Citation Analysis for measuring the value of scientific publications: An Evaluative Study of the Ph. D theses submitted to Physics programme, Goa University (period 2017 – 2022)

Dissertation submitted in partial

fulfilment to Goa University for the

Degree of Masters of Library and Information Science

By

Tanvi Hanumant Parab

Enrollment Number

22P034012

Under the Supervision Of

Novelty Ramesh Volvaikar

Library and Information Science Programme

D. D Kosambi School of Social Sciences and Behavioural Studies

Presented for Viva voce on 28/9/2023

PROGRAMME DIRECTOR LIBRARY AND INFORMATION SCIENCE D. D. Kosambi School of Social Sciences & Behavioural Studies Goa University

DEAN D. D. Kosambi School of Social Sciences & Behavioural Studies Goa University Goa - 403206

Goa University

2022-2023

Citation Analysis for measuring the value of scientific publications: An Evaluative Study of the Ph. D theses submitted to Physics programme, Goa University (period 2017 – 2022)

Dissertation submitted in partial

fulfilment to Goa University for the

Degree of Masters of Library and Information Science

By

Tanvi Hanumant Parab

Enrollment Number

22P034012

Under the Supervision Of

Novelty Ramesh Volvaikar

Library and Information Science Programme

D. D Kosambi School of Social Sciences and Behavioural Studies

Goa University

2022-2023

CERTIFICATE

This is to certify that the work incorporated in the dissertation entitled **"Citation Analysis for measuring the value of scientific publications: An Evaluative Study of the Ph. D theses submitted to Physics programme, Goa University (period 2017 – 2022)"** is the bonafide work carried out by **Miss Tanvi Hanumant Parab**, in partial fulfilment of the requirement of the degree of Masters of Library And Information Science of Goa University is her own work carried out under the guidance and worthy of examination.

Novelty Ramesh Volvaikar

Assistant Professor

Library and Information Science Programme,

Goa University

DECLARATION

I declare that this dissertation entitled **"Citation Analysis for measuring the value of scientific publications: An Evaluative Study of the Ph. D theses submitted to Physics programme, Goa University (period 2017 – 2022)"** submitted by Tanvi Hanumant Parab is my original contribution and the same has not been submitted on any occasion for any other degree or diploma of this University or other University/Institute. To the best of my knowledge, the present study is the first comprehensive work of its kind from the area mentioned. The literature related to the problem investigated has been cited.

Date:

Place:

Tanvi Hanumant Parab
Library and Information
Programme, Goa University

ACKNOWLEDGEMENT

I am deeply indebted to many people in the completion of this dissertation.

First of all, I attribute the successful completion of this dissertation to God for giving me the strength and energy, without which I would not have been able to complete this dissertation.

I would like to express my deep sense of gratitude to my guide, Novelty Ramesh Volvaikar for her unfailing patience, able guidance and encouragement throughout the course of my work.

I am also thankful to the staff of Goa University library for their corporation and giving their valuable time.

A special thanks goes to my family for their constant moral support and encouragement.

At last, I would like to thank all my friends and classmates for their support.

Tanvi Hanumant Parab

Table of contents

List of Tables

List of Figures

Chapter 1

INTRODUCTION

1.1 Introduction

The effectiveness of scientific research performance could be realised through a proper communication system. Communication in science could be viewed from the standpoint of a historian, an economist, a sociologist, a library professional, and so on. Thus, science and scientific communication are so interrelated that one influences the other for the generation of information. Bibliometric/scientometric tools and techniques have been increasingly used to evaluate scholars' research performance and the growth of various science and social sciences disciplines.

Scientific tradition requires that when a scientist announces his finding, he should refer to earlier findings of similar nature which relate his to them. These references are supposed to identify those earlier researchers whose concepts the author used to shape his research. It is believed that when an item is cited, the citing author finds something relevant to the topic of his work in the cited article.

Bibliographical references and citations form a crucial part of a thesis. And it is understood that a citation in a thesis, as a communication artifact, establishes a relationship between the two documents, the thesis which cites and the article or book which is cited. The list of references pointing to prior publications is an essential part of research papers.

Frencis Nerlin and others comment, “a reference is the acknowledgment that one document gives to another; a citation is the acknowledgement that one document receives from another”.

According to Martin “a citation implies a relationship between a part or the whole of the cited document and a part of the whole of the citing document”. Citation analysis is that area of bibliometrics which deals with the studies of this relationship.

Citation analysis is a quantitative method where important and essential literature of a field can be identified on the basis of how often a publication is

cited in other publications. It measures the relative importance or impact of an author, an article, or a publication by counting the number of times that author, article, or publication has been cited by other works. Citation analysis is the examination of the frequency, patterns, and graphs of citations in scholarly works. It is one of the most widely used methods of bibliometrics, wherein citations from scholarly works are used to establish a relationship between authors, scholarly works, field of study, journals, or even between countries. Citations both, from and to a certain document is studied in order to establish links to other works or other researchers. It helps to determine the impact of a single author, specific articles, and publications in a given field, and also assesses the core journals in any subject field. (Barman, 2022) Citations given by the author indicate what form of material and how much of them are being used to support their findings.

1.2 Objectives of the study

Research is a systematic study done with the establishment of a set of objectives. Objectives state the primary purpose of the research that has been undertaken, they also state what will/ will not be addressed to. The present study is carried out with the following aims and objectives

i. To study the year wise distribution of cited documents.
ii. To study the forms of documents cited.
iii. To prepare rank list of journals.
iv. To identify authorship pattern.
v. To study country - wise scattering of cited journals.

1.3 Hypothesis

i. Journals are most preferred sources of information in the field of Physics.
ii. There is significant multiple author collaboration.

1.4 Scope and limitation of the study

The present study is conducted to determine the core information source types used in Physics discipline by analysing various parameters like the forms of documents, year wise distribution, authorship trends, collaborative research, etc. The main limitation of the study is coverage of the source material from the 11 doctoral dissertations in the field of Physics submitted to Goa University in the year between 2017 - 2022.

1.5 Research methodology

a) Population of the study

The study is conducted on the theses submitted to Physics programme of Goa University. A total of 11 theses is taken as a sample size for analysing the references.

b) Methodology

Data regarding the present study is collected from the Ph. D theses submitted to the Physics programme, Goa University during 2017 – 2022. References listed in the theses are thoroughly analysed and segregated into different categories of documents such as journal articles, books, conference papers, book chapters, etc., and presented and interpreted with the help of tables, figures, and graphs.

1.6 Organisation of the study

Chapter 1 – Introduction

This chapter deals with the introduction to bibliographical references and citations, providing basic definitions of Citation Analysis. It also includes objectives of the study, scope and limitations, research methodology, and organisation of the study.

Chapter 2 – Literature Review

This chapter deals with the literature done earlier on citation analysis by scholars on various fields of study. A total of 25 relevant references are reviewed and presented in this chapter.

Chapter 3 – Explanation of Concepts

This chapter deals with the explanation of the basic concepts related to citation studies.

Chapter 4 – Data Analysis and Interpretation

This chapter includes all the data that has been analyzed, and arranged into tables. The arranged data is represented into graphs and charts wherever required.

Chapter 5 – Major Findings

This chapter deals with all the major findings that has been analyzed from the study.

Chapter 6 – Suggestions and Conclusion

This chapter suggests ways to improvise the errors found during the analysis, and gives an overall conclusion about the study conducted.

1.7 Conclusion

Citation analysis does not end with the study of the distribution or scattering of references, it extends to the study of literature of a subject which grows exponentially with time. This method emphasizes that information sources most profusely cited can be taken to be the most desirable ones in a library collection, for they are likely to be frequently used by the researchers in a particular subject field or for a particular scientific community in a geographical area (Gupta, 2015)

1.8 References

Barman, B. (2022). *A comprehensive book on Library and Information Science.* LIS Links.

Gupta, j. (2015). *Citation Studies: a performance evaluation technique of LIS Scientists.* New Delhi: ESS Publications.

Chapter 2

LITERATURE REVIEW

Library and Information Science scholars have conducted several research and studied the concepts of citation analysis. Major research of the pertinent studies was reviewed and comprehended.

1. **Yahaya Aliyu** (Aliyu, 2018) analysed the citation pattern of doctoral these in Education and reveals that books and monographs were cited most frequently at 43 percent, followed by journal articles receiving 33.4 percent, and the least score was recorded for newsletters at 1.1 percent. Based on the study, the author recommends the university library improve its journal collection and also to subscribe online journals as these are the sources of information through which researchers particularly at the doctoral level can get current research findings that would assist them in conducting their research.

2. A citation alone may look insignificant but when accumulated and analysed in bulk it can provide very useful and interesting insights about a discipline (Gayan & Singh, 2021). **Mithu Anjali Gayan** and **Sanjay Kumar Singh** revealed that journals were found to be the most cited document in the field of Mathematics, accounting for 82.07 percent of the total share. Books were the second highest cited documents having received a share of 8.64 percent. The authorship pattern observed from the study concludes that single authors remained dominant until 1950, gradually increasing the number of authors and later the trend grew towards multiple authorship. The authors gave a key message suggesting that the core journals and books found from the study should be purchased by the library authority as they are most relevant for the researchers.

3. A study done by **Y. L. Somashekara** and **Mallinath Kumbar** (Somashekara & Mallinath, 2015) on doctoral theses of Zoology identified that journals constituted 78.54 percent of the total cited references, followed by books with 11 percent and conference proceedings with 5 percent.

4. Citation analysis of doctoral theses in the field of Biotechnology done by **Banateppanvar et al** (Banateppanvar, Biradar, & Kannappanavar, 2013) shows that researchers mainly depend upon journal sources which account for 79.72 percent of total citations. Citations from books, proceedings, theses, reports, and patents were also found. Through the authorship pattern, it was observed that foreign authors' contribution is more dominant, and the geographical distribution shows that the USA literature is mostly used for the research.

5. **Koteppa Banateppanvar, B.S. Biradar**, and **B.U. Kannappanavar** (Banateppanvar, Biradar, & Kannappanavar, Citation analysis of doctoral theses in botany submitted to Kuvempu University, India: a case study, 2013) researched to study the citation pattern of doctoral theses in Botany. The findings reveal that journals are the most preferred sources of information used by the researchers showing their importance in communicating scholarly literature, accounting for 74.7 percent of total citations. Citations from books, proceedings, theses, reports, and patents were also found. The authorship pattern for journal citations shows that most of the citations are contributed by two authors and it was observed that foreign authors' contribution is dominant in the entire authorship pattern.

