitted before Covid-19 and another after the pandemic. Two theses are titled as “Knowledge management research: A scientometric study (2001-2015)” and “Knowledge management research: A scientometric analysis” which was submitted almost a decade apart.

Entity-wise distribution with respect to type of BISCA studies

As explained in the scope of the study, the types of studies were further categorised on the entities on which the research has been carried out. The result is tabulated in Table 12. More than half (n=308) of the studies were carried out on a discipline or specific topic. Scientometric studies dominate in this area with more than two third of the research done.

Majority of studies based on the journals are bibliometric in nature (n=44) and 22% of 202 bibliometric studies are based on the productivity of journals. Among the bibliometric studies on journals, more than half of studies (n=23) were based on a specific journal or a small set of journals by a publisher or in a discipline. Some example titles of theses are:

1. *A scientometric study On NISCAIR Journal of Annals of Library and Information Studies from 1999 to 2013*
2. *Scientometric profile of the e journals in Library and Information Science published by Emerald during the period 2005 2015*

3. *A scientometric study on IEEE transactions on control systems technology*
4. *A scientometric study on IEEE transactions on fuzzy systems*
5. *Scientometric analysis of journal of Current Science*

Seven studies on seven different journals published by IEEE could be identified, out of which four were done at Bharathiar University. One can find two different studies done on the contents of two prominent journals each, *DESIDOC Journal of Library and Information Technology* and *Annals of Library and Information Studies*.

Majority of 71 citation studies were based on theses submitted at different universities or in different disciplines (n=53, 74.65%). Among the 101 studies based on theses, more than half were citation analyses (n=53, 52.48%).

Few examples will illustrate this.

1. *Citation analysis of doctoral theses submitted to the University of Agricultural Sciences Gandhi Krishi Vignyan Kendra (GKVK) Bangalore*
2. *Citation Analysis of Postgraduate Theses with Reference to R V S Krishi Vishwa Vidyalaya, Gwalior*
3. *Citation analysis of Ph.D. theses submitted to Punjab Rao Krishi Vidyapeeth during 1990-1994*
4. *A citation analysis of doctoral dissertations of plant pathology in the agricultural universities of Bihar*
5. *Citation analysis of PhD theses in philosophy*

Scientometric studies are more prevalent in measuring the scientific productivity of institutions. Among 325 scientometric studies, 19.69% (n=64) are based on institutions. Some examples for such studies are:

1. *Research Productivity of Faculty Members in Dr Panjabrao Deshmukh Krishi Vidyapeeth, Akola: a Scientometric Study*
2. *Research productivity of Tamil Nadu Veterinary and Animal Sciences University TANUVAS: a scientometrics study*

Table 12 — Different types of BISCA studies carried out on various entities

Theses based on	Bibliometric	Informetric	Scientometric	Citation analysis	Total
Conference Proceedings	1	0	2	0	3
Institution(s)	35	1	64	3	103
Journal(s)	44	0	27	8	79
Newspapers Citations	0	0	0	1	1
Personal portrait(s)	2	1	6	0	9
Theses	42	0	6	53	101
Disciplines or specific topics	78	4	220	6	308
Total	202	6	325	71	604

3. *Scientometric study of research output of biology subject in universities of Gujarat*
4. *Research productivity in life sciences of central universities in Delhi: a scientometric study*
5. *Mapping of Research Productivity of Scientist in IITs in India: A Scientometrics Study*

Three theses were based on proceedings of conferences organised by DRTC, INFLIBNET, DELNET, IFLA, COLLNET and IASLIC. A thesis was on the newspapers citations in scientific publications indexed in Web of Science. Nine theses were about the contributions of Sir C. V. Raman, Dr Raja Ramanna, J. C. Bose, K C Kar and Eugene Garfield, Nobel laureates in the fields of economics, chemistry and physics, and winners of Shanti Swarup Bhatnagar Award.

Key terms in the title of theses

It was observed that there are certain words or key terms which appear more often in the titles of theses considered for the study. The suffix “-metric” has the highest presence, ie, 484 times mostly in the terms “scientometric”, “bibliometric” and “informetric”. The word “study” or “studies” is the frequent one with highest number of occurrences (n=315). The term “research” occur 276 times, “scientometric” occur 273 times, “analysis” occur 263 times while “bibliometric” can be found 198 times in the titles of theses. The common words or key terms in the titles of theses are tabulated in the Table 13, in which similar concepts are arranged in the descending order of occurrences.

BISCA theses awarded PhD by non-LIS academic departments

Research on BISCA are usually carried out by scholars associated with the academic department of Library and Information Science. The scholars and guides in some other disciplines have also shown interest in the topic. Scholars from diverse fields

like Ayurveda, Commerce, Education, etc. have contributed six theses to BISCA.

The PhDs were awarded in the respective fields as indicated in the Table 14. In two theses of Alagappa

Table 13 — Key terms used in the titles of theses on BISCA.