6. According to **Preeti Mahajan** and **Anil Kumar** (Mahajan & Kumar, 2017) books are the most preferred sources of information used by researchers in the field of Sociology, accounting for 57.65 percent of the total citations and journals quote for 36.52 percent. Single authorship was found to be dominant in both, books as well as journal articles. The majority of citations to books and journals were found to be of Indian origin, followed by U.K. and U.S.A. The authors in their paper recommend that while citing the work of others, the researchers should cite the complete bibliographical information in a standard reference style to avoid inaccurate and incomplete citations.

7. The study conducted by **Amritpal Kaur** and **Gurjeet Kaur Rattan** (Kaur & Rattan, 2018) revealed that journals are the most cited sources in the Ph. D theses of Economics with 49.39 percent of the citations and the year-wise distribution of authorship pattern indicates that the trend is changing from single-authored

documents to multiple-authored documents. The study also infers the increasing usage of electronic resources as the years gradually increase. The authors also found that electronic documents were not cited in a uniform pattern and suggested that proper training should be given to students about citing electronic documents as well as using uniform referencing patterns of documents.

8. According to **Sunil Tyagi** and **Krishna Kumar** (Tyagi & Kumar, 2017) books received the highest number of citations in the field of Political Science followed by journal articles, newspapers, etc. Country-wise scattering revealed that Indian literature ranked first, followed by USA and UK. The analysis of the authorship pattern revealed that 79.6 percent of citations were papers written by single authors, which implies that political science is less collaborative as compared to sciences and technology.

9. **Prabhjot Kaur** and **Dr. PC Sehgal** (Kaur & Sehgal, 2021) in their study found that journal articles received the highest number of citations in the field of Library and Information Science followed by books, web resources, conference proceedings, etc. Authorship patterns revealed that single-author documents are most cited than double-authored documents. Subject-wise distribution of citations identified that majority of citations are on subject Information seeking behaviour, followed by Information and communication technologies.

10. **S.M. Shafi** and **Wahida Gazi** (Shafi & Gazi, 2005) in their study attempted to ascertain the citation potential and distribution of various sources in the theses collected from sub-fields of Natural Sciences. The study reveals that out of 100 theses, the maximum number of theses (35%) pertain to Physics followed by Botany (32%). The authors deduced from the study that researchers did not follow a standard format to record bibliographic details. The highest citations were from journals followed by seminar proceedings which are by international and national practices in Natural sciences.

11. **Anjan Gohain** and **Dr. Mukesh Saikia** (Gohain & Saikia, 2014) analysed the Ph.D. these of Chemical Sciences, submitted to Tezpur University. After studying the distribution of citations according to bibliographic format, it was observed that

journals contribute the highest number of citations accounting for 78.83 percent, which infers that it is the most preferred source of information used by researchers in the field of chemical sciences. Books were the second most cited source accounting for 15.57 percent of the total citations. The authorship pattern of journal citations revealed that most of the citations were contributed by more than three authors and it was concluded that collaborative research is prevailing in chemical sciences. Journal of American Chemical Society occupies the first rank as the most preferred journal having been cited 617 times.

12. **Koteppa Banateppanavar** (Banateppanavar, 2015) carried citation analysis of theses in the field of Biosciences and attempted to rank the documents, particularly journals based on their usage and productivity. The journals and other documents were analysed according to their country of origin. It was revealed that India occupies the top position with 31.57 percent citations, followed by the USA covering 27.23 percent citations which reflects that these countries have been well-developed in the field of Bioscience. The authorship pattern indicates that team research is prevailing since double authors are being cited for the highest of total citations. The study shows that cited references in Bioscience are scattered among 119 subjects among which, the field of Medicinal Plant Research stands in the first place second place occupied by Pharmacology. The author in his paper suggests that India has to improve its conditions for the development of research activities in the universities and other institutions. Better services and orientation programs for the research scholars of universities should be arranged to create a scholarly environment to bring India gradually on par with the US research standards.

13. **R.V. Chikate** and **S.K. Patil** (Chikate & Patil, 2008) in their paper say that citation analysis is a worthwhile area of research that is useful for understanding subject relationships, author effectiveness, publication trends, and so on. It is also a way to understand users, where the references cited show you the types of sources most commonly used and valued locally in their respective disciplines. Theses of Library and Information Science from Pune university were collected and analysed for the citation study. Out of the total citations, journals contribute 42.2 percent, followed by books with 31.2 percent. The most cited journal by LIS researchers is College and Research Libraries, followed by Scientometrics. The geographical analysis of

citations revealed that the US ranks first among foreign countries, with India securing second place. Most of the articles are contributed by single authors.

14. In their research paper, **M. Thamaraiselvi, M. Manthiramoorthi,** and **A. Manikandan** (Thamaraiselvi, Manthiramoorthi, & Manikandan, 2016) deal with the citation analysis of doctoral theses of Library and Information Science submitted to the Alagappa University. This study aimed to identify the most cited sources of information, authorship pattern, rank list of core journals, and country-wise publication in library and information science. The study revealed journals received the highest number of citations followed by websites contributing with 79.91 percent and 6.39 percent respectively. The Electronic Library journal ranked first and the Annals of Library and Information Studies was ranked second. The majority of authorship patterns of cited documents were single authors. Most of the cited publications are from the UK followed by India.

15. **Y. L. Somashekara** and **Mallinath Kumbar** (Somashekara & Kumbar, 2015) evaluates Ph.D. theses in Physics, submitted to three universities of Karnataka, and reveal that journals are the most frequently used bibliographical form accounting for 77.36 percent of the total citations. The Journal of Chemical Physics published in the USA ranks first in the ranking list of journals.

16. **Y. L. Somashekara** and **Mallinath Kumbar's** (Somashekara & Kumbar, 2014) paper addresses the research performance of the Department of Physics, at Bangalore University. The study analysed that a major part of citations are journal citations at 80.68 percent, books at 10.99 percent, and E-resources at 1.21 percent. The highest and lowest number of citations were from two authors and three authors respectively. The researcher observed that collaboration in research is a very common phenomenon in science and technology. Publications from the USA received the largest number of citations, followed by the United Kingdom, Netherlands, and India. In the present-day scenario, information is available online and it was observed that out of 2485 citations, 2455 (98.792 %) citations were print citations, and only 30 (1.207%) citations were online e-resources.

17. **Banateppanvar et al.** (Banateppanvar K. , Biradar, Kannappanavar, DharaniKumar, & Kumar, 2013) tried to determine the materials cited in doctoral theses of the Zoology, submitted to the Kuvempu University, to improve the existing collection of the library. The study revealed that journals are the most preferred sources of information used by researchers in the field of Zoology accounting for 74.47 percent of total citations followed by books and monographs. Citations from conference proceedings, theses, reports, patents, and newspapers were also found. It was also observed that researchers take advantage of internet resources. The Journal of Mutation Research ranked first with 94 citations accounting for 5.71 percent of the total journal citations. Cited materials were mainly contributed by multi-authors.

18. The study conducted by **Chandrakant R. Satpute** (Satpute, 2015) of Ph. D Theses in Pure Sciences was concerned with the subjects comprising Environment Science, Microbiology, Biochemistry, Biotechnology, Chemistry, Physics, Electronics, Computer Sciences, Mathematics, Statistics, Botany, and Zoology. Journals are major documents cited at a maximum of 81.02 percent, followed by 13.26 percent citations from books. In every subject mentioned above, journals are the major documents cited in maximum, except in the case of Computer Science where books are the major form of media used. The authors discovered the oldest citation was from the year 1798 in Chemistry subject. Multiple authors are more predominant than single authors which have been observed in all the subjects. The author suggests research scholars cite the whole bibliographical details while citing the work of other authors to make the analysis of citations easier.

19. **Shakuntala Nighot** (Nighot, 2019) did citation analysis of Ph.D. theses in education in two state universities of Maharashtra. The term ‘Education’ here is used for ‘Teacher Education’ discipline. Education theses studied, were written in four languages, English, Marathi, Hindi, and Gujarati. In all, English was the predominant language. All the theses were classified using ERIC Thesaurus and DDC class 270 (Education). ‘Pedagogy of School Subjects and Curriculum’ was a highly researched area with 38 theses, followed by Educational Psychology, Educational Administration, Sociology of Education, and Methods of Instruction and Study. Books (39.19%) and Journals (21.9%) were the first two highly used

sources together contributing 61 percent citations followed by Web Resources (8.52%). In total citations, Indian publications received highest citations followed by USA and UK in comparison to other individual countries. The author in conclusion says that in the age of information explosion, unused or less used material should be withdrawn and highly used material should be maintained properly. The need-based collection should be developed to satisfy the researcher's quench for knowledge. Resources on upcoming and ongoing research areas should be made easily available and accessible.

20. **Sonia Gupta** (Gupta, 2020) also did citation analysis of doctoral theses in Education submitted to three universities. From all universities the highly researched subject was 'Educational Psychology', and the least researched subject area was 'Information and Communication Technologies'. Out of the total citations, single authors are cited more times than joint authors. Books comprised the highest citations, followed by theses.

21. **Edward J. Eckel** (Eckel, 2009) the author studied the citation patterns in 96 Master's theses and 24 Ph.D. dissertations completed at Western Michigan University's College of Engineering and Applied Sciences. Bibliographic information of each thesis and dissertation was gathered, and the data analysed indicated that doctoral engineering students used a significantly greater number of scholarly journal articles (44.3% to 29.3%) and conference papers (21.9% to 12.5%) than master's students. This study shows that there is a significant difference in the proportions of scholarly and other research sources used by master and doctoral engineering students. The author suggests that websites used by engineering students should be analysed and characterized on the basis of their functionality i.e., in terms of what types of information can be sought from it. Given the increasing importance of websites in engineering research, such a study would be valuable.

22. **Ifeanyi J. Ezema** (Ezema, 2016) did a citation analysis of Language theses to examine scholarly communication behaviour in languages using theses and dissertations to enhance collection development policy in linguistics research. Books and monographs dominated the entire citations with 63.6 percent while

journal citations were 17.9 percent. Electronic resources accounted for 15.4 percent of the citations. Monographs have been found to be more useful for language researchers. The paper intends to interrogate the authorship pattern sources, language, currency and frequency of sources among others. From the findings it was deduced that single authorship pattern dominates most of the sources cited, however, multiple authorships are increasingly being reported in language and linguistics. This study provides useful evidence to librarians who would be interested in developing the language library collections.

23. **Jamal Ahmad Siddiqui, Sanya Khanam** and **Pooja Kaushik** (Siddiqui, Khanam, & Kaushik, 2021) performed citation analysis on Ph.D. theses in Economics and revealed that highest number of citations were recorded from books, followed by journal articles, newspapers, conference proceedings, reports etc. Indian literature ranked first with 55.00 percent citations, followed by the USA with 7.6 percent. The analysis of the authorship pattern reveals that 55.8 percent of citations were papers written by single authors where most of the cited authors in the theses are Indian. The journal 'Economic and Political weekly' occupies the first rank accounting for 7.3 percent of the total journal citations followed by the American Economic reviews with 3.6 percent.

24. Citation Analysis of PhD theses in Sociology done by **K.P. Singh** and **Bebi** (Singh & Bebi, 2013) revealed that highest number of citations were recorded from books, followed by journal articles, book chapters, encyclopaedias, reports, etc. Country-wise scattering of citations shows that Indian literature ranked first, followed by the USA and UK. The authorship patter reveals 83.9 percent of citations were to the papers written by single authors. Further, it indicates that most cited authors in the theses are foreign authors followed by Indian authors.

25. **K. Kusuma Kumari** and **Dr. M. Doraswamy** (Kumar & Doraswamy, 2014) in their research paper tries to ascertain the various information sources consulted by the researchers in Civil Engineering. The authors analysed the Ph.D. theses and their findings reveal that journals are the most preferred source of information

contributing the highest number of citations. Most of the journal articles are published collaboratively by the authors. Among the 578 journals, 'Journal of Hydraulic Division' is cited the highest number of times, followed by 'Geotechnique', and 'Water Research'.

2.1 References

Aliyu, Y. (2018, March 13). Citation Analysis of Doctoral Theses in Education,University of Maiduguri, Nigeria. *Library Philosophy and Practice (e-Journal)*. Retrieved November 1, 2022, from https://digitalcommons.unl.edu/libphilprac/1721

Banateppanavar, K. (2015). Citation Analysis Of Doctoral Theses in Bioscience Accepted By The Kuvempu University. Retrieved November 2, 2022, from http://hdl.handle.net/10603/378390

Banateppanvar, K., Biradar, B. S., Kannappanavar, B. U., DharaniKumar, P., & Kumar, S. K. (2013, July). Citation analysis of doctoral theses in Zoology submitted to Kuvempu University, India: A case study. *International Journal of Library and Information Science, V*(6), 192-202. doi:10.5897/IJLIS2012.0333

Banateppanvar, K., Biradar, B., & Kannappanavar, B. (2013). Citation analysis of doctoral theses in Biotechnology submitted to Kuvempu University, Karnataka: A case study. *International Journal of Information Dissemination and Technology, III*(3), 147-157. Retrieved November 4, 2022

Banateppanvar, K., Biradar, B., & Kannappanavar, B. (2013). Citation analysis of doctoral theses in botany submitted to Kuvempu University, India: a case study. *Collection Building, XXXII*(1), 12-20. doi:10.1108/01604951311295058

Chikate, R., & Patil, S. (2008, December). Citation Analysis of Theses in Library and Information Science Submitted to University of Pune: A Pilot Study. *Library Philosophy and Practice (e-journal)*. Retrieved November 4, 2022, from https://digitalcommons.unl.edu/libphilprac/222

Eckel, E. J. (2009, October 4). The Emerging Engineering Scholar: A Citation Analysis of Theses and Dissertations at Western Michigan University. *University Libraries Faculty & Staff Publication*, 1-17. Retrieved November 18, 2022, from https://scholarworks.wmich.edu/library_pubs/2

Ezema, I. J. (2016, October). Scholarly Communication and Authorship Patterns in Language Research: Evidences from Citation Analysis of Language Theses in Nigeria. *Ghana Journal of Development Studies, XIII*(2), 1-25. doi:http://dx.doi.org/10.4314/gjds.v13i2.1

Gayan, M. A., & Singh, S. K. (2021, February 18). Citation analysis of Mathematics: a scientometric study based on Ph.D. theses, Tripura University. *Library Philosophy and Practice (e-journal)*. Retrieved November 1, 2022, from https://digitalcommons.unl.edu/libphilprac/5167

Gohain, A., & Saikia, M. (2014, October 1). Citation Analysis of Ph.D. Theses Submitted To The Department of Chemical Sciences, Tezpur University, Assam. *Library Philosophy and Practice (e-journal)*. Retrieved September 21, 2022, from https://digitalcommons.unl.edu/libphilprac/1066

Gupta, S. (2020). CITATION ANALYSIS OF DOCTORAL THESES IN EDUCATION SUBMITTED TO THE UNIVERSITIES OF HARYANA, PUNJAB AND CHANDIGARH. India. Retrieved November 2, 2022, from http://hdl.handle.net/10603/340524

Kaur, A., & Rattan, G. K. (2018, May 4). Citation Analysis of Theses in Economics Submitted to Punjabi University, Patiala during 2000-2014. *DESIDOC Journal of Library & Information Technology, XXXVIII*(3), 192-198. doi:10.14429/djlit.38.3.12474

Kaur, P., & Sehgal, P. (2021, April 3). Citation Analysis of Ph.D. Theses in Library and Information Science: A Study of Panjab University, Chandigarh. *Library Progress (International), XXXXI*(1), 106-112. doi:10.5958/2320-317X.2021.00011.8

Kumar, K. K., & Doraswamy, M. (2014, January-March). CITATION ANALYSIS OF Ph.D. THESES IN CIVIL ENGINEERING SUBMITTED TO SRI VENKATESWARA UNIVERSITY, TIRUPATI, ANDHRA PRADESH.

International Journal of Digital Library Services, IV(I), 83-91. Retrieved November 19, 2022

Mahajan, P., & Kumar, A. (2017, November). Citation Analysis of Doctoral Theses in the field of Sociology submitted to Panjab University,Chandigarh (India) during 2002-2012. *Library Philosophy and Practice (e-journal)*. Retrieved November 5, 2022, from http://digitalcommons.unl.edu/libphilprac/1611

Nighot, S. (2019, May). CITATION ANALYSIS OF Ph.D. THESES IN EDUCATION IN TWO STATE UNIVERSITIES OF MAHARASHTRA. India. Retrieved November 2, 2022, from http://hdl.handle.net/10603/312092

Satpute, C. R. (2015, March). CITATION ANALYSIS OF PH.D. THESES IN PURE SCIENCES AWARDED BY NORTH MAHARASHTRA UNIVERSITY, JALGAON. Retrieved November 2, 2022, from http://hdl.handle.net/10603/70705

Shafi, S., & Gazi, W. (2005). Citation Analysis of Ph.D. Theses A study of doctoral theses submitted to Kashmir University during 1980-2000 in Natural Sciences. *Trends in Information Management (TRIM), I*.

Siddiqui, J. A., Khanam, S., & Kaushik, P. (2021, February 11). Citation Analysis of Ph.D. theses in Economics submitted to Ch. Charan Singh University, Meerut (2011-2015). *ResearchGate*. India. doi:10.5958/2320-317X.2020.00036.7

Singh, K., & Bebi. (2013, November). Citation Analysis of Ph.D. Theses in Sociology Submitted to University of Delhi during 1995-2010. *DESIDOC Journal of Library & Information Technology, XXXIII*(6), 489-493. Retrieved November 19, 2022

Somashekara, Y. L., & Mallinath, K. (2015, February). Citation analysis of doctoral theses of Zoology subject submitted to three universities in Karnataka, India. *e-Library Science Research Journal, III*(4). Retrieved November 6, 2022

Somashekara, Y., & Kumbar, M. (2014, August). CITATION ANALYSIS OF SCIENCE DOCTORAL THESES IN PHYSICS SUBMITTED TO BANGALORE UNIVERSITY BANGALORE, KARNATAKA, INDIA. *Golden Research Thoughts, IV*(2), 1-9. Retrieved November 4, 2022

Somashekara, Y., & Kumbar, M. (2015, January-March). Citation Analysis Of Doctoral Theses: An Analysis Of Physics Theses Submitted To Three Universities of Karnataka, India. *International Journal of Library and Information Studies, V*(1), 20-33. Retrieved November 4, 2022

Thamaraiselvi, M., Manthiramoorthi, M., & Manikandan, A. (2016, January-June). Citation Analysis of Doctoral Theses of Library and Information Science Submitted to the Alagappa University with Special References to Shodhganga Website. *ScieXplore: International Journal of Research in Science, III*(1), 41-46. doi:10.15613/sijrs/2016/v3i1/114285

Tyagi, S., & Kumar, K. (2017). Citation Analysis of Doctoral Theses in Political Science Submitted to Chaudhary Charan Singh University. *Journal of Indian Library Association, XXXXXIII*, 5-13. Retrieved September 21, 2022

Chapter 3

EXPLANATION OF CONCEPTS

3.1 Introduction

Bibliometrics is a set of measurement techniques used with the application of mathematical and statistical methods for analysing books or other media of communication. Bibliometrics include Informetrics, scientometrics, webometrics, altmetrics, and citation analysis. It is conventionally used for studying the process of communication, information flow, and related topics for better understanding and effective management and dissemination of information. Bibliometrics as a measurement technique has wide functions to be aware of the trends in authorship and collaboration in research as well as the research trends in a subject, core periodicals, obsolescence, and scattering of scientific literature. It also assists to count the usefulness of secondary periodicals in estimating comprehensiveness. It also helps in studying the author's productivity, and characteristics of subject literature including the structure of knowledge, historical and sociological aspects of science, and helpful in the formulation of need-based collection development policy weeding and stacking policy, science policy studies, and many more. Bibliometric mapping of science and technology is the method to envisage the field of knowledge and it is accomplished by creating landscape maps (Sarkale, 2017).