Key terms in titles of theses	No. of theses
-metric	484
scientometric	273
bibliometric	198
informetric	6
citation analysis	49
citation(s)	86
study/studies	315
analysis	263
mapping	68
pattern	35
growth	29
trend	25
research	276
literature	125
publication/published	67
output	82
research output	75
productivity	88
research productivity	71
scientific	24
performance	14
scholarly	16
communication	11
faculties/faculty members	30
scientists	23
India (including Indian=64)	146
university/universities	128
institute(s)/institution(s)	33
doctoral	51
theses	66
dissertations	30
journal/journals	69
open access journals	10
periodical	16
science/sciences	168
social science(s)	21
library and information science	46

Table 14 — Theses in BISCA which were awarded PhD in non-LIS disciplines

Title of theses	URL	PhD awarded in	Remarks
Scientometric analysis and mapping of scientific research articles on hirudotherapy with respect to leech therapy in skin disorders for ayurved novice research scholars from the database 1998 to 2018	http://hdl.handle.net/10603/464636	Ayurveda	Acknowledged LIS professionals
Research and publication contribution of teachers in commerce and management a bibliometric study	http://hdl.handle.net/10603/217768	Commerce	Acknowledged LIS expert
Citation patterns of documents in linguistics researches: a statistical analysis of the literature	http://hdl.handle.net/10603/31354	Linguistics	Acknowledged LIS expert
Collaborative research in social science in India: A review of status of womens participation in collaborative research programme	http://hdl.handle.net/10603/265106	Sociology	Acknowledged LIS expert
Educational technology literature: a bibliometric study	http://hdl.handle.net/10603/196475	Education	Co-Guide from LIS
A bibliometric analysis of womens studies journals 1995 to 2007	http://hdl.handle.net/10603/289382	Women's Studies	Co-Guide from LIS

University and Mother Theresa Women's University, two librarians have acted as co-guides for the theses and the research was interdisciplinary. From the acknowledgement part of theses, one can see the presence of LIS professionals in the completion of the theses in many roles.

Conclusion

According to Shodhganga, universities from Indian state of Tamil Nadu tops in the number of theses in any subject, in LIS as well as in BISCAs. As a subject, LIS constitute only less than one percent of theses available over Shodhganga. Among those theses, research on BISCAs is about 15%, which is not a small amount, considering other research topics in LIS. About 88% of theses on BISCAs submitted to Indian universities can be found on Shodhganga. The inconsistencies in data entry to Shodhganga pose serious challenges while searching and evaluating the documents in the database. Although Shodhganga has provided guidelines for metadata, those who enter them seems to be least bothered about it. Duplicate entries unnecessarily increase the numbers of theses in the reservoir. Although MPhil theses are not part of the reservoir, one can find many masters level dissertations in Shodhganga. An online database providing comprehensive list of theses which they have awarded and related details is desirable to identify the apex degree holders of the HEIs and this will help public to verify their credentials.

A total of 604 theses on BISCAs could be discovered from various sources for this study. During the years 2019, 2015 and 2021 the submission of theses on BISCAs was maximum with an average of 50 theses per year and these three years alone contributed a quarter of entire BISCAs theses. More than half of the theses (n=347, 57.45%) were submitted during the decade from 2011-2020, the reason for which can be attributed to the UGC Regulations 2009 on PhD and UGC Regulations 2010 on rewards for PhD holders and job seekers in higher education. Fifteen Tamil Nadu universities topped in awarding PhDs in BISCAs and the PhDs they awarded in BISCAs is more than three times than those awarded by ten universities in Maharashtra which is at second place. About one third of theses in BISCAs (n=198) was awarded by seven Tamil Nadu universities among the top ten universities which produced BISCAs theses. It is an interesting fact that the colleagues at BAMU, Dr Vaishali S. Khaparde and Dr Shashank S. Sonwane tops along with Dr S. L.

Sangam in guiding theses on BISCAs. Another notable fact is the award of PhDs to three independent scholars from Madurai Kamaraj University which constitutes more than one fifth of total independent theses in various subjects indexed in Shodhganga.

Among studies on BISCAs, scientometrics dominates with more than half of theses (n=325) while bibliometric studies constitute one third of total theses. Medicine and LIS together alone (n=90+60) has a share of one quarter of subjects of theses in BISCAs. About 100 of theses on BISCAs are based on the research productivity of institutions in the country. Another 100+ scholars studied the theses awarded by various universities while half of these studies concentrated on citation analysis of those theses. More than half of the theses have the words "study" or "studies" (n=315) and nearly another half has got the words "research" or "researchers" (n=285) in their titles. Almost a quarter of the titles has the name of the country "India" (n=146) in title. Although generally accepted to be a part of LIS, theses on BISCAs was awarded PhD by six non-LIS departments.

Certain misnomers like content analysis were found among the titles of BISCAs studies. It is desirable to have clarity of the terms in scientific studies and bring them in to practice.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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