3.2 Citation Analysis

Citation analysis is a non-intrusive method of finding patterns in a specific populations' use of research materials, when one author cites another author, a relationship is established. Citation analysis uses citations in scholarly works to establish links. Many different links can be determined, such as links between authors, scholarly works, journals, fields, or even between two or more nations. Citations both from and to a certain document may be studied (Evaluation based on scientific publishing: Citation analysis and databases containing citation information, 2013). Citation analysis is very useful to find out the influence of a single author on a given field by counting the number of times the author has been cited by others. Citation analyses permit

researchers to see how frequently a work has been cited in articles and are valuable for any literature review.

Hence citations are nothing but the bibliographical references which are generally added with every research communication. A document referred to in another article is called the cited document, and the previous the citing document. A description of the cited article is called as the citation. It includes the statement of authorship, document, pagination, year of publication, places, etc. The pattern of citation may change as per the type of publication. The citations are also known as references and readings and they may appear as endnotes as well as footnotes. A reference is an acknowledgement that one document gives to another and a citation is the acknowledgement that one document receives from another. Thus, there is an implied relationship between the cited document and the citing document. This assumption has led to a number of studies focusing on citation counts, impact factors, bibliography coupling, co-citations, and citation indexes (Sarkale, 2017).

3.3 Definitions of Citation Analysis:

1) Martin defined citation analysis, as "As an activity involving analysis of citation and references which forms a part of primary scientific communication."

2) According to Ravichandran Rao "By citation Analysis one can evaluate and interpret citations received by articles, authors, institutions and other aggregates of scientific activity."

3) Narin and Moil state that "The most active area of modern bibliometrics is concerned with citations."

3.4 Explanation of the Concept:

3.4.1 Bibliometrics:

Bibliometrics is a set of methods used to study or measure texts and information. Citation analysis and content analysis are commonly used bibliometric methods. The bibliometric methods are often used in the field of library and Information science, and

it has wide applications in other areas. Many research fields use bibliometric methods to explore the impact of their field.

3.4.2 Citation Analysis:

Citation analysis is the interrogation of the frequency, patterns, and graphs of Citations in articles and books.

3.5 Application of Citation Analysis:

3.5.1 Literature of studies:

The citations in a particular subject area are to be studied to describe the pattern of citation.

3.5.2 Type of literature studies:

Citation analysis can be used to calculate the dissemination of results reported in certain types of literature such as government documents, dissertations, or the exchange of literature of regional scientific societies.

3.5.3 User studies:

The application of citation analysis technique is used to resolve users' needs which are much useful for the collection development and designing of library services.

3.5.4 Communication pattern:

Citations may also show scientific communication patterns. These studies also specify the kind of researchers in a field of study like single or multi researchers etc.

3.5.5 Information Retrieval:

It is examined that perhaps, the use of citation relation is having the greater impact on information retrieval, where citations have been used to enhance more traditional approaches to literature searching.

3.5.6 Collection Development:

Primarily citation analysis is applied to journal collection development in a library. The citation analysis helps in deciding the titles of journals to be acquired (Sarkale, 2017).

3.6 References

Evaluation based on scientific publishing: Citation analysis and databases containing citation information. (2013). Retrieved from Oulun yliopiston kirjasto: https://libguides.oulu.fi/evaluatingpublications/citationanalysis

Sarkale, A. B. (2017, December 12). A Study of Citation Analysis of Psychology Journal Available in Directory of Open Access Journals. *submitted to Swami Ramanand Teerth Marathwada University*, 245. Retrieved March 30, 2023, from http://hdl.handle.net/10603/209105

Wardikar, V. G. (2013, December 15). Application of Bradford's Law of Scattering to the Literature of Library & Information Science: A Study of Doctoral Theses Citations Submitted to the Universities of Maharashtra, India. *Library Philosophy and Practice (e-journal)*. Retrieved March 30, 2023, from https://digitalcommons.unl.edu/libphilprac/1054

Chapter 4

DATA ANALYSIS AND INTERPRETATION

The data is collected from the Ph. D theses submitted to the Physics programme of Goa University, from the period 2017 – 2022. The references appended to each chapter and the bibliography attached at the end of the thesis was collected and analysed to gather the data. Techniques have been used to arrange the analysed data into tables, and represent it in the form of charts and graphs.

4.1 Profile of the sample of study.

Goa University was established under the Goa University Act of 1984 and commenced operations on 1st June 1985. The university provides higher education in the Indian state of Goa. The university on its campus has 10 schools. They offer programmes leading to Undergraduate Degree (3), Master's Degree (35), and Ph.D. Degree (25) in various disciplines.

The School of Physical and Applied Sciences is a result of the amalgamation of three correlated departments i.e., Electronics, Mathematics, and Physics which belonged to the erstwhile Faculty of Natural Sciences. Department of Physics is one of the oldest departments that served the local students by providing them with quality higher education for more than four decades.

4.2 To Study the Year-wise Distribution of Cited Documents

The purpose of this objective was to find out the most productive year in the field of Physics by counting the number of citations received by the years mentioned in the cited documents. Table No. 1 shows the number of citations received by each year, and Figure No. 1 is the graphical representation of the tabulated data.

Table No. 1. Year-wise Distribution of Cited Documents

Year of Publication	No. of Citation
1820	1
1837	3
1847	3
1850	2
1879	3
1881	1
1898	2
1912	2
1913	1
1915	1
1923	1
1924	2
1926	1
1927	1
1928	1
1929	1
1930	1
1931	2
1932	4
1933	4
1934	1
1935	2
1936	3
1937	1
1938	2
1939	1
1945	1
1947	1
1948	8
1949	2
1950	1
1951	2
1952	5
1953	4
1954	3
1955	3
1956	6
1957	6
1958	5
1959	3
1960	5
1961	6
1962	8
1963	5
1964	11
1965	8
1966	6
1967	9
1968	10
1969	10
1970	9
1971	7
1972	16
1973	11
1974	13
1975	12
1976	20
1977	9
1978	16
1979	9
1980	19
1981	13
1982	13
1983	16
1984	9
1985	14
1986	17
1987	14
1988	25
1989	12
1990	15
1991	19
1992	16
1993	28
1994	22
1995	31
1996	36
1997	24
1998	34
1999	48
2000	45

2001	55
2002	57
2003	55
2004	70
2005	86
2006	97
2007	108
2008	106
2009	95
2010	115
2011	95
2012	123
2013	119
2014	130
2015	128
2016	113
2017	92
2018	83
2019	44
2020	16
2021	2

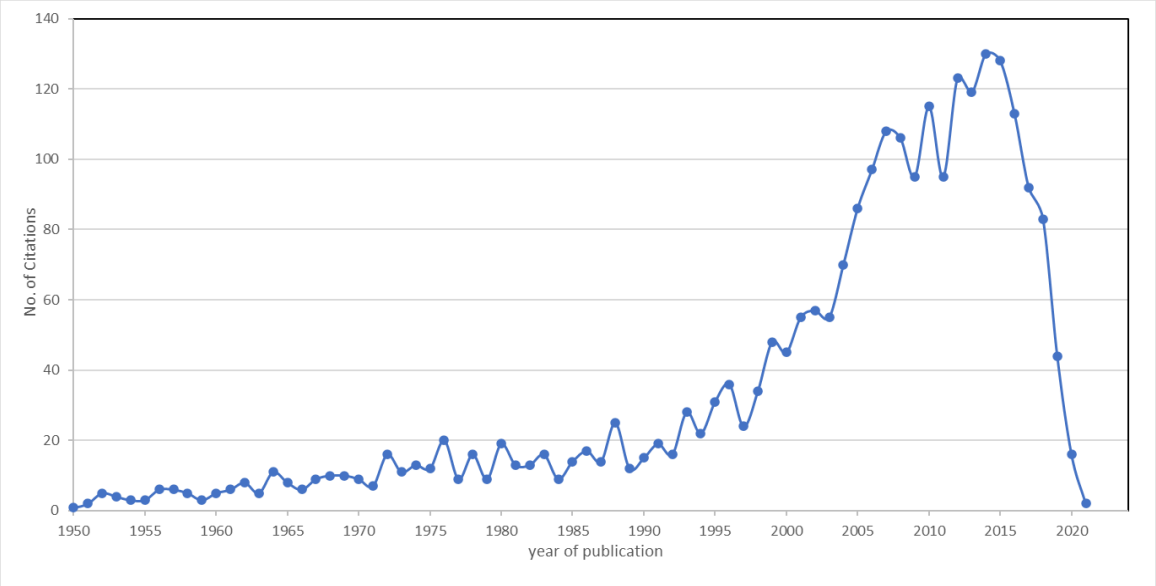

Figure No. 1. Graph showing number of citations received by each year of publication.

Graph of the number of citations versus the year of publication, plotted on the basis of data tabulated Table No. 1 shows that the year 2014 was the most productive year receiving 130 citations, followed by the year 2015 accounting 128 citations, and year 2016 with 113 citations.

4.3 To Study the Form of Document Cited.

Earlier, the research scholars of various disciplines were mainly dependent on books and journal articles for attaining scholarly literature. But, considering the present-day scenario, different kinds of information sources are distributed and available in various forms. It includes journals, books, manuals, theses, technical reports, e-resources, websites, handbooks, lecture notes, conference proceedings, patents, encyclopedia, magazines, etc.

The aim of this objective was to find out which is the most preferred form of information resource used by the Ph. D. scholars of Physics programme to gather scholarly literature for their research. Table No. 2 and Figure No. 2 show the distribution of citations received by different bibliographic formats cited by physics scholars in their research.

Table No. 2. Distribution of citations according to bibliographic format

Sr. No.	Bibliographic Format	No. of Citations	Percentage
1	Journal Articles	1984	76.89922481
2	Books	418	16.20155039
3	Conference Proceedings	55	2.131782946
4	Websites	39	1.511627907
5	Technical Reports	21	0.813953488
6	Encyclopedia	10	0.387596899
7	Course	10	0.387596899
8	Thesis	9	0.348837209
9	Others	34	1.317829457
Total		2580	100

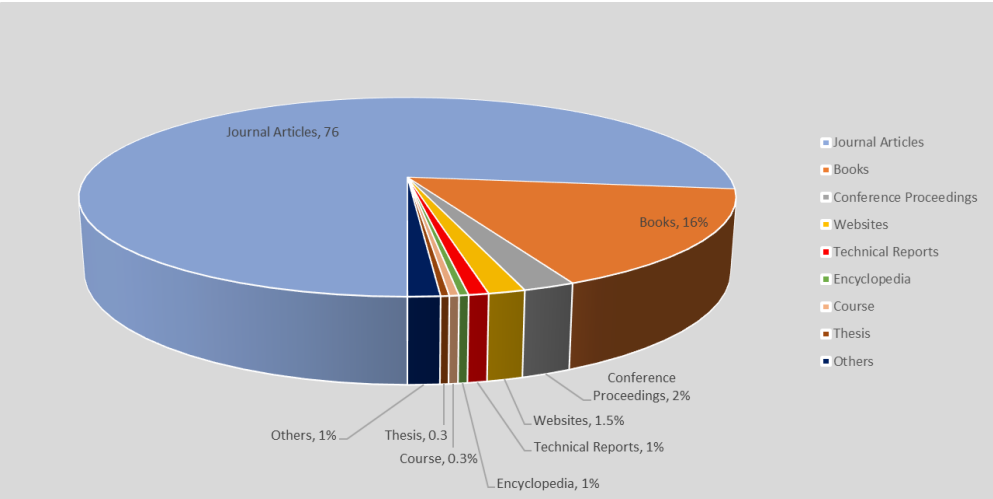

Figure No. 2. Pie chart representing different bibliographic formats.

As can be seen from the above pie chart, journal articles contribute the highest number of citations accounting for 76.89% (1984) of the total citations. This revealed that journals are the most preferred source of information used by researchers in the field of Physics. Books were the second most cited source accounting for 16.20% (418) of the total citations. The next preferred source of information for the physics research

scholars is seminar/conference proceedings which is 2.13% (55), followed by web resources at 1.51% (39), technical reports 0.81% (21), encyclopaedia 0.38% (10) and course materials 0.38% (10), Ph. D theses 0.34% (9), and others contributing to 1.31% (34) citations. It is found that journals and books are widely used format by the researchers of Goa University in the field of Physics when compared to other sources of information.

4.4 To Prepare Rank List of Journals.

The purpose of this objective was to find the core journals used by the Physics scholars for their research. Students or information seekers need to know the available resources which can be utilised while conducting any research.

Rank list of journals is prepared by counting the number of citations they have received. The prepared rank list can help in evaluating the highly influenced and most preferred journal in any given field. Below, Table No. 3 is the list of core journals in the field of Physics which are mostly used by researchers for their investigation. The list is arranged in descending order of the citations the journal has received. The highly cited journal is ranked as 1, and so on.

Table No. 3. Rank List of Journals

Sr. No.	Name of Journal	No. of Citations	Rank	Percentage
1.	Physical Review B	181	1	9.122983871
2.	Journal of Applied Physics	157	2	7.913306452
3.	Journal of Non-Crystalline Solids	141	3	7.106854839
4.	Journal of Magnetism and Magnetic materials	134	4	6.754032258
5.	Journal of Materials Science: Materials in Electronics	96	5	4.838709677
6.	Journal of Alloys and Compounds	52	6	2.620967742
7.	Physical Review Letters	51	7	2.570564516
8.	Applied Physics Letters	46	8	2.318548387
9.	Nature	40	9	2.016129032

10.	Material Research Society Bulletin	33	10	1.663306452
11.	Journal of Geophysical Research, Oceans	30	11	1.512096774
12.	Limnology and Oceanography Bulletin	29	12	1.461693548
13.	Physica B: Condensed Matter	27	13	1.360887097
14.	Solid State Communications	26	14	1.310483871
15.	Ceramics International	25	15	1.260080645
16.	Journal of the American Ceramic Society	24	16	1.209677419
17.	Journal of Physics: Condensed Matter	21	17	1.058467742
18.	Physical Reviews A	20	18	1.008064516
19.	Applied Optics	18	19	0.907258065
20.	Royal Society of Chemistry Advances (RSC Advances)	17	20	0.856854839
21.	Journal of the Physical Society of Japan	16	21	0.806451613
22.	Remote Sensing of Environment	15	22	0.756048387
23.	Acta Materialia	14	23	0.705645161
24.	Optical Materials	14	23	0.705645161
25.	Europhysics Letters	14	23	0.705645161
26.	Physica Status Solidi (B)	14	23	0.705645161
27.	Science	12	24	0.60483871
28.	Solid State Ionics	12	24	0.60483871
29.	Materials letters	12	24	0.60483871
30.	Journal of Luminescence	11	24	0.554435484
31.	CrystEngComm	11	24	0.554435484
32.	Physical Review	11	24	0.554435484
33.	Materials Sciences and Engineering: B	10	25	0.504032258
34.	Journal of Material Sciences	10	25	0.504032258
35.	Journal of Physics and Chemistry of Solids	10	25	0.504032258
36.	Advanced Materials	10	25	0.504032258
37.	Journal of Superconductivity and Novel Magnetism	9	26	0.453629032
38.	Applied Surface Science.	8	27	0.403225806
39.	Indian Journal of Marine Sciences	8	27	0.403225806
40.	Philosophical Magazine	8	27	0.403225806
41.	Estuarine, Coastal and Shelf Science	8	28	0.403225806

42.	Journal of Physics D: Applied Physics	8	28	0.403225806
43.	Scientific Reports	7	29	0.352822581
44.	The Journal of Physical Chemistry B	7	29	0.352822581
45.	International Journal of Refrigeration	7	29	0.352822581
46.	Optical Express	7	29	0.352822581
47.	Ferroelectrics	7	29	0.352822581
48.	Journal of Physics: Conference Series	7	29	0.352822581
49.	The Journal of Chemical Physics	7	29	0.352822581
50.	Indian Journal of Geo-Marine Science.	7	29	0.352822581
51.	Bulletin of Material Science	7	29	0.352822581
52.	Journal of the European Ceramic Society	7	29	0.352822581
53.	Material Chemistry and Physics	7	29	0.352822581
54.	Journal of the American Chemical Society	6	30	0.302419355
55.	Acta Crystallographica Section A: Foundations and Advances	6	30	0.302419355
56.	Journal of Material Chemistry C	6	30	0.302419355
57.	Central European Journal of Physics	6	30	0.302419355
58.	Reviews of Modern Physics	6	30	0.302419355
59.	Dalton Transaction	6	30	0.302419355
60.	Crystal Growth & Design	6	30	0.302419355
61.	AIP Advances	6	30	0.302419355
62.	Soviet Physics. Solid State	5	31	0.252016129
63.	Chemical Reviews	5	31	0.252016129
64.	Superlattices and Microstructures	5	31	0.252016129
65.	Journal of Nanoparticle Research	5	31	0.252016129
66.	Journal of Physical Chemistry C	5	31	0.252016129
67.	Optoelectronics and Advanced Materials-Rapid Communications	5	31	0.252016129
68.	Nanotechnology	5	31	0.252016129
69.	Physica Status Solidi (A)	5	31	0.252016129
70.	Annual Review of Materials Research	5	31	0.252016129
71.	Current Science	5	31	0.252016129

72.	Nuclear Instruments and Methods in Physics Research-section A (NIM-A)	4	32	0.201612903
73.	Advanced Science Letters	4	32	0.201612903
74.	Physics Letters	4	32	0.201612903
75.	New Journal of Chemistry	4	32	0.201612903
76.	Journal of Raman Spectroscopy	4	32	0.201612903
77.	Journal of Molecular Structure	4	32	0.201612903
78.	Zeitschrift für Physik	4	32	0.201612903
79.	Physics and Chemistry of Glasses	4	32	0.201612903
80.	Asian Journal of Chemistry	4	32	0.201612903
81.	Journal of Solid-State Chemistry	4	32	0.201612903
82.	Annual Review of Materials	4	32	0.201612903
83.	Philosophical Magazine A	4	32	0.201612903
84.	Advanced functional Materials	4	32	0.201612903
85.	Powder Technology	4	32	0.201612903
86.	The Journal of Physical Chemistry A	4	32	0.201612903
87.	Physics and Chemistry of Glasses: European Journal of Glass Science and Technology B	4	32	0.201612903
88.	Journal of Atmospheric and Oceanic Technology	4	32	0.201612903
89.	Journal of the Indian Society of Remote Sensing	4	32	0.201612903
90.	Journal of Physics C: solid state Physics	4	32	0.201612903
91.	Journal of Nanomaterials	3	33	0.151209677
92.	Material Science – Poland	3	33	0.151209677
93.	Energy and Environmental Science	3	33	0.151209677
94.	Journal of Nano-and Electronic Physics	3	33	0.151209677
95.	Applied Science Letters	3	33	0.151209677
96.	Acta Physica Polonica A	3	33	0.151209677
97.	International Journal of Remote Sensing	3	33	0.151209677
98.	Journal of Physics B: Atomic Molecular and Optical Physics	3	33	0.151209677
99.	International Journal of Scientific Research and Reviews	3	33	0.151209677
100.	Progress in Natural Science: Materials International	3	33	0.151209677

101.	Journal of Nanoparticle Research	3	33	0.151209677
102.	Journal of Crystal Growth	3	33	0.151209677
103.	Journal of Oceanography	3	33	0.151209677
104.	Chemistry of Materials	3	33	0.151209677
105.	Inorganic Chemistry	3	33	0.151209677
106.	Journal of Electronic Material	3	33	0.151209677
107.	Physica E: Low-dimensional Systems and Nanostructures	3	33	0.151209677
108.	Electrochimica Acta	3	33	0.151209677
109.	Applied Physics A: Materials Science and Processing	3	33	0.151209677
110.	Zeitschrift fur kristallographie – Crystaline Materials	3	33	0.151209677
111.	Environment Monitoring and Assessment	3	33	0.151209677
112.	Chemical Engineering Journal	3	33	0.151209677
113.	Water Science and Technology	3	33	0.151209677
114.	Materials Research Express	3	33	0.151209677
115.	Journal of Electroceramics	3	33	0.151209677
116.	Journal of Colloid and Interface Science	3	33	0.151209677
117.	Report on Progress in Physics	3	33	0.151209677
118.	Indian Journal of Engineering and Materials Sciences	3	33	0.151209677
119.	Journal of Ceramic Association Japan	3	33	0.151209677
120.	Optics Letters	3	33	0.151209677
121.	Journal of material Chemistry A	3	33	0.151209677
122.	Materials Chemistry and Physics	3	33	0.151209677
123.	Journal of Asian Ceramic societies	2	34	0.100806452
124.	Journal of Photochemistry and Photobiology A: Chemistry	2	34	0.100806452
125.	Lithuanian Journal of Physics	2	34	0.100806452
126.	Physics of the Solid State	2	34	0.100806452
127.	Materials	2	34	0.100806452
128.	Deep-Sea Research Part 1: Oceanographic Research Papers Publisher	2	34	0.100806452
129.	Journal of for Research in Applied Science & Engineering Technology (IJRASET)	2	34	0.100806452

130.	Materials Science in Semiconductor Processing	2	34	0.100806452
131.	Chemistry letters	2	34	0.100806452
132.	International Journal of Molecular Sciences	2	34	0.100806452
133.	Annual Reviews of Marine Science	2	34	0.100806452
134.	Results in Physics	2	34	0.100806452
135.	Nano letters	2	34	0.100806452
136.	Vibrational Spectroscopy	2	34	0.100806452
137.	Journal of Marine Research	2	34	0.100806452
138.	Journal of Research of the National Institute of Standards and Tech.	2	34	0.100806452
139.	International Journal of Nanotechnology & Applications.	2	34	0.100806452
140.	Sensors and Actuators B: Chemical	2	34	0.100806452
141.	Scripta Materialia	2	34	0.100806452
142.	PloS ONE	2	34	0.100806452
143.	Journal of Rare Earths	2	34	0.100806452
144.	Angewandte Chemie	2	34	0.100806452
145.	Chinese Physics B	2	34	0.100806452
146.	International Journal of Hydrogen Energy	2	34	0.100806452
147.	Journal of the European Optical Society	2	34	0.100806452
148.	CMES - Computer Modeling in Engineering & Sciences	2	34	0.100806452
149.	Radiation Measurements	2	34	0.100806452
150.	Indian Journal of Chemistry-Section A (IJCA).	2	34	0.100806452
151.	Remote Sensing Letters	2	34	0.100806452
152.	American Journal of Applied Sciences	2	34	0.100806452
153.	Langmuir	2	34	0.100806452
154.	Oceanologica	2	34	0.100806452
155.	International Journal of Scientific and Research Publications	2	34	0.100806452
156.	Nanoscale Research letters.	2	34	0.100806452
157.	Zeitschrift für Naturforschung	2	34	0.100806452
158.	Biogeosciences	2	34	0.100806452
159.	Journal of Electronic Materials	2	34	0.100806452

160.	Physica C: Superconductivity and its Applications	2	34	0.100806452
161.	Crystal Research and Technology	2	34	0.100806452
162.	Journal of Material Research	2	34	0.100806452
163.	Journal of Materials Science Letters	2	34	0.100806452
164.	Physica Scripta	2	34	0.100806452
165.	Journal of Experimental Nanoscience	2	34	0.100806452
166.	Journal of Material Chemistry	2	34	0.100806452
167.	Annual Review of Nucleus and Particle Sciences	2	34	0.100806452
168.	Advanced Drug Delivery Reviews	2	34	0.100806452
169.	Crystallography Reports	1	35	0.050403226
170.	Fibers and Polymers	1	35	0.050403226
171.	Materials Characterization	1	35	0.050403226
172.	Journal of King Saud University – Science	1	35	0.050403226
173.	Journal of Inorganic and Organometallic Polymers and Materials	1	35	0.050403226
174.	Revista Maxicana de Fisica	1	35	0.050403226
175.	Micro and Nonosystems	1	35	0.050403226
176.	Journal de Physique, Colloque	1	35	0.050403226
177.	European Polymer Journal	1	35	0.050403226
178.	Integrated Ferroelectrics	1	35	0.050403226
179.	Advanced Energy Materials	1	35	0.050403226
180.	International Journal of ChemTech Research	1	35	0.050403226
181.	Advances in Nanoparticles	1	35	0.050403226
182.	Journal of Crystal Growth	1	35	0.050403226
183.	Journal of Materials Engineering and Performance	1	35	0.050403226
184.	Progress in Crystal Growth and Characterization of Materials	1	35	0.050403226
185.	Journal of Applied Sciences	1	35	0.050403226
186.	Silicon	1	35	0.050403226
187.	Journal of the Saudi Society of Agricultural Sciences	1	35	0.050403226
188.	Journal of Advanced Dielectrics	1	35	0.050403226
189.	Sedimentary Geology	1	35	0.050403226

190.	Solid State Sciences	1	35	0.050403226
191.	Journal of Statistical Mechanics Theory and Experiment	1	35	0.050403226
192.	Archives of Applied Science Research	1	35	0.050403226
193.	Journal of Synchrotron Radiation	1	35	0.050403226
194.	Oceanography	1	35	0.050403226
195.	Journal of Geological Education	1	35	0.050403226
196.	Physics Reports	1	35	0.050403226
197.	Journal of Materiomics	1	35	0.050403226
198.	Materia-Rio de Janeiro	1	35	0.050403226
199.	The Journal of Chemical Thermodynamics	1	35	0.050403226
200.	Surface Review and Letters	1	35	0.050403226
201.	Applied Physics Research	1	35	0.050403226
202.	Indian Journal of Pure & Applied Physics	1	35	0.050403226
203.	Global Change Biology	1	35	0.050403226
204.	Advances in Space Research	1	35	0.050403226
205.	Physics procedia	1	35	0.050403226
206.	Sensors and Actuators A: Physical	1	35	0.050403226
207.	Applied Thermal Engineering	1	35	0.050403226
208.	Applied Energy	1	35	0.050403226
209.	Chinese Journal of Oceanology and limnology	1	35	0.050403226
210.	Journal of Applied Science Engineering & Technology	1	35	0.050403226
211.	International Journal of Engineering and Advanced Technology	1	35	0.050403226
212.	Journal of the Korean Physical Society	1	35	0.050403226
213.	Hydrobiologica	1	35	0.050403226
214.	Chemical Geology	1	35	0.050403226
215.	Key Engineering Materials	1	35	0.050403226
216.	Journal of vacuum Science and Technology	1	35	0.050403226
217.	Computational Materials Science	1	35	0.050403226
218.	Water	1	35	0.050403226
219.	Earth System Science Data	1	35	0.050403226
220.	Chemical Physics	1	35	0.050403226

221.	JAAST: Material Science	1	35	0.050403226
222.	Journal of Theoretical and Applied Physics	1	35	0.050403226
223.	Resonance	1	35	0.050403226
224.	Marine Chemistry	1	35	0.050403226
225.	Journal of Ceramic Processing Research	1	35	0.050403226
226.	Journal of Chemical Society	1	35	0.050403226
227.	International Journal of Nanotechnology	1	35	0.050403226
228.	American Mineralogist	1	35	0.050403226
229.	ACS Nano	1	35	0.050403226
230.	Egyptian Journal of Solids	1	35	0.050403226
231.	AICHE Journal	1	35	0.050403226
232.	Journal of Nanotechnology & Advanced Material	1	35	0.050403226
233.	Journal of Microscopy	1	35	0.050403226
234.	Journal of Australian Ceramic Society	1	35	0.050403226
235.	Fishery Bulletin	1	35	0.050403226
236.	International Journal of Nanoscience	1	35	0.050403226
237.	Analytical Chemistry	1	35	0.050403226
238.	Marine and Freshwater Research	1	35	0.050403226
239.	Hydrology Research	1	35	0.050403226
240.	Geochimica et Cosmochimica Acta	1	35	0.050403226
241.	Chalcogenide Letters	1	35	0.050403226
242.	Croatica Chemica Acta.	1	35	0.050403226
243.	Spectrochimica Acta	1	35	0.050403226
244.	Aquatic Microbial Ecology	1	35	0.050403226
245.	IFAC-PapersOnline	1	35	0.050403226
246.	Journal of Electroanalytical Chemistry	1	35	0.050403226
247.	Journal of Applied Crystallography	1	35	0.050403226
248.	International Journal of IT, Engineering Applied Sciences Research (IJIEASR)	1	35	0.050403226
249.	Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and atoms	1	35	0.050403226
250.	Journal of mathematics and physics	1	35	0.050403226

251.	Express Polymer Letters	1	35	0.050403226
252.	World Applied Science Journal	1	35	0.050403226
253.	Nanostructured Materials.	1	35	0.050403226
254.	Materials and Manufacturing Processes	1	35	0.050403226
255.	Journal of Low Temperature Physics	1	35	0.050403226
256.	CRC Critical Reviews in Solid State Sciences	1	35	0.050403226
257.	Journal of Chemical Thermodynamics	1	35	0.050403226
258.	Acta Physica Slovaca	1	35	0.050403226
259.	Nuovo Cimento D	1	35	0.050403226
260.	Material Science forum	1	35	0.050403226
261.	Comptes Rendus Physique	1	35	0.050403226
262.	Carbon - Science and Technology	1	35	0.050403226
263.	International Journal of Chemical and Physical Sciences	1	35	0.050403226
264.	Current Opinion in Solid State and Materials Science	1	35	0.050403226
265.	Chemical Communications	1	35	0.050403226
266.	Intermetallics	1	35	0.050403226
267.	Electrochemistry	1	35	0.050403226
268.	Dyes and Pigments	1	35	0.050403226
269.	Journal of Bioelectronics and Nanotechnology	1	35	0.050403226
270.	Journal of Nanoscience and Nanotechnology	1	35	0.050403226
271.	Desalination and Water Treatment	1	35	0.050403226
272.	Journal of Advanced Ceramics	1	35	0.050403226
273.	Journal of Earth System Science	1	35	0.050403226
274.	APL Materials	1	35	0.050403226
275.	Russian Metallurgy	1	35	0.050403226
276.	Electronic Materials Letters	1	35	0.050403226
277.	Journal of the Marine Biological Association of India	1	35	0.050403226
278.	Neutron News	1	35	0.050403226
279.	Materials Science and Engineering A	1	35	0.050403226
280.	Modern Physics Letters B	1	35	0.050403226
281.	Microporous and Mesoporous materials	1	35	0.050403226
282.	Journal of Solid-State Chemistry	1	35	0.050403226

283.	International Journal of Minerals, Metallurgy and Minerals.	1	35	0.050403226
284.	Indian Journal of Meteorology & Geophysics	1	35	0.050403226
285.	Journal of Physical Oceanography	1	35	0.050403226
286.	Journal of Marine Systems	1	35	0.050403226
287.	Spectroscopy Letters	1	35	0.050403226
288.	Turkish Journal of Physics	1	35	0.050403226
289.	Iranian Journal of Catalysis	1	35	0.050403226
290.	Journal of Scientific Research	1	35	0.050403226
291.	Philosophical Transactions of the Royal Society	1	35	0.050403226
292.	International Journal of Chemical Studies	1	35	0.050403226
293.	Proceedings of the National Academy of Sciences of the United States of America	1	35	0.050403226
294.	Asian Journal of Physics	1	35	0.050403226
295.	Journal of High-Temperature Chemical Processes	1	35	0.050403226
296.	Indian Journal of Science & Technology	1	35	0.050403226
297.	Atmospheric Environment	1	35	0.050403226
298.	Environmental Earth Science	1	35	0.050403226
299.	Journal of Earth System Science	1	35	0.050403226
300.	Continental Shelf Research	1	35	0.050403226
	Total	1984		100

Table No. 3 shows that there are a total of 300 journals used by researchers in the physics discipline. The list provides an overall ranking of journals based on the citations each journal has received from the citing document. All the 1984 citations received by journals were analysed and the citations received by each journal were counted. The journals are arranged in the decreasing order of their respective rank. The journal with the highest number of citations receives the first rank which proves it's usage by physics scholars, while the least important titles are placed at the bottom of Table No. 3.

Physical Review B occupies the first rank as the most preferred journal having been cited 181 times with 9.12% of the total citation counts for journals. *Journal of Applied Physics* occupies the second rank with a citation count of 157 (7.91%), third rank is

occupied by the *Journal of Non-Crystalline Solids* having a citation count of 141(7.10%), fourth rank is occupied by the *Journal of Magnetism and Magnetic Materials* with 134 (6.75%) citations, and the fifth rank is occupied by the *Journal of Materials Science: Materials in Electronics* with 96 (4.83%) citations. All the remaining journals also contribute to the total number of citations and are placed at the bottom of Table No. 3.

4.5 To Identify Authorship Pattern

The purpose of this objective is to identify and measure the contribution of authors in the field of Physics. The authorship pattern reveals the number of authors per publication and also helps to identify the extent of knowledge that is shared with others through the adduced number of authors' affiliations in collaborative work. It also helps to find to what extent authors collaborate with one another to give outputs to scholarly research. The number of authors was counted and analysed from each bibliographic reference appended to the theses. The data is tabulated in Table No. 4.

Table No. 4. Authorship Pattern in the cited documents.

Sr. No.	Authors	Total no. of Citations	Percentage
1	Single Author	387	17.38544474
2	Two	424	19.04761905
3	Three	385	17.29559748
4	Multiple Authors	1030	46.27133872
Total		2226	100

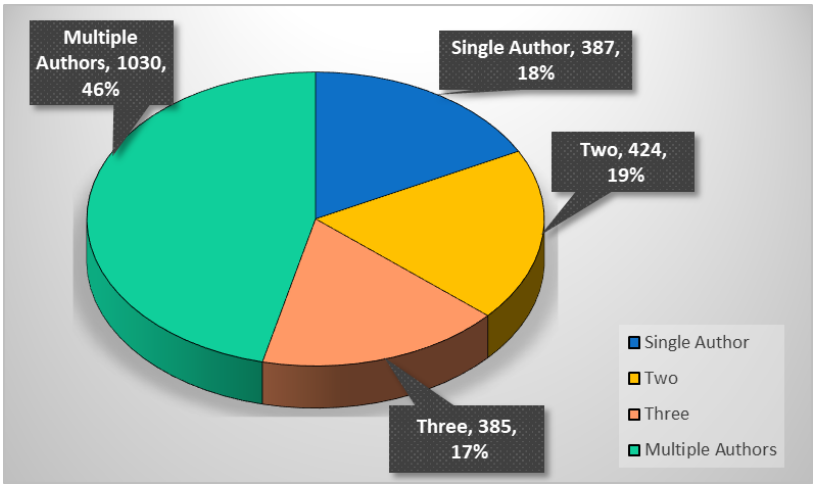

Figure No. 3. Pie chart showing authorship pattern

The above Table No. 4 and Figure No. 4 shows the authorship pattern of the cited documents. It reveals that out of 2226 citations, most of the citations i.e., 1030 (46.27%) were by more than three authors, followed by two authors with 424 citations accounting for 19.04%, followed by three authors with 385 (17.29%), and lastly followed by single authors with 387 (17.38%) citations. It is observed that the majority of the cited documents were by more than three authors which proves that collaborative research is prevailing in the field of physics.

4.6 To Study Country - wise Scattering of Cited Journals

The purpose of this objective was to find the countries active in producing scholarly research in the field of Physics. The geographical analysis of citations provides information about the countries highly contributing to the scientific community. Table No. 5 shows the geographical distribution of 300 ranked journals covering 1984 citations.

Table No. 5. Geographical Distribution of cited Journals.

Sr. No	Country	No. of Journals	Percentage	No. of Citations	Percentage
1	United States	81	27	895	45.1108871
2	United Kingdom	76	25.33333333	367	18.49798387
3	Netherlands	70	23.33333333	213	10.7358871
4	India	29	9.666666667	80	4.032258065
5	Switzerland	10	3.333333333	67	3.377016129
6	Germany	9	3	64	3.225806452
7	Japan	8	2.666666667	60	3.024193548
8	Romania	7	2.333333333	59	2.973790323
9	China	2	0.666666667	53	2.671370968
10	Poland	1	0.333333333	49	2.469758065
11	France	1	0.333333333	33	1.663306452
12	Brazil	1	0.333333333	30	1.512096774
13	Egypt	1	0.333333333	6	0.302419355
14	Singapore	1	0.333333333	3	0.151209677
15	South Korea	1	0.333333333	1	0.050403226

16	Lithuania	1	0.333333333	2	0.100806452
17	Canada	1	0.333333333	2	0.100806452
		300	100	1984	100

As can be seen from the above table, The United States ranks first among the foreign countries with 27% covering 81 journals and 895 citations. The second and third place is occupied by the United Kingdom and the Netherlands contributing 25.33% receiving citations 367 and 213 respectively. India is ranked fourth with 9.66% covering 29 journals and 80 citations.

Chapter 5

MAJOR FINDINGS

5.1 Major Findings

In the present study, 2580 citations were analyzed from 11 Ph.D. theses in Physics programme of Goa University. On the basis of the above study, the major findings are as follows.

- It is observed from the study that the year 2014 was the most productive year receiving 130 citations, followed by the year 2015 accounting for 128 citations, and the year 2016 with 113 citations.

- The analysis of citations according to bibliographic forms revealed that the journals contribute the highest number of citations accounting for 76.89% (1984) of the total citations. This revealed that journals are the most preferred sources of information used by researchers in the field of Physics, which shows not only their importance in communicating scholarly literature but also the dependency of researchers on journals for their research work. Books were the second most cited source accounting for 16.20% (418) of the total citations. The next preferred source of information for Physics research scholars were the seminar/conference proceedings which is contributing to 2.13% (55), followed by web resources at 1.51% (39).

- It is found that journals and books were widely used format by the Physics researchers of Goa University.

- The rank list of Journals in the field of Physics revealed that journal citations cited by researchers were scattered among 300 journals. The journal *Physical Review B* occupies the first rank as the most preferred journal having been cited

181 times with 9.12% of the total citation counts for journals. *Journal of Applied Physics* occupies the second rank with a citation count of 157 (7.91%), third rank is occupied by the *Journal of Non-Crystalline Solids* having a citation count of 141(7.10%), fourth rank is occupied by the *Journal of Magnetism and Magnetic Materials* with 134 (6.75%) citations, and the fifth rank is occupied by the *Journal of Materials Science: Materials in Electronics* with 96 (4.83%) citations.

- The analyzed authorship pattern observed in the cited documents shows that most of the citations were contributed by more than three authors which proves the fact that research in the fields of applied and natural sciences is collaborative in all aspects.

- The analysis for the geographical scattering of 300 cited journals reveals that, the United States ranks first among the foreign countries with 27% covering 81 journals and 895 citations. The second and third place is occupied by the United Kingdom and the Netherlands contributing 25.33% receiving citations 367 and 213 respectively. India is ranked fourth with 9.66% covering 29 journals and 80 citations.

5.2 Minor findings

There is no uniformity in the citation styles in the theses that are submitted to the Physics programme of Goa University. The researchers do not follow standard format for recording the bibliographic details. A few citations don't include full bibliographic description which in turn lacks in proper identification of the sources cited.

5.3 Hypothesis Testing

Hypothesis 1: Journals are the most preferred sources of information in the field of Physics.

From the findings (table no. 2) it can be seen that journals contribute to 76.89% of the total citation counts. Hence hypothesis 1 is accepted.

Hypothesis 2: There is significant multiple-author collaboration.

From the findings (table no. 4) it can be seen that more than three authors account for 46.27% of the total citation counts. This reveals that multiple-author collaboration is prevailing. Hence hypothesis 2 is accepted.

Chapter 6

SUGGESTIONS AND CONCLUSION

6.1 Suggestions

1. As observed in the theses and mentioned in minor findings, most of the citations don't follow a particular referencing style, which lacks full bibliographic details. So, awareness has to be created when it comes to referencing and citing styles which can be taken care of by the library of Goa University by conducting user orientation programs on referencing and citing styles.

2. From the study it has been seen that, citations by more than three authors with 46.27% are prevailing. Collaborative research is higher, but there is still a significant percentage of authors who are going for research as single-author publications. To bring to the forefront, the research scholars should also be guided as to how collaborative research can help them in gaining their academic visibility.

3. As journals are the most preferred sources of references, the research scholars can be made aware of the number of highly cited journals, and advise them to publish their research in high-impact factor journals.

6.2 Conclusion

Citation analysis does not end with the study of the distribution or scattering of references, it extends to the study of literature of a subject which grows exponentially with time. This method emphasizes that information sources most profusely cited can be taken to be the most desirable ones in a library collection, for they are likely to be frequently used by researchers in a particular subject field or for a particular scientific community in a geographical area. Citation analysis in any research activity helps study

the impact, subject relationships, publication trends, authorship pattern, and identifies core journals in a particular subject field or for a particular scientific community (Gohain & Saikia, 2014)

The study covers 11 Ph. D theses submitted to the physics programme of Goa University from the period 2017 – 2022. It is evident from the citations that physics research scholars consulted enormous literature while preparing their dissertations. The study revealed that journals are the most preferred sources of information. The journal *Physical Review B* occupies the first rank as the most preferred journal having been cited 181 times with 9.12% of the total citation counts. *Journal of Applied Physics* occupies the second rank with a citation count of 157 (7.91%), third rank is occupied by the *Journal of Non-Crystalline Solids* having a citation count of 141(7.10%). The rank list provided in the study might become useful for physics research scholars in identifying the journals of greater importance. The rank list might also be used by the librarians in the acquisition of periodicals in the library.

6.3 References

Gohain, A., & Saikia, M. (2014, October 1). CITATION AN TION ANALYSIS OF PH.D THESES SUBMI SIS OF PH.D THESES SUBMITTED TO THE DEPARTMENT OF CHEMICAL SCIENCES, TEZPUR UNIVERSITY, ASSAM. *Library Philosophy and Practice (e-journal)*. doi:https://digitalcommons.unl.edu/libphilprac/1066

BIBLIOGRAPHY

Aliyu, Y. (2018, March 13). Citation Analysis of Doctoral Theses in Education,University of Maiduguri, Nigeria. *Library Philosophy and Practice (e-Journal)*. Retrieved November 1, 2022, from https://digitalcommons.unl.edu/libphilprac/1721

Banateppanavar, K. (2015). Citation Analysis Of Doctoral Theses in Bioscience Accepted By The Kuvempu University. Retrieved November 2, 2022, from http://hdl.handle.net/10603/378390

Banateppanvar, K., Biradar, B. S., Kannappanavar, B. U., DharaniKumar, P., & Kumar, S. K. (2013, July). Citation analysis of doctoral theses in Zoology submitted to Kuvempu University, India: A case study. *International Journal of Library and Information Science, V*(6), 192-202. doi:10.5897/IJLIS2012.0333

Banateppanvar, K., Biradar, B., & Kannappanavar, B. (2013). Citation analysis of doctoral theses in Biotechnology submitted to Kuvempu University, Karnataka: A case study. *International Journal of Information Dissemination and Technology, III*(3), 147-157. Retrieved November 4, 2022

Banateppanvar, K., Biradar, B., & Kannappanavar, B. (2013). Citation analysis of doctoral theses in botany submitted to Kuvempu University, India: a case study. *Collection Building, XXXII*(1), 12-20. doi:10.1108/01604951311295058

Barman, B. (2022). *A comprehensive book on Library and Information Science.* LIS Links.

Chikate, R., & Patil, S. (2008, December). Citation Analysis of Theses in Library and Information Science Submitted to University of Pune: A Pilot Study. *Library Philosophy and Practice (e-journal).* Retrieved November 4, 2022, from https://digitalcommons.unl.edu/libphilprac/222

Eckel, E. J. (2009, October 4). The Emerging Engineering Scholar: A Citation Analysis of Theses and Dissertations at Western Michigan University.

University Libraries Faculty & Staff Publication, 1-17. Retrieved November 18, 2022, from https://scholarworks.wmich.edu/library_pubs/2

Evaluation based on scientific publishing: Citation analysis and databases containing citation information. (2013). Retrieved from Oulun yliopiston kirjasto: https://libguides.oulu.fi/evaluatingpublications/citationanalysis

Ezema, I. J. (2016, October). Scholarly Communication and Authorship Patterns in Language Research: Evidences from Citation Analysis of Language Theses in Nigeria. *Ghana Journal of Development Studies, XIII*(2), 1-25. doi:http://dx.doi.org/10.4314/gjds.v13i2.1

Gayan, M. A., & Singh, S. K. (2021, February 18). Citation analysis of Mathematics: a scientometric study based on PhD theses, Tripura University. *Library Philosophy and Practice (e-journal)*. Retrieved November 1, 2022, from https://digitalcommons.unl.edu/libphilprac/5167

Gohain, A., & Saikia, M. (2014, October 1). CITATION AN TION ANALYSIS OF PH.D THESES SUBMI SIS OF PH.D THESES SUBMITTED TO THE DEPARTMENT OF CHEMICAL SCIENCES, TEZPUR UNIVERSITY, ASSAM. *Library Philosophy and Practice (e-journal)*. doi:https://digitalcommons.unl.edu/libphilprac/1066

Gohain, A., & Saikia, M. (2014, October 1). Citation Analysis of Ph.D Theses Submitted To The Department of Chemical Sciences, Tezpur University, Assam. *Library Philosophy and Practice (e-journal)*. Retrieved September 21, 2022, from https://digitalcommons.unl.edu/libphilprac/1066

Gupta, J. (2015). *Citation Studies: a performance evaluation technique of LIS Scientists.* New Delhi: ESS Publications.

Gupta, S. (2020). CITATION ANALYSIS OF DOCTORAL THESES IN EDUCATION SUBMITTED TO THE UNIVERSITIES OF HARYANA, PUNJAB AND CHANDIGARH. India. Retrieved November 2, 2022, from http://hdl.handle.net/10603/340524

Kaur, A., & Rattan, G. K. (2018, May 4). Citation Analysis of Theses in Economics Submitted to Punjabi University, Patiala during 2000-2014. *DESIDOC*

Journal of Library & Information Technology, XXXVIII(3), 192-198. doi:10.14429/djlit.38.3.12474

Kaur, P., & Sehgal, P. (2021, April 3). Citation Analysis of PhD Theses in Library and Information Science: A Study of Panjab University, Chandigarh. *Library Progress (International), XXXXI*(1), 106-112. doi:10.5958/2320-317X.2021.00011.8

Kumar, K. K., & Doraswamy, M. (2014, January-March). CITATION ANALYSIS OF Ph.D THESES IN CIVIL ENGINEERING SUBMITTED TO SRI VENKATESWARA UNIVERSITY, TIRUPATI, ANDHRA PRADESH. *International Journal of Digital Library Services, IV*(I), 83-91. Retrieved November 19, 2022

Mahajan, P., & Kumar, A. (2017, November). Citation Analysis of Doctoral Theses in the field of Sociology submitted to Panjab University,Chandigarh (India) during 2002-2012. *Library Philosophy and Practice (e-journal)*. Retrieved November 5, 2022, from http://digitalcommons.unl.edu/libphilprac/1611

Nighot, S. (2019, May). CITATION ANALYSIS OF Ph.D. THESES IN EDUCATION IN TWO STATE UNIVERSITIES OF MAHARASHTRA. India. Retrieved November 2, 2022, from http://hdl.handle.net/10603/312092

Sarkale, A. B. (2017, December 12). A Study of Citation Analysis of Psychology Journal Available in Directory of Open Access Journals. *submitted to Swami Ramanand Teerth Marathwada University*, 245. Retrieved March 30, 2023, from http://hdl.handle.net/10603/209105

Satpute, C. R. (2015, March). CITATION ANALYSIS OF PH.D THESES IN PURE SCIENCES AWARDED BY NORTH MAHARASHTRA UNIVERSITY, JALGAON. Retrieved November 2, 2022, from http://hdl.handle.net/10603/70705

Shafi, S., & Gazi, W. (2005). Citation Analysis of Ph.D Theses A study of doctoral theses submitted to Kashmir University during 1980-2000 in Natural Sciences. *Trends in Information Management (TRIM), I*.

Siddiqui, J. A., Khanam, S., & Kaushik, P. (2021, February 11). Citation Analysis of Ph.D. theses in Economics submitted to Ch. Charan Singh University, Meerut (2011-2015). *ResearchGate*. India. doi:10.5958/2320-317X.2020.00036.7

Singh, K., & Bebi. (2013, November). Citation Analysis of PhD Theses in Sociology Submitted to University of Delhi during 1995-2010. *DESIDOC Journal of Library & Information Technology, XXXIII*(6), 489-493. Retrieved November 19, 2022

Somashekara, Y. L., & Mallinath, K. (2015, February). Citation analysis of doctoral theses of Zoology subject submitted to three universities in Karnataka, India. *e-Library Science Research Journal, III*(4). Retrieved November 6, 2022

Somashekara, Y., & Kumbar, M. (2014, August). CITATION ANALYSIS OF SCIENCE DOCTORAL THESES IN PHYSICS SUBMITTED TO BANGALORE UNIVERSITY BANGALORE, KARNATAKA, INDIA. *Golden Research Thoughts, IV*(2), 1-9. Retrieved November 4, 2022

Somashekara, Y., & Kumbar, M. (2015, January-March). Citation Analysis Of Doctoral Theses: An Analysis Of Physics Theses Submitted To Three Universities of Karnataka, India. *International Journal of Library and Information Studies, V*(1), 20-33. Retrieved November 4, 2022

Thamaraiselvi, M., Manthiramoorthi, M., & Manikandan, A. (2016, January-June). Citation Analysis of Doctoral Theses of Library and Information Science Submitted to the Alagappa University with Special References to Shodhganga Website. *ScieXplore: International Journal of Research in Science, III*(1), 41-46. doi:10.15613/sijrs/2016/v3i1/114285

Tyagi, S., & Kumar, K. (2017). Citation Analysis of Doctoral Theses in Political Science Submitted to Chaudhary Charan Singh University. *Journal of Indian Library Association, XXXXXIII*, 5-13. Retrieved September 21, 2022

Wardikar, V. G. (2013, December 15). Application of Bradford's Law of Scattering to the Literature of Library & Information Science: A Study of Doctoral Theses Citations Submitted to the Universities of Maharashtra, India. *Library Philosophy and Practice (e-journal)*. Retrieved March 30, 2023, from https://digitalcommons.unl.edu/libphilprac/1